Gender diversity in corporate boards of companies listed on the Johannesburg Stock Exchange: a quantile regression approach

Mpinda Freddy Mvita and Elda Du Toit

Abstract

Purpose – *This paper aims to explore the effect of female's presence in corporate governance structures to reduce agency conflicts, using a quantile regression approach.*

Design/methodology/approach – *The research investigates the relationship between company performance and boardroom gender diversity using quantile regression methods. The study uses annual data of 111 companies listed on the Johannesburg Stock Exchange from 2010 to 2020.*

Findings – *The study reveals that women on the board impact firm return on assets and enterprise value, varying across performance distribution. This contrasts fixed effect findings but aligns with two-stage least squares. However, quantile regression indicates that female executives and independent non-executive directors have notably negative impacts in high and low-performing companies, highlighting non-uniformity in the board gender diversity effect compared with previous assumptions.*

Practical implications – *The empirical findings suggest that companies with no women directors on the board are generally more likely to experience a decrease in performance and enterprise value relative to companies with women directors on the board. As recommended through the King Code of Corporate Governance, it is thus valuable to companies to ensure gender diversity on the board of directors.*

Originality/value – *The research confirms through rigorous statistical analyses that corporate governance policies, principles and guidelines should include gender diversity as a requirement for a board of directors.*

Keywords *Gender diversity, Corporate governance, Board of directors, Quantile regression*

Paper type *Research paper*

Mpinda Freddy Mvita and Elda Du Toit are both based at the Department of Financial Management, University of Pretoria, Hatfield Campus, Pretoria, South Africa.

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1. Introduction

> The governing body should promote diversity in its membership across a variety of attributes relevant to promoting better decision-making and effective governance, including the field of knowledge, skills and experience as well as age, culture, race and gender.
>
> King IV (IoDSA, 2016).

The corporate governance landscape highlights the global push for gender diversity on boards, acknowledging the varied contributions that women bring (Arora and Singh, 2020; Bennouri *et al.*, 2018; Campbell and Mínguez-Vera, 2010; Conyon and He, 2017; Fan *et al.*, 2019; Kim and Starks, 2016; Liu *et al.*, 2020; Mazzotta and Ferraro, 2020; Zalata *et al.*, 2018). Despite initiatives, boardrooms remain male-dominated, impacting gender parity worldwide (PricewaterhouseCoopers, 2021; Catalyst, 2021; Changole, 2021; Hawarden and Greenwood, 2021). However, the benefits of diverse boards are evident, offering unique insights and fostering improved financial performance (Conyon and He, 2017). Reforms and legislation

have sought to enhance female representation on boards in various countries, including South Africa (Brahma *et al.*, 2020; Ntim, 2015). Nevertheless, the impact of gender diversity on company performance remains debated, warranting further investigation (Amin *et al.*, 2021; Ozdemir, 2020; Rahman and Zahid, 2021; Bennouri *et al.*, 2018; Joecks *et al.*, 2013).

The study aims to bridge this gap, particularly in the context of South Africa and the Johannesburg Stock Exchange (JSE), examining the relationship between gender diversity and financial performance (Campbell and Mínguez-Vera, 2008). Using a quantile regression approach, this research seeks to illuminate the impact of gender diversity in an emerging market like South Africa, contributing to a more comprehensive understanding of its influence on financial outcomes. Through this, the study not only corroborates but unravels the nuanced interplay between gender diversity and financial performance in the unique fabric of a developing economy. The paper underscores the necessity of such investigation, not only for local companies but also for a global readership seeking a deeper grasp of gender diversity's effects within diverse economic contexts.

By delving into the JSE-listed companies, this research sheds light on the unique contributions of gender diversity in an emerging market, aligning with governance reforms suggested by King IV and the JSE listings requirements. The findings affirm the positive relationship between a gender-diverse board and enhanced financial performance in both low and high-performing companies, contributing significantly to the ongoing discussion about gender diversity's impact on company success.

2. Literature review

2.1 Theoretical foundation

2.1.1 Agency theory. The agency theory, introduced by Fama and Jensen (1983), underscores the pivotal role of the board of directors in corporate governance. It highlights the board's responsibility for aligning shareholder and managerial interests through monitoring and advisory roles (Bennouri *et al.*, 2018; Campbell and Bohdanowicz, 2015).

Proponents advocate specific board attributes, such as independent directors and robust monitoring committees, enhancing the board's efficacy in addressing agency problems (Kanadlı *et al.*, 2022; Wagana and Nzulwa, 2017). Nonetheless, critics argue that the theory oversimplifies corporate governance complexities, focusing excessively on self-interest and overlooking the diverse motivations influencing boardroom decisions.

Gender diversity on boards is believed to enhance monitoring efficiency and reduce agency costs, bringing varied expertise, communication channels and legitimacy (García-Meca, *et al.*, 2015; Kılıç and Kuzey, 2016; Brahma *et al.*, 2020; Ozdemir, 2020). Research supports the influence of board member attributes, including gender, on strategic decisions and company performance (Bennouri *et al.*, 2018; Kanadlı *et al.*, 2022; Ntim, 2015).

2.1.2 Resource dependence theory. Resource dependence theory underscores the reliance of companies on external resources and the need to establish connections with external entities (Lückerath-Rovers, 2013; Pfeffer and Salancik, 2003). It posits that a diverse board effectively navigates a dynamic environment and connects with external resources (Arora and Singh, 2020; Fernández-Temprano and Tejerina-Gaite, 2020).

