GENDER DIVERSITY ON THE BOARD AND INVESTMENT EFFECTIVENESS IN THE EMERGING MARKET

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Abstract

The implementation of new gender diversity requirements has sparked significant research interest in assessing how such a commitment influences value-creation indicators (Chebri & Bahoussa, 2020). This study aims to examine the impact of gender diversity in the board of directors on the investment efficiency of listed firms in Morocco, using panel data from a sample of 36 non-financial firms listed on the Casablanca Stock Exchange for the period 2014 to 2019. To accurately identify the board dimensions that determine firms' investment efficiency, we conduct a fixed-effects regression analysis, in which a firm's investment efficiency variables are regressed, directly and indirectly (i.e., the moderating effect of board diversity), on board attributes. This study draws on the complementary propositions of agency theory and social feminist theory. The empirical results of this study indicate that diversity not only has a positive and significant direct impact on the level of investment effectiveness but also moderates the relationship between board characteristics and investment effectiveness. This study provides empirical evidence of the moderating role of gender diversity on the effect of board structure and investment effectiveness.

Keywords: Investment, Gender Diversity, Governance, Board of Directors, Duality

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1. INTRODUCTION

Debates on board diversity, and more specifically gender diversity, have gained momentum (Andrian & Pangestu, 2022; Haroon & Zaka, 2023). At the heart of this discussion lies the issue of board composition, particularly the representation of women in these governance bodies. This issue holds particular significance in Morocco, a country experiencing economic growth, where gender balance in the professional world has become a major concern.

The board of directors plays a crucial role in strategic decision-making within companies. It holds the power to define the company's vision, oversee its activities, and ensure accountability to shareholders. Consequently, the composition of this body inevitably influences the decisions and directions taken by a company. It is in this context that gender diversity in the board of directors has emerged as a central point of interest.

In Morocco, despite significant progress in women's education and their increasing participation in the workforce, women's representation in leadership positions remains relatively low. This raises essential questions about power dynamics, professional advancement opportunities for women, and the potential impact on company performance.

The effectiveness of investment policies is often measured against the objective of maximizing

shareholder wealth. This means that firms seek to maximize the return on their investments by using their resources efficiently and by ensuring that the investment projects chosen bring a return that exceeds their cost (Charreaux, 2000). The maximization of shareholder wealth derived from classical financial theory assumes that all entrusted funds are managed and invested according to investment policies that are consistent with the interests of shareholders. However, firms may face frictions such as information asymmetry and conflicts of interest among stakeholders (managers, shareholders, and creditors) that are likely to lead to negative spillovers on investment policies, namely underinvestment costs and overinvestment costs (Chen et al., 2017).

The effectiveness of investment policies is often assessed by comparing the firm's actual investments with expected investment levels. If actual investments do not deviate significantly from expected investment levels, given the firm's growth opportunities, then investment policies can be considered effective (Benlemlih & Bitar, 2018). However, these policies could deviate from the expected level of investment that may incur costs of under- or overinvestment when managers take advantage of the failures of the control exercised over it. As a result, the board of directors as a governance mechanism has an important role to play in overseeing the activities of the company and protecting the interests of shareholders. It has a fiduciary responsibility to exercise rigorous control over management decisions and actions, in order to reduce agency problems and secure investment policies (Verdi, 2006). Agency theory can explain how the board of directors can engage in improving the effectiveness of investment policies by ensuring that the interests of shareholders are protected and by supervising the actions of senior management. It assumes that there is a separation between the owners and the agents of the company, which can lead to conflicts of interest (Jensen & Meckling, 1976). For some time, there has been a renewed interest in the structure of the board. Debates on board diversity, and more specifically gender diversity, have gained momentum. Indeed, several countries have legislated quotas on the representation of women on the boards of listed companies, while other countries have introduced "comply or explain" requirements such as Morocco. These regulations seek to enhance the recognition of valuable resources, including highly capable women who face exclusion from leadership roles (Komal et al., 2023). The introduction of new gender diversity requirements has attracted considerable research interest in examining the impact of such a commitment on value-creation indicators (Nguyen et al., 2020). The results of the various studies that analyze the relationship between gender diversity and investment policy are mixed. However, they show that new policies on women's representation on the board of directors are a tool to fight against discrimination but also a performance lever.