Advocates argue that gender diversity on boards offers varied perspectives and competencies, presenting it as a resource for companies (Fan *et al.*, 2019; Moreno-Gómez and Calleja-Blanco, 2018). However, critics suggest oversimplification of how diversity impacts resource acquisition and use.

Moreover, gender diversity is seen to enhance monitoring, resource acquisition, organisational legitimacy and reputation (Lückerath-Rovers, 2013; Carter *et al.*, 2010; Fernández-Temprano and Tejerina-Gaite, 2020). It symbolises good governance, and company commitment to

equity, and serves as an attraction for top-tier talent (Brahma *et al.*, 2020; Moreno-Gómez and Calleja-Blanco, 2018).

This foundation supports the idea that gender diversity on boards improves monitoring, reduces costs, enhances resource acquisition and contributes to organisational performance. This relationship can be explored within the frameworks of agency theory, resource dependence theory and the pursuit of organisational legitimacy.

2.2 Empirical review and hypothesis development

Research indicates that gender diversity offers substantial benefits to corporate boards. Studies by Adams and Ferreira (2009) demonstrated that increased gender diversity correlates with improved attendance and monitoring efforts. Women exhibit distinct leadership styles and values compared to men, emphasising collaboration, participative decision-making and ethical responsibility (Kirsch, 2018; Papangkorn *et al.*, 2021). They contribute traits such as security-oriented supervision and diligent control, engaging actively in discussions, showcasing participative leadership and demonstrating higher ethical standards (Li and Li, 2020; Martín-Ugedo, *et al.*, 2018). Female directors bring diverse professional backgrounds, counteracting groupthink and offering problem-solving skills, creativity, innovation and enhanced access to information (Erhardt, *et al.*, 2003; Fan *et al.*, 2019; Kim and Starks, 2016).

Moreover, the dominance of men in corporate boards has been linked to corporate collapses and financial crises, advocating for increased women's participation on boards (Handa and Singh, 2015). Female leadership introduces diversity and the potential to steer boards in new directions, enhancing monitoring and improving firm performance (Campbell and Mínguez-Vera, 2008; Chen, *et al.*, 2016; Papangkorn *et al.*, 2021). Women's unique characteristics, such as patience, resilience and meticulousness, contribute to innovation, credibility, prestige and knowledge within companies (Campbell and Mínguez-Vera 2008, 2010; Moreno-Gómez and Calleja-Blanco, 2018; Smith, *et al.*, 2006; Terjesen, *et al.*, 2009), indicating potential enhancements in financial performance. Ultimately, advocating for increased female representation on boards aims to enhance boardroom dynamics and governance, potentially leading to improved financial performance (Campbell and Bohdanowicz, 2015).

There remains continued interest in the financial effect of having greater gender diversity on the board of directors of companies. Numerous studies on this topic have been conducted around the world with varied results. Looking at studies conducted from 2010 onwards, the results are diverse, indicating both positive and varied effects. Several studies found a positive association between gender diversity and financial performance, such as those conducted in Spain (Campbell and Mínguez-Vera, 2010), Malaysia (Julizaerma and Sori, 2012), China (Liu, *et al.*, 2014), Turkey (Ararat, *et al.*, 2015; Kılıç and Kuzey, 2016), France (Bennouri *et al.*, 2018; Gharbi and Othmani, 2022; Sabatier, 2015), South Africa (Gyapong *et al.*, 2016; Ntim, 2015), Australia (Vafaei, *et al.*, 2015), India (Jeet, 2020; Mukarram, *et al.*, 2018), the UK (Brahma *et al.*, 2020), Colombia (Moreno-Gómez and Calleja-Blanco, 2018), Italy (Gordini and Rancati, 2017; Mazzotta and Ferraro, 2020), Pakistan (Amin *et al.*, 2021), Senegal (Périlleux and Szafarz, 2021), Russia (Tleubayev *et al.*, 2020) and the USA (Conyon and He, 2017; Liu *et al.*, 2020; Ozdemir, 2020). However, some studies reported varied or mixed effects in countries such as the USA (Carter *et al.*, 2010; Papangkorn *et al.*, 2021), Germany (Joecks *et al.*, 2013), The Netherlands (Lückerath-Rovers, 2013), Spain (Fernández-Temprano and Tejerina-Gaite, 2020) and India (Papangkorn *et al.*, 2021).

Several studies also investigated other factors such, e.g. Chen *et al.* (2016) investigated internal control measures' effectiveness, whereas Fan *et al.* (2019), Zalata *et al.* (2018), Li and Li (2020), Wahid (2019) and Rahman and Zahid (2021) examined earnings management, financial irregularities and share volatility. In all cases, increased gender

diversity on the board correlated with reduced risk. In addition, Gul *et al.* (2011) found a positive relationship between board gender diversity and share price informativeness, contrasting Handa and Singh's (2015) discovery of a negative non-significant impact on initial public offering (IPO) under-pricing. Kaur and Singh (2015) noted no effect on IPO pricing in India, while Reutzel and Belsito (2015) found a negative relationship in the USA.

Findings from systematic literature reviews, like Nguyen *et al.* (2020), support the positive effect of gender diversity on company performance. However, Bennouri *et al.* (2018) suggested varying impacts based on company characteristics, showing positive accounting-based measures but a negative relationship in market-based measures. Joecks *et al.* (2013) found mixed links, with recent trends showing a positive direction. Hoobler *et al.*'s (2018) meta-analysis across 78 studies confirmed a positive influence of female board representation on company performance.

From the literature, the authors believe that greater gender diversity on the board of directors positively affects financial performance, considering that the relationship may also be affected by contextual factors and mediating variables, all of which cannot be considered in one study. Drawing from the agency and resource dependency theoretical frameworks and logical reasoning, based on the idea that diversity on the board brings new insights, the study's hypothesis is as follows:

H1. The proportion of female directors' presence on the board of directors is more positively related to financial performance in high-performing companies than in low-performing companies.

2.3 A review of the structure and the performance of the Johannesburg Stock Exchange

The JSE, established in 1887, holds a prominent status as the largest stock exchange in Africa, crucial to South Africa's financial market. It functions as a trading platform for diverse financial instruments, such as equities, derivatives and bonds, fostering interactions between investors and companies seeking capital. With 242 listed companies across various sectors, such as mining, finance, technology and health care, the JSE mirrors the resilience and adaptability of the South African economy. Governed by stringent regulations overseen by the Financial Sector Conduct Authority, the exchange prioritises transparency, fairness and investor safeguards. Operating within a socio-economic context, the JSE acts as an economic barometer for South Africa, reflecting local business vitality while also serving as a gateway for global investment. Understanding the JSE intricacies is pivotal in comprehending South Africa's economic dynamics, playing a crucial role in regional and global investment and economic development.

2.4 Research design and sample selection

This study, conducted between 2010 and 2020, used a descriptive research design to explore the relationship between gender diversity and financial performance without intervening in the data. Initially, using purposive sampling, 120 companies were selected from all sectors of the JSE, which was then refined to 111 companies based on data availability in annual integrated reports.

Two primary data sets were used, one consisted of 1,320 annual published financial statements, focusing on corporate governance variables, including gender diversity, from reliable sources. The second data set, sourced from the IRESS database, comprised company performance and control variables.

To ensure a comprehensive analysis while minimising the influence of outliers, the data underwent winsorisation, a statistical technique used to manage extreme values in regression analysis.

2.5 Model specification

As per Conyon and He (2017), the objective of the research is to compare the estimates of a classical least square estimator to those generated from a quantile regression function. Firstly, the research estimates the conditional mean regression (Greene, 2012):

$$E(Y_{it}/X_{it}) = y_{it} = \alpha + \beta G_{it} + \gamma_1 x_{1,it} + \ldots + \gamma_{k,it} x_{k,it} + \varepsilon_{it} \quad (1)$$

Where y_{it} is the ith company performance in year t. The dependent and model covariates are indexed by company i and period t. The research uses two different measures of performance, namely, the return on equity and the return on assets (ROA). The term gender diversity (GD) is the main corporate governance variable of interest and $x_1 \ldots x_k$ are set of company control variables described in Table 1:

$$Q_T(Y_{it}/X_{i,t}) = \alpha_T + \beta_T GD_{it} + \gamma_{T,1} x_{k,it} + \ldots + \gamma_{T,k} x_{k,it} + \varepsilon_{it} \quad (2)$$

Where $Q_T(Y_{it}/X_{it})$ is the Tth quantile regression function.

The quantile regression technique is advantageous compared to ordinary least squares as it provides a detailed view of the relationship between variables. It is robust against outliers, reducing their impact. Unlike the average-focused ordinary least squares (OLS), quantile

Table 1 Variable definitions

Variables	*Code*	*Description*
Dependent variables		
Return on assets	(ROA)	[(Profit Before Interest and Tax (EBIT) – Total Profit Extraordinary Nature – Taxation)/Total Assets] * 100
Independent variable		
Gender diversity		
Gender diversity_01	GD01	Female dummy variable with "1" assigned to firms with no woman director and "0" otherwise in year *t* of a company *i*
Gender diversity_02	GD02	Female dummy variable with "1" assigned to firms with 1 woman director and "0" Otherwise in year *t* of a company i
Gender diversity_04	GD04	The proportion of female directors sitting on board in year *t* of company *i*
Gender diversity_05	GD05	The proportion of male directors sitting on board in year *t* of company *i*
Gender diversity_07	GD07	The proportion of female executive directors sitting on board in year *t* of company *i*
Control variables (governance specific)		
Board size	BS	Total number of directors sitting on the board
Board independence01	IND	Percentage of independent non-directors on board
Board independence02	ND	Percentage of non-directors on board
Female independence02	FIND	Percentage of independent non-executive women directors on board
Control variables (company-specific)		
Company size	SIZE	Natural logarithm transformation of the book value of total assets as expressed in millions in year *t* of a company *i*
Growth opportunities	GW	% Change in sales
Price-to-book ratio	PB	Share Price @ Company Financial Year End/[(Ordinary Shareholders Interest/Nr of Ordinary Shares in Issue @Year End) * 100]
Age	AGE	Number of years of the company since its incorporation
Liquidity	CR	Current assets divided by current liabilities
Debt-to-equity ratio	DE	(Total Long-Term Loan Capital + Total Current Liabilities)/Total Owners Interest

Source: Prepared by authors

regression predicts various points across the outcome's distribution. It goes beyond central tendencies, estimating different percentiles, like the 25th or 75th, offering a versatile method to understand the impact of an independent variable on the outcome. By analysing an array of conditional quantile functions, it comprehensively illustrates the relationship between variables. This method enables differentiation between high and low-performing companies.