Through this article, our ambition is to fill a gap in the literature on the link between women's representation on boards and the effectiveness of investment policies in the Moroccan context. Thus, the problem of our research translates into the following research question:

RQ: What is the link between women's representation on boards of directors and the effectiveness of investment policies?

The remainder of this paper is structured as follows. Section 2 introduces the key theoretical perspectives, examines empirical studies exploring the impact of board diversity on investment effectiveness, and articulate our research hypotheses. Section 3 details the sample, outlines the procedure, elucidates the data collection methodology, and expounds on the empirical method. Section 4 lays out the primary results. Section 5 presents the discussion. Section 6 offers the conclusion of the research paper.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

In recent years, Moroccan corporate governance has evolved towards greater transparency and accountability, with reforms focusing on financial transparency, managerial accountability, and minority shareholder protection. The 2003 corporate governance law established requirements for transparency and accountability, creating the Moroccan Capital Market Authority to oversee rule application. Subsequent reforms in 2016, including a law on financial transparency, further enhanced requirements for listed companies and introduced a monitoring system for financial transactions. Morocco's 2015 Organisation for Economic Co-operation and Development (OECD) membership aligned the nation with international best practices, contributing to improved corporate governance. Despite progress, women's representation on boards in Morocco remains at 14%, falling short of the 30% target set by a 2015 law.

Theoretically, the separation of ownership and control in a firm creates agency relationships that are subject to informational asymmetries and differences of interest, which lead to conflicts of interest and agency costs (Jensen & Meckling, 1976). The board of directors holds the responsibility of supervising the company's operations and safeguarding the interests of the owners. It plays a pivotal role in resolving conflicts of interest between owners and managers through the establishment of effective investment policies (Komal et al., 2023). Board members can use their expertise to assess investment opportunities and develop investment policies that maximize value for owners while taking risks into account. They can also monitor the performance of managers and ensure that they follow established investment policies (Jensen & Meckling, 1976). In summary, agency theory highlights the important role of the board of directors in managing conflicts of interest between owners and managers and in setting effective investment policies. The board of directors is responsible for overseeing the activities of the firm and protecting the interests of the owners to ensure that the value of their investment is maximized.

Nevertheless, while agency theory contributes to our understanding of board functions, it falls short in explaining the gender dynamics of directors on the board. In this context, we turn to social feminist theory, which acknowledges gender-based differences in traits and behaviors, providing insights into how increased representation of

women on the board influences the cognitive processes involved in investment decision-making (Zalata et al., 2022). The social feminist theory argues that gender diversity on the board can improve corporate governance and investment policies by bringing a different perspective and challenging traditional practices. It also predicts that the presence of women on boards can reduce the separation of ownership and control and increase the fiduciary responsibility of directors.

2.1. Development of the hypotheses

2.1.1. The relationship between board size and investment efficiency

Board size refers to the number of members elected to the board of the company in a given year. The size of the board of directors is therefore largely dependent on the extent of the complexity of the company (Lu et al., 2022). Directors may have conflicts of interest, and it may be more difficult for them to work together effectively.

Unsurprisingly, expansive boards could potentially facilitate instances of free-riding among directors, involving decision-making that deviates from the optimal interests of the company and its shareholders (Beji et al., 2021). Members of an overly large board may have little opportunity to participate in discussions and decisions, which may result in a lack of honest discussions. Additionally, members can easily be controlled by chief executive officers (CEOs) or other dominant directors, which can cause governance problems. However, Kao et al. (2019) argue that larger boards provide a better input of resources in terms of knowledge, experience, expertise, and skills, which results in better oversight of management.