3. Empirical results and discussion

3.1 Descriptive statistics and correlation

Table 2 depicts the mean values and standard deviations for each variable used in this research. As shown in Table 2, the average ROA is approximately 9.649 with the minimum and maximum being –39.145 and 63.079, respectively. The mean percentage of women on the board is about 19.254% with the minimum and maximum being 0% and 50%, respectively. The mean percentage of women on board in South Africa is greater than the mean percentage of women in other studies (Amin *et al.*, 2021; Conyon and He, 2017; Adams and Ferreira, 2009). The mean percentage of male directors on the board is 80.751% with a minimum and maximum of 0% and a maximum of 100%, respectively, suggesting that in South Africa most directors on the board are men. The average board size is 10.212 directors. The average percentage of women executive directors is 2.381%. The average percentage of women independent non-executive directors is 13.853%. The average debt-to-equity ratio is 1.152. A typical company in our sample is approximately 43.703 years old with the minimum and maximum being 4 and 123 years old, respectively. The average price-to-book ratio is 2.013.

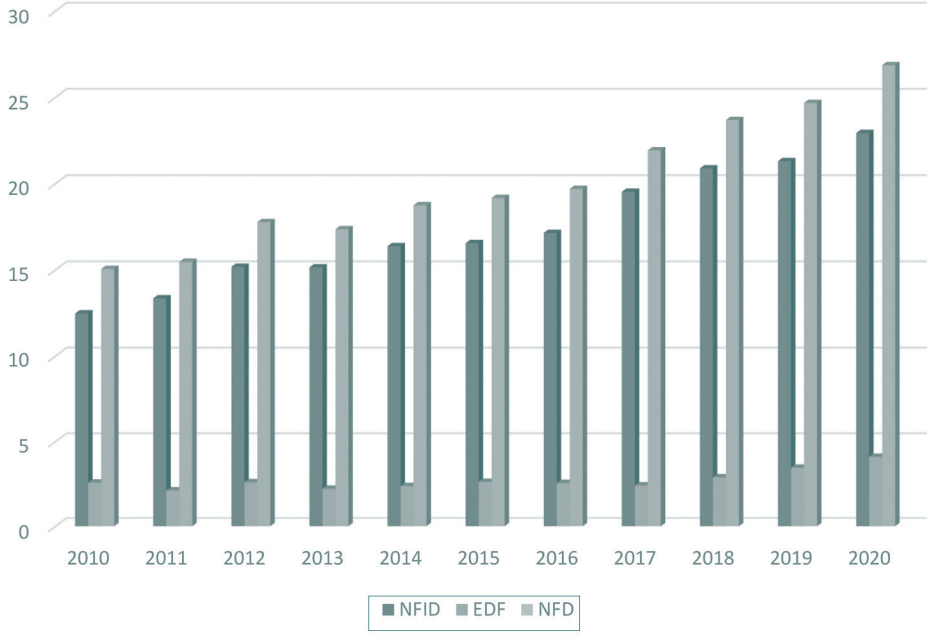
Because the research focuses on board gender diversity, it is interesting to see how women's participation has changed over time. Figure 1 plots the percentage of the number of female independent directors, female executive directors and the number of female directors. This suggests there is an increasing trend in women's participation over time. However, this increase is small and below 5% for executive directors, below 25% for the independent female non-executive directive and below 30% for the women directors on the board. The research concludes that although the percentage of women on South African boards remains low, female representation on corporate boards has experienced an upward trend in recent

Table 2 Descriptive statistics of the key variables

Variables	*Obs*	*Mean*	*SD*	*Min*	*Max*	*p1*	*p99*	*Skew.*	*Kurt.*
ROA	1221	9.649	14.31	-39.145	63.079	–39.145	63.079	0.059	6.574
EVT	1221	1.595	1.694	–0.118	12.34	–0.118	12.34	3.743	21.594
GD 04	1220	19.254	12.627	0	50	0	50	0.226	2.44
GD 05	1221	80.751	12.623	50	100	50	100	–0.227	2.441
GD 07	1221	2.381	4.628	0	20	0	20	1.792	5.265
FI 02	1221	13.853	11.246	0	40	0	40	0.342	2.225
BZ 02	1221	10.212	2.752	5	17	5	17	0.234	2.54
GW	1221	8.894	24.42	–46.45	153.188	–46.45	153.188	2.815	17.701
CR	1221	2.413	4.45	0.099	36.915	0.099	36.915	6.626	49.651
DE	1221	1.152	1.29	0.001	7.39	0.001	7.39	2.514	10.606
AGE	1221	43.703	29.869	4	123	4	123	0.674	2.589
PB	1221	2.013	2.193	0	11.287	0	11.287	2.247	8.342
SIZE	1221	6.741	0.882	4.609	8.678	4.609	8.678	–0.427	2.98

Notes: ROA = return on assets; EVT = enterprise value; GD_04 = proportion of female directors sitting on the board; GD_05 = proportion of male directors sitting on the board; GD_07 = proportion of female executive directors sitting on the board; FI_02 = percentage of independent non-executive women directors on board; CR = current ratio; GW = growth opportunities; PB = price to book ratio; SIZE = company size; AGE = number of years of the company since its incorporation
Source: Authors' analyses

Figure 1 Percentage of women on boards: 2010–2020



Source: Prepared by authors

history. It would thus be of interest to evaluate whether increased women's representation on boards of directors leads to improved performance.

The correlation results between variables are presented in Table 3. The results of the pairwise correlation suggest that gender diversity is positively and significantly correlated with the ROA and the enterprise value. The finding suggests that the presence of women has an overall impact on both measures of performance. These results provide credence to the idea that gender diversity on the board of directors adds a new aspect to boardroom dynamics, perhaps strengthening the board's governance and operation. On the board size, the company's growth opportunity, and the price-to-book ratio age are positively and significantly correlated with the ROA and enterprise value. Size is negatively and significantly correlated with the ROA. The debt-to-equity ratio is negatively and significantly correlated with the ROA but positively and significantly correlated with the enterprise value. Female independent directors are positively and significantly correlated with enterprise value. Liquidity is negatively and significantly correlated with enterprise value.

3.2 Regression results

Table 4 outlines the initial estimates of the association between firm performance and female board representation. Columns 1 and 2 display OLS estimates, while columns 3 and 4 account for firm-level fixed effects, and columns 5 and 6 address endogeneity in gender diversity. The adjusted R^2 of these models are 0.384, 0.68, 0.24, 0.49, 0.396 and 0.691, respectively. The enterprise value has the highest R^2 as compared to the ROA. This finding suggests that the variation in performance measures is explained by the independent variables. OLS models reveal a significant positive link between the ROA and female board

Table 3 Correlation results

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*
(1) roa_w	1.000												
(2) evt_w	0.595 (0.000)	1.000											
(3) gd_04_w	0.103 (0.000)	0.160 (0.000)	1.000										
(4) gd_05_w	−0.103 (0.000)	−0.160 (0.000)	−1.000 (0.000)	1.000									
(5) gd_07	0.028 (0.321)	0.013 (0.639)	0.372 (0.000)	−0.372 (0.000)	1.000								
(6) fi_02	0.004 (0.876)	0.084 (0.003)	0.777 (0.000)	−0.777 (0.000)	0.025 (0.381)	1.000							
(7) bz_02_w	0.055 (0.054)	0.154 (0.000)	0.302 (0.000)	−0.301 (0.000)	0.097 (0.001)	0.227 (0.000)	1.000						
(8) gw_w	0.260 (0.000)	0.215 (0.000)	−0.031 (0.273)	0.031 (0.285)	0.023 (0.430)	−0.064 (0.025)	0.013 (0.638)	1.000					
(9) cr_w	0.031 (0.286)	−0.149 (0.000)	−0.190 (0.000)	0.190 (0.000)	−0.002 (0.958)	−0.166 (0.000)	−0.269 (0.000)	−0.046 (0.105)	1.000				
(10) de_w	−0.070 (0.014)	0.085 (0.003)	0.148 (0.000)	−0.149 (0.000)	0.012 (0.664)	0.138 (0.000)	0.085 (0.003)	−0.039 (0.173)	−0.433 (0.000)	1.000			
(11) age_w	0.055 (0.054)	0.073 (0.010)	0.174 (0.000)	−0.173 (0.000)	0.076 (0.008)	0.102 (0.000)	0.335 (0.000)	−0.047 (0.104)	0.068 (0.018)	0.058 (0.043)	1.000		
(12) pb_w	0.516 (0.000)	0.775 (0.000)	0.176 (0.000)	−0.176 (0.000)	0.061 (0.034)	0.090 (0.002)	0.264 (0.000)	0.177 (0.000)	−0.182 (0.000)	0.356 (0.000)	0.190 (0.000)	1.000	
(13) size_w	−0.053 (0.062)	−0.001 (0.969)	0.345 (0.000)	−0.345 (0.000)	0.052 (0.067)	0.330 (0.000)	0.618 (0.000)	−0.008 (0.768)	−0.280 (0.000)	0.190 (0.000)	0.335 (0.000)	0.167 (0.000)	1.000

Notes: *p*-value in parenthesis. ROA = return on assets; EVT = enterprise value; gd_04 = proportion of female directors sitting on the board; gd_05 = proportion of male directors sitting on board; gd_07 = proportion of female executive directors sitting on; fi_02 = percentage of independent non-executive women directors on board; cr = current ratio; gw = growth opportunities; pb = price to book ratio, size is the company size, age is the number of years of the company since its incorporation
Source: Authors' analyses

Table 4 Company performance and women on the board: OLS, fixed effect and two-stage least squares (2SLS)

Variables	(1) ROA OLS	(2) EVT OLS	(3) ROA Firm fixed effects	(4) EVT Firm fixed effects	(5) ROA_W 2SLS	(6) EVT_W 2SLS
GD_04_	0.175** (0.085)	0.011 (0.009)	0.002 (0.051)	–0.004* (0.002)	0.178*** (0.055)	0.012** (0.005)
GD_07_	–0.182 (0.128)	–0.018 (0.014)	0.093 (0.094)	–0.002 (0.004)	–0.188** (0.081)	–0.02*** (0.007)
FI_02_	–0.107 (0.081)	–0.002 (0.01)	–0.026 (0.048)	0.002 (0.002)	–0.097* (0.053)	–0.003 (0.005)
BZ_02_	–0.168 (0.195)	–0.004 (0.017)	–0.213 (0.165)	–0.001 (0.008)	–0.175 (0.129)	–0.005 (0.008)
GW_	0.106*** (0.019)	0.004** (0.002)	0.11*** (0.016)	0.004*** (0.001)	0.115*** (0.021)	0.004*** (0.001)
CR_	0.102 (0.417)	–0.107*** (0.033)	0.602** (0.296)	–0.078*** (0.014)	0.195 (0.264)	–0.111*** (0.017)
DE_	–2.78*** (0.491)	–0.274*** (0.055)	–3.111*** (0.405)	–0.232*** (0.019)	–2.757*** (0.279)	–0.266*** (0.024)
AGE_	–0.003 (0.018)	–0.001 (0.002)	–0.23*** (0.089)	0.016*** (0.004)	0.001 (0.01)	–0.001 (0.001)
PB_	3.493*** (0.274)	0.505*** (0.031)	2.81*** (0.261)	0.341*** (0.013)	3.462*** (0.163)	0.505*** (0.014)
SIZE_	–1.267 (0.785)	–0.193 (0.126)	0.955 (1.241)	–0.229*** (0.06)	–1.154** (0.476)	–0.194*** (0.047)
_cons	13.925** (5.329)	2.209*** (0.749)	11.478 (7.405)	2.12*** (0.355)	12.35*** (2.958)	2.211*** (0.295)
Observations	1220	1220	1220	1220	1109	1109
R-squared	0.384	0.68	0.24	0.49	0.396	0.691