The board, as the primary internal governance mechanism, discharges the fiduciary responsibility of strategic oversight and guidance (Lu et al., 2022). Directors are encouraged to diligently detect opportunistic behavior by management and ratify investments and other decisions. The objective is to act in the interest of all shareholders by securing investment policies and reducing the expropriation of resources (Ezzi & Jarboui, 2016). Thus, the establishment of a board that exercises rigorous control and has a good understanding of managerial actions has considerable weight in improving the efficiency of investment policies. This stems from the fact that the board possesses information regarding investment projects, and, as a result, enhanced scrutiny of managerial actions contributes to elevating the standards of financial reporting (Beji et al., 2021).

Limited literature examines the impact of board size on corporate investment. For instance, Med Bechir and Jouirou (2021) studied 626 listed Asian firms from 2012 to 2019, finding a positive link between board size and investment efficiency measured by capital expenditure. Ashwin et al. (2016) explored Indian pharmaceutical firms from 2003 to 2009, reporting that larger boards enhance research and development (R&D) spending, moderating sensitivity to financial constraints. In contrast, Chen et al. (2016) analyzed Chinese firms from 2001 to 2004, finding larger supervisory boards reduce overinvestment but increase underinvestment. Andreou et al. (2014) observed listed maritime firms

from 1999 to 2010, noting overinvestment decreases with board size. Consistent with existing literature, we hypothesize the following:

H1: There is a positive relationship between board size and investment efficiency.

2.1.2. The relationship between the presence of independent directors and investment effectiveness

Independent directors are pivotal for good governance due to their lack of financial ties to the company, ensuring decisions align with all shareholders' interests. Their presence enhances transparency, fairness, and power balance between directors and management. Numerous studies (Chen & Chen, 2012; Nor et al., 2018; Agyei-Mensah, 2021) explore the board's oversight role and its correlation with value creation indicators. Emphasis is placed on independent directors' significance, acting as unbiased monitors with no inclination to collude with senior management. Their role involves effective executive monitoring and independent judgments on managerial conduct and performance.

Nor et al. (2018) show in a study of the top 200 listed public companies in Malaysia between 2009 and 2011 that the presence of independent directors on boards has no impact on investment efficiency. However, Agyei-Mensah (2021) examine the impact of director independence and board size on the investment efficiency of listed firms in Ghana. The results of his study show that firms with a higher percentage of independent directors have less efficient investments. In a similar vein, Chen and Chen (2012), examining the impact of director independence on the investment efficiency of listed firms in Taiwan, found that firms with a higher percentage of independent directors have more efficient investments.

Independent directors can play a key role in ensuring that investments are aligned with the long-term objectives of the company. They can monitor the performance of the investment team and ensure that it is making sound investment decisions. They can also help to ensure that adequate control procedures are in place to avoid unnecessary risks and to ensure transparency in investment decisions.

The aim is to ensure the protection of all stakeholders who are at risk from the company's activities and who are vulnerable to attempts to be expropriated by management. In sum, the presence of independent directors can contribute to an effective investment policy by ensuring that shareholders' interests are protected and that investment decisions are made in an informed manner.

H2: There is a positive relationship between board independence and investment effectiveness.

2.1.3. The relationship between CEO duality and investment efficiency

CEO duality, where the CEO serves as both the company's agent and primary decision-maker, raises concerns about conflicts between corporate objectives and shareholder interests. Recent studies emphasize its impact on investment effectiveness (Chen et al., 2017; Aktas et al., 2019; Azhar et al., 2019; Chen et al., 2020). This dual role can lead to conflicts between short-term company goals and

long-term shareholder interests, according to agency theory. CEO duality concentrates immense power, potentially hindering firm performance, fostering management entrenchment, and weakening board control (Aktas et al., 2019). CEOs may prioritize short-term gains, like profits and bonuses, over long-term outcomes, such as sustainable growth and shareholder value. This may result in misallocated investment funds and a reluctance to pursue long-term projects with delayed returns.