Notes: Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ ROA = return on assets; EVT = enterprise value; GD_04 = proportion of female directors sitting on the board; GD_05 = proportion of male directors sitting on the board; GD_07 = proportion of female executive directors sitting on the board; FI_02 = percentage of independent non-executive women directors on board; CR = current ratio; GW = growth opportunities; PB = price to book ratio; SIZE = company size; AGE = number of years of the company since its incorporation

Source: Authors' analyses

representation, yet insignificance for enterprise value. In interpreting the OLS estimates (columns 1 and 2) of the association between firm performance and female board representation, it is noteworthy that the positive link with ROA aligns with expectations, while the insignificance for enterprise value prompts further investigation into the nuanced dynamics influencing different performance metrics. When fixed effects are considered (columns 3 and 4), the gender diversity impact diminishes, indicating an insignificant relationship with ROA, and surprisingly, a negative relationship with enterprise value. This unexpected result might be due to associations between female board presence and firm-specific effects, leading to its disappearance when firm-level effects are controlled. Additionally, addressing endogeneity through two-stage least squares the results (columns 5 and 6) show a significant positive correlation between gender diversity and both ROA and enterprise value. However, assuming a constant gender effect across performance distribution is invalid, leading to subsequent quantile regression analysis reported in Tables 6 and 7.

As shown in Table 5, the variance inflation factor (VIF) values, ranging from 1.062 to 3.667, indicate that multicollinearity is not a significant concern among the variables. Generally, VIF values below 10 suggest acceptable levels of multicollinearity and ensure the reliability of the statistical analyses. This implies that the independent variables contribute unique information to the model without introducing excessive redundancy. The low VIF values strengthen the validity of the panel regression results, enhancing the confidence in drawing meaningful conclusions about the relationship between gender diversity on boards and financial performance.

By conducting quantile regressions for ROA and enterprise value, this study explores the heterogeneity within board gender diversity in more detail, drawing inspiration from the work of Conyon and He (2017). We calculate 19 different quantile regressions, ranging from the 5th to the 95th percentile, for each dependent variable. We can evaluate the effects of board gender diversity at various levels by examining these quantiles.

Some significant and interesting conclusions are drawn from the analysis. Firstly, in line with Conyon and He (2017), parameter heterogeneity has been observed concerning the effect of gender board diversity on a company's ROA and enterprise value. Following the

Table 5 Variance inflation factor

Variables	*VIF*	*1/VIF*
GD 04	3.667	0.273
FI 02	3.095	0.323
SIZE	1.851	0.54
BZ 02	1.837	0.544
DE	1.439	0.695
CR	1.414	0.707
GD 07	1.412	0.708
PB	1.316	0.76
AGE	1.253	0.798
GW	1.062	0.941
Mean VIF	1.835	–

Notes: ROA = return on assets; EVT = enterprise value; GD_04 = proportion of female directors sitting on the board; GD_05 = proportion of male directors sitting on the board; GD_07 = proportion of female executive directors sitting on the board; FI_02 = percentage of independent non-executive women directors on board; CR = current ratio; GW = growth opportunities; PB = price to book ratio; SIZE = is the company size; AGE = number of years of the company since its incorporation
Source: Authors' analyses

expectations made in the hypothesis, women on boards have a stronger overall impact on firm performance across all quantiles of the ROA and enterprise value distributions (refer to Tables 6 and 7). These results are consistent with those of Conyon and He (2017), who found that the magnitude decreased when ROA was used as a performance indicator.

The impact of women on boards varies across quantiles, significantly affecting enterprise value at higher quantiles (Table 6). However, the influence of female executive and non-executive directors diminishes at both lower and higher quantiles. Control variables in regressions maintain consistency in their significance across quantiles, indicating their importance. Board size displays varying associations with performance measures at different quantiles, showcasing both positive and negative significance. Other variables, like debt-to-equity ratio, price book value, liquidity ratio and growth ratio, also reveal distinct impacts on performance measures across quantiles.

The diverse findings across regression models and quantile analyses underscore the nuanced relationship between gender diversity on corporate boards and financial performance, revealing both general positive correlations and specific performance variations at different quantiles. These results intricately align with our hypothesis, emphasising that the impact of female board representation on financial performance is contingent on the company's performance level, supporting the notion that the proportion of female directors may have a more positive association with financial performance in high-performing companies than in low-performing ones.

These findings affirm that gender diversity on boards enhances boardroom dynamics, potentially bolstering governance and operational effectiveness, translating into improved financial outcomes. Moreover, a diverse board brings various experiences that aid in informed decision-making and provide a competitive advantage in navigating complex and dynamic environments. These conclusions extend to the South African context, underscoring the relevance of diverse boards for organisational success.