Azhar et al.'s (2019) study on 50 non-financial companies on the Pakistan Stock Exchange found a negative link between CEO duality and investment efficiency. Aktas et al. (2019) revealed resource inefficiency under CEO duality, negatively impacting firm value. Similarly, Chen et al. (2020) demonstrated significantly lower investment efficiency in firms with CEO duality compared to those without. However, firms with lower ownership concentration experienced less impact on investment efficiency due to CEO duality. In contrast, Khedmati et al. (2020) identify a noteworthy positive correlation between CEO duality and investment efficiency, based on a sample of American companies spanning the period from 1999 to 2017.

It is important to note that these studies have limitations and cannot establish a direct causality between CEO duality and investment effectiveness, but they show a positive correlation between the two. It is therefore important for companies to have an independent and effective audit committee to ensure the quality of financial statements and thus help investors make informed investment decisions.

H3: There is a negative relationship between CEO duality and investment effectiveness.

2.2. The moderating role of gender diversity

Women's presence on boards enhances companies' competitive advantages by optimizing resources efficiently and gaining a better understanding of the market (Agyei-Mensah, 2021). Existing research emphasizes women's characteristics, contending that they bring knowledge and diverse perspectives, adopting a democratic and participatory leadership style compared to men's autocratic approach (Chen et al., 2016). While prior studies highlight women directors' effective oversight and strategic roles, the direct link between women's representation and investment policy effectiveness remains unexplored in the literature. Mixed results emerge from studies such as Jin et al. (2014), Shin et al. (2020), Ullah et al. (2020), and Agyei-Mensah (2021).

Ullah et al. (2020) research indicates a significant relationship between board diversity (including women's representation) and age, impacting board investment policy effectiveness. The study suggests that diverse boards, incorporating women and varying ages, discipline executives, mitigate agency conflicts, and enhance corporate governance. Similarly, Shin et al. (2020) find that female directors improve the overall effectiveness of investment policies in Korean companies. Agyei-Mensah (2021) reveals a positive impact of higher women directors' representation on the investment efficiency of Ghanaian firms, attributing it to improved oversight, management discipline, and reduced agency problems.

Contrarily, Jin et al. (2014) shows a negative relationship between less developed market regions and firms with higher power concentrations in China. Yet, this impact becomes insignificant in more developed market regions and firms with lower power concentration. This study challenges Agyei-Mensah's (2021) findings, suggesting that female directors in the Chinese institutional context may not uniformly enhance investment efficiency.

Based on the above literature, it can be expected that the presence of women directors strengthens the board's oversight role over management's actions, especially investment decisions, hence the hypothesis that predicts that:

H4: There is a positive association between the representation of women on the board and the effectiveness of investment policies.

H4a: Greater gender diversity will strengthen the positive relationship between board size and investment policy effectiveness.

H4b: Greater gender diversity will strengthen the positive relationship between board independence and investment policy effectiveness.

H4c: The moderating role of gender diversity in CEO duality has a positive influence on the effectiveness of investment policies.

3. RESEARCH METHODOLOGY

In research exploring the relationship between governance mechanisms and investment efficiency, various methodological approaches have been employed. Some scholars have utilized Tobin's Q investment model, focusing on market asset valuation and investment expenditures. This approach, utilizing panel data and specific econometric models, provides an in-depth analysis of the dynamics between investment policy and governance.

Other studies have concentrated on specific aspects such as corporate governance quality, board independence, or ownership structure. They have employed diverse measures of investment efficiency, including financial ratios or profitability indicators. Each of these approaches brings a unique perspective to understanding the intricate relationship between governance and investment efficiency.

In our study, we have adopted the methodology of the all-firm capital expenditure anticipation model, an established approach in the literature. This method, based on the ideal balance of unexpected capital expenditures being zero, allows for quantifying deviations from optimal investment levels. By working with the absolute values of residuals, this approach simplifies the analysis by focusing on overall investment inefficiency, aligned with the objective of our study.