The research used a rigorous methodology, using quantile regression. Compared to the traditional least square estimator that has been frequently used in earlier studies, our technique enables a more thorough analysis (Conyon and He, 2017).

To investigate the relationship between the performance indicators (return on equity and ROA) and the primary corporate governance variable of interest, gender diversity, as well as a set of company control variables ($x\_1 \ldots x\_k$), the research first estimated a conditional

Table 6 Company performance and gender diversity: a quantile regression for the return on assets

ROA	*Coef.*	*St. Err.*	t-*value*	p-*value*	*[95% conf. interval]*		*Sig*
Q.25							
GD_04	0.169	0.058	2.90	0.004	0.055	0.283	***
GD_05	0	–	–	–	–	–	
GD_07	–0.243	0.128	–1.90	0.058	–0.494	0.008	*
FI_02	–0.083	0.074	–1.13	0.261	–0.228	0.062	
BZ_02	–0.132	0.208	–0.64	0.525	–0.541	0.276	
GW	0.049	0.03	1.62	0.106	–0.01	0.108	
CR	–0.381	0.096	–3.97	0	–0.57	–0.193	***
DE	–1.862	0.315	–5.90	0	–2.481	–1.243	***
AGE	0.018	0.01	1.91	0.057	–0.001	0.037	*
PB	2.344	0.172	13.61	0	2.006	2.682	***
SIZE	–1.145	0.691	–1.66	0.098	–2.501	0.211	*
Constant	10.12	3.659	2.77	0.006	2.941	17.3	***
Q.50							
GD_04	0.149	0.043	3.45	0.001	0.064	0.233	***
OGD_05	0	–	–	–	–	–	
GD_07	–0.173	0.077	–2.25	0.024	–0.323	–0.022	**
FI_02	–0.142	0.042	–3.39	0.001	–0.224	–0.06	***
_BZ_02	–0.16	0.123	–1.30	0.195	–0.402	0.082	
GW	0.043	0.021	2.00	0.046	0.001	0.084	**
CR	–0.432	0.069	–6.23	0	–0.568	–0.296	***
DE	–2.36	0.225	–10.48	0	–2.801	–1.918	***
AGE	–0.008	0.01	–0.79	0.431	–0.027	0.011	
PB	3.188	0.243	13.15	0	2.712	3.664	***
SIZE	–2.01	0.331	–6.07	0	–2.659	–1.36	***
Constant	22.798	1.903	11.98	0	19.065	26.532	***
Q.75							
GD_04	0.125	0.051	2.48	0.013	0.026	0.224	**
GD_05	0	–	–	–	–	–	
GD_07	–0.134	0.07	–1.92	0.056	–0.271	0.003	*
FI_02	–0.115	0.048	–2.41	0.016	–0.208	–0.021	**
BZ_02	–0.187	0.112	–1.67	0.095	–0.406	0.033	*
GW	0.047	0.026	1.83	0.068	–0.003	0.098	*
CR	–0.04	0.118	–0.34	0.733	–0.272	0.191	
DE	–2.498	0.291	–8.59	0	–3.068	–1.927	***
AGE	–0.019	0.014	–1.40	0.162	–0.046	0.008	
PB	4.5	0.376	11.98	0	3.763	5.236	***
SIZE	-2.272	0.433	–5.25	0	–3.121	–1.422	***
Constant	26.662	2.733	9.75	0	21.299	32.024	***
Mean dependent var		9.654		SD dependent var		14.315	

Notes: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ ROA = return on assets; EVT = enterprise value; GD_04 = proportion of female directors sitting on the board; GD_05 = proportion of male directors sitting on the board; GD_07 = proportion of female executive directors sitting on the board; FI_02 = percentage of independent non-executive women directors on board; CR = current ratio, GW = growth opportunities; PB = price to book ratio; SIZE = company size; AGE = number of years of the company since its incorporation

Source: Authors' analyses

mean regression model [equation (1)]. The relationship between these factors was better understood as a result of this stage.

To examine heterogeneity across various quantiles of the performance distribution, the analyses then went on to estimate quantile regression functions [equation (2)]. To accurately represent the range of the performance distribution, quantile functions were computed at the median (50th percentile) and the interquartile (25th and 75th percentiles). Conyon and He's (2017) earlier research is consistent with this strategy.

Table 7 Company performance and gender diversity: a quantile regression for the Enterprise value