3.1. Sample and data collection

The data used for our study's variables were sourced from the annual reports of companies listed on the Casablanca Stock Exchange during a six-year period spanning from 2014 to 2019. We selected these specific years based on data availability. Additionally, during this timeframe, Moroccan-listed companies began showing increased commitment to complying with corporate governance principles.

To construct our sample, we excluded financial firms listed on the exchange, as they exhibit unique characteristics within the accounting system and

differ significantly in terms of organization and concept from other firms. The initial research population consisted of 72 companies listed on the Bourse des Valeurs Mobilières (BVC) as of December 31, 2019. Following the exclusion of financial listed companies, the final sample comprised 50 non-financial companies. We also excluded companies with missing annual reports throughout the study period. Consequently, the number of companies in the ultimate sample was reduced to 36 firms. Therefore, our final dataset, encompassing 216 observations over six years, represents those firms with complete and analyzable data.

3.2. Definitions and measures of variables

3.2.1. Dependent variable

In this study, our dependent variable of interest is *Investment efficiency* (*IE*). Drawing upon insights from prior research, we anticipate that governance mechanisms can have either a positive or negative influence on investment efficiency. Therefore, any deviation from the *Optimal investment level* (*INV*), as indicated by the residual, is expected to lead to a corresponding change in investment efficiency. Consequently, a lower *IE* value reflects a higher degree of investment efficiency. To ensure precise measurement of this variable and to align with the study's objectives, we have chosen to employ the measurement approach utilized by Richardson (2006) and Chen et al. (2017) for evaluating the variable *IE*.

We have based our analysis on the all-firm capital expenditure anticipation model, which is commonly used to forecast a firm's or organization's future capital expenditure. This model assumes that, on average, the unexpected capital expenditure observed in the firm's annual data, represented by the residuals, should ideally equal zero. In other words, the extent of unexpected investment or deviation from optimal investment can be quantified by taking the absolute value of the residuals. Since both overinvestment and underinvestment, signified by positive and negative residuals, indicate investment inefficiency we will work with the absolute values of the residuals. This approach negates the need to differentiate between positive and negative residuals for the purposes of our research.

To this end, the dependent variable is represented by the absolute value of the residuals (ε) obtained from Model 1:

$$INV_{it} = \beta_0 + \beta_1 CROIS_{it-1} + \beta_2 FTN_{it-1} + \beta_3 ENT_{it-1} + \beta_4 ROA_{it-1} + \beta_5 AGE_{it-1} + \beta_6 TAIL_{it-1} + \beta_7 INV_{it-1} + \varepsilon \quad (1)$$

knowing that:

$$INV_{it} = (AF_{it-1} + CE_{it-1} + AI_{it-1} + ILT_{it-1})/AT_{it} \quad (2)$$

where,
- *AF* = the sum of fixed assets;
- *CE* = construction in progress;
- *AI* = intangible assets;
- *ILT* = long-term investments;
- *AT* = total assets.

Note that the *CROIS* variable measures the growth opportunities of a given listed company and is defined as the sum of the market value of equity plus the book value of liabilities divided by the book value of total assets. *FTN* is defined as net cash flow divided by the book value of total assets. *ENT* is defined as the ratio of debt to total assets. *ROA* is measured as the percentage of net income to total assets. *AGE* is defined as the difference between the current year and the IPO year of a given listed company. *TAIL* is the natural logarithm of total assets.

3.2.2. Explanatory variables

In our quest to precisely elucidate the intricate relationship between gender diversity within the board of directors and investment efficiency, we incorporated several board characteristics variables into our analysis. These variables are as follows:

Board size (*TCA*): This variable reflects the total number of board members, providing insights into the board's composition and size.