EVT	*coef.*	*St. Err.*	t-*value*	p-*value*	*[95% conf. interval]*		*sig*
Q.25							
GD_04	0	0.002	–0.21	0.837	–0.004	0.004	
O. GD_05	0	–	–	–	–	–	
GD_07	–0.005	0.003	–1.60	0.111	–0.011	0.001	
FI_02	0.002	0.002	0.91	0.363	–0.002	0.006	
BZ_02	0.008	0.006	1.39	0.166	–0.003	0.02	
GW	0.001	0.001	1.47	0.143	0	0.002	
CR	–0.028	0.001	–25.61	0	–0.03	–0.026	***
DE	–0.105	0.015	–6.98	0	–0.134	–0.075	***
AGE	–0.001	0	–3.85	0	–0.002	–0.001	***
PB	0.367	0.014	25.77	0	0.339	0.395	***
SIZE	0.001	0.018	0.05	0.956	–0.035	0.037	
Constant	0.523	0.095	5.52	0	0.337	0.71	***
Q.50							
GD_04	0.006	0.002	2.51	0.012	0.001	0.01	**
GD_05	0	–	–	–	–	–	
GD_07	–0.008	0.003	–2.66	0.008	–0.014	–0.002	***
_FI_02	–0.004	0.002	–1.94	0.053	–0.007	0	*
BZ_02	0.014	0.003	4.54	0	0.008	0.02	***
GW	0.001	0.001	1.18	0.24	0	0.002	
CR	–0.018	0.005	–3.95	0	–0.028	–0.009	***
DE	–0.088	0.021	–4.22	0	–0.128	–0.047	***
AGE	–0.002	0	–5.68	0	–0.002	–0.001	***
PB	0.481	0.022	22.26	0	0.438	0.523	***
SIZE	–0.067	0.015	–4.43	0	–0.096	–0.037	***
Constant	0.883	0.089	9.89	0	0.708	1.059	***
Q.75							
GD_04	0.009	0.004	2.14	0.033	0.001	0.018	**
GD_05	0	–	–	–	–	–	
GD_07	–0.013	0.004	–3.11	0.002	–0.021	–0.005	***
FI_02	–0.004	0.004	–1.02	0.31	–0.012	0.004	
BZ_02	0.003	0.006	0.44	0.663	–0.01	0.015	
GW	0.002	0.001	1.51	0.132	–0.001	0.004	
CR	–0.017	0.005	–3.62	0	–0.027	–0.008	***
DE	–0.062	0.026	–2.42	0.016	–0.112	–0.012	**
AGE	–0.001	0.001	–1.16	0.246	–0.003	0.001	
PB	0.625	0.029	21.53	0	0.568	0.682	***
SIZE	–0.218	0.047	–4.66	0	–0.309	–0.126	***
Constant	1.967	0.346	5.69	0	1.289	2.646	***
Mean dependent var		1.596		SD dependent var		1.694	

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$; ROA = return on assets; EVT = enterprise value; GD_04 = proportion of female directors sitting on the board; GD_05 = proportion of male directors sitting on the board; GD_07 = proportion of female executive directors sitting on the board; FI_02 = percentage of independent non-executive women directors on board; CR = current ratio; GW = growth opportunities; PB = price to book ratio; SIZE = company size; AGE = number of years of the company since its incorporation

Source: Authors' analyses

The research took into consideration potential differences in the impact of the primary gender diversity variable and control variables across various levels of performance by using quantile regression. With the aid of this methodology, one may understand the relationship more intricately and spot any repercussions that differ at various quantiles.

In general, this extensive methodology improves the accuracy and dependability of the findings by enabling a careful analysis of the correlation between corporate governance characteristics, control variables and performance metrics.

4. Summary and conclusion

4.1 Conclusions

The study's findings, akin to Ntim (2015), echo agency and resource dependence theories, indicating that gender diversity bolsters board independence, executive oversight and decision-making processes. This research sheds light on how female representation augments board dynamics, fortifying governance and correlating with improved financial performance. It emphasises the value of diverse directors in providing multifaceted insights and fostering a competitive edge in navigating dynamic environments.

The research underscores the alignment with agency and resource dependence theories in how gender diversity enhances board independence, oversight and decision-making, reflecting compliance with affirmative action principles and promoting sustained financial performance.

These findings significantly impact the understanding of how gender diversity on boards improves financial performance, consistent with agency and resource dependence theories. They highlight the added dimension brought by female representation, reinforcing governance and leading to enhanced financial outcomes. The study accentuates the diverse insights contributed by directors from various backgrounds, providing a competitive advantage in adapting to dynamic environments and establishing effective external connections.

These conclusions resonate with the broader narrative regarding gender diversity on boards. They advocate for meeting affirmative action principles and leveraging gender diversity to access resources and drive long-term financial performance. Acknowledging the pivotal role of gender diversity in bolstering board effectiveness, organisations can strategically embrace diversity, leading to improved outcomes for shareholders and stakeholders.

4.2 Discussion and recommendations

The study suggests two key recommendations for organisations and regulatory bodies. Firstly, businesses are encouraged to actively prioritise gender diversity in their boardrooms, recognising the valuable perspectives and insights that women bring, ultimately improving decision-making and organisational outcomes.

Secondly, regulatory bodies and policymakers should advocate for inclusive practices and policies that support diversity within corporate governance, ensuring equal opportunities for women's board participation. By implementing these suggestions, organisations can benefit from diverse perspectives, improve financial performance and contribute to gender equality in corporate settings.

In conclusion, the study's practical recommendations emphasise the importance of companies prioritising gender diversity in their board composition and the supportive role of regulatory bodies in fostering inclusive governance practices. By implementing these recommendations, organisations can tap into the benefits of diverse perspectives, improve financial performance and contribute to gender equality in the corporate sphere.

4.3 Limitations and suggestions for future studies

The study has several limitations that warrant acknowledgement for a comprehensive understanding. The sample size, limited to JSE-listed companies, may constrain the generalisability of findings. To enhance external validity, future research could involve a larger and more diverse sample, spanning additional years.

Moreover, the study primarily focuses on the percentage of women on boards, neglecting other influential characteristics. Future investigations might use structural equation models

to encompass a wider range of women's qualities, offering a more detailed analysis of their impact on performance.

Exploring the "critical mass" threshold for gender diversity and conducting comparative studies across different countries could provide valuable insights into board effectiveness. Longitudinal studies tracking the long-term effects of gender diversity initiatives on organisational performance would offer significant insights into sustainability and long-term benefits.

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Further reading

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Corresponding author

Elda Du Toit can be contacted at: Elda.DuToit@up.ac.za