Board independence (*IND*): To gauge board independence, we calculated the proportion of independent directors in the boardroom relative to the total number of directors. This variable helps assess the degree of independence within the board.

CEO duality (*DUAL*): The CEO duality variable was measured as a binary variable, with a value of 1 indicating that the chairman of the board concurrently holds the position of CEO, and a value of 0 signifying otherwise. This variable allows us to consider the potential impact of CEO duality on investment efficiency (Daidai & Tamnine, 2021).

By including these board-related variables, we aim to capture a comprehensive view of the board's composition and dynamics, which can help shed light on the relationship between gender diversity and investment efficiency.

3.2.3. Moderator variable

We adopted a nuanced approach by employing both direct and indirect methods to scrutinize the intricate relationship between board attributes and investment efficiency. Within this framework, we delved into the moderating role of gender diversity (*GENR*) in the aforementioned relationship. To quantify gender diversity, we utilized the Blau Heterogeneity Index (*BLAU*). This index could be a better measure to capture gender diversity (Wahid, 2019):

$$BLAU = 1 - [\%FEM^2 + (1\%FEM)^2]$$

where, *%FEM* is the percentage of women on the board.

3.2.4. Control variables

To ensure the robustness of our model and account for potential confounding factors that may impact a firm's capital structure decisions, we incorporate additional control variables. These control variables

serve to prevent model misspecification and encompass other factors that can influence a firm's choices regarding its capital structure.

Drawing from an extensive review of prior research, it is evident that a firm's capital structure can be influenced by various firm-specific determinants. Therefore, we include the following control variables:

Firm size (*TAIL*): We gauge firm size using the natural logarithm of total assets. Firm size is a critical factor that can play a significant role in shaping a firm's capital structure decisions.

Profitability (*ROA*): This variable is measured as the percentage of net income relative to total assets. Profitability serves as an essential control variable as

it can impact a firm's capacity to finance its operations and influence its capital structure choices.

Firm age (*AGE*): We assess the age of the firm by taking the natural logarithm of the number of years since its establishment. The age of a firm is a pertinent factor to consider, as it can reflect the firm's experience and historical context, which may influence its capital structure preferences.

By controlling for these additional variables, we aim to provide a more comprehensive and accurate analysis of the factors influencing a firm's capital structure decisions. Finally, the variable *Z-SCORE* corresponds to the risk of bankruptcy calculated by the Altman's (1983) formula which equals to:

$$1.2 * (working\ capital/total\ assets) + 1.4 * (retained\ earnings/total\ assets) + 3.3$$
$$* (earnings\ before\ interest\ and\ taxes/total\ assets) + 0.6$$
$$* (market\ value\ of\ equity/total\ liabilities) + 0.99(sales/total\ assets)$$

These variables are used to hold constant certain characteristics of the study subjects, to better understand the effect of the independent variable on the dependent variable.

3.2.5. Regression models

To statistically examine the study dataset and demonstrate the impact of gender diversity on board

performance on investment effectiveness, we conducted a quantitative analysis utilizing longitudinal data spanning six years. Our analytical approach involved the construction of a regression model, which draws inspiration from McNichols and Stubben's (2008) framework, focusing on the assessment of investment policy effectiveness (*IE*). As discussed earlier, a comprehensive model can be represented by the following equation:

$$IE_{it} = \beta_0 + \beta_1 TCA_{it} + \beta_2 IND_{it} + \beta_3 DUAL_{it} + \beta_4 GENR_{it} + \beta_5 TAIL_{it} + \beta_6 ROA_{it} + \beta_7 AGE_{it} + \beta_8 Z-SCORE_{it} + \beta_9 END_{it} + \sum YEAR_{it} \sum SEC_{it} + \varepsilon \tag{3}$$

where:
- IE_{it} = investment efficiency of firm *t* in the year *i*;
- TCA_{it} = size of the board of directors of company *t* in the year *i*;
- IND_{it} = independence of the board of directors of company *t* in the year *i*;
- $DUAL_{it}$ = duality of the chairman of the board of directors of company *t* in the year *i*;
- $TAIL_{it}$ = size of company *t* in the year *i*;
- ROA_{it} = return on assets of company *t* in the year *i*;
- AGE_{it} = age of enterprise *t* in the year *i*;
- $Z-SCORE_{it}$ = fault score of firm *t* in the year *i*;
- END_{it} = fault score of company *t* in year *i*;
- SEC_{it} = company's sector of activity;
- *i* = the company;

- *t* = the time dimension (years);
- β_0 = the constant;
- β_1 to β_9 = the regression coefficients;
- ε = a vector of the stochastic error term.

With the main objective of answering our research question, we adopt the moderating effect of the *GENR* variable on the other board variables in order to better understand how they are related and how it can influence the relationship between board characteristics and investment effectiveness by changing the strength or direction of this relationship.

Following Zaid et al. (2020), our second research model that considers the moderating effect of gender diversity is as follows:

$$IE_{it} = \beta_0 + \beta_1 TCA_{it} + \beta_2 IND_{it} + \beta_3 DUAL_{it} + \beta_4 GENR_{it} + \beta_5 TCA * GENR_{it} + \beta_6 IND * GENR_{it} + \beta_7 DUAL * GENR_{it} + \beta_8 TAIL_{it} + \beta_9 ROA_{it} + \beta_{10} AGE_{it} + \beta_{11} Z-SCORE_{it} + \beta_{12} END_{it} + \sum YEAR_{it} \sum SEC_{it} + \varepsilon \tag{4}$$

4. RESULTS

4.1. Descriptive statistics

Table 1 presents the descriptive statistics for our sample of 216 firm-year observations over six years from 2014 to 2019.

Descriptive statistics reveal significant variation in the effectiveness of investment policies across companies, with a mean deviation from expected investment levels at -0.672 (standard deviation (SD) = 0.509). The average board size is 8.1 members, with 23% being women and 7%

independent directors. In 51% of cases, the CEO serves as the chairman. Women's representation on boards ranges from zero to 43%, indicating diversity. However, some companies have yet to consider female directors despite the General Instruction on female representation. For company size, the mean is 16.24 (SD = 1.334), and the average debt is 0.431 (SD = 0.953), indicating dispersed debt levels. Z-SCORE values (mean = -2.414, SD = 1.618) suggest financial distress in many firms. Residuals range from -5.022 (highest underinvestment) to 2.004 (highest overinvestment), with a standard deviation of 0.698 (Table 1).

Table 1. Descriptive statistics of the study variables

Variables	Observations	Mean	Minimum	Maximum	Standard deviation
IE	216	-4.221	-0.672	0.000	0.509
TCA	216	8.201	3.000	2.553	15.000
INDI	216	0.072	0.000	0.780	3.000
DUAL	216	0.518	0.000	0.524	1.000
GENR	216	0.236	0.000	0.437	3.000
TAIL	216	16.24	20.75	27.04	1.334
ROA	216	0.94	-1.391	4.051	28.410
AGE	216	5.929	8.664	12.025	1.227
Z-SCORE	216	-2.414	2.063	10.519	1.618
END	216	0.431	0.113	0.254	0.953
RESIDUES	216	-4.107	-5.022	2.004	0.698

4.2. Correlation analysis

Table 2 presents an overview of the results obtained from the Pearson correlation matrix, examining the interrelationships among the study variables. The table reveals positive correlations between women's board representation and key factors such as investment efficiency, board size, presence of independent directors, firm size, and debt levels. Conversely, the proportion of women on the board is negatively correlated with variables like *ROA* and *AGE*. No significant correlation is observed between the proportion of women and company size or the *Z-SCORE*. The most notable correlation among explanatory variables is 0.622, representing the correlation between board size and CEO duality.

The correlation coefficients in Table 2 consistently remain below the critical threshold of 0.8, indicating the absence of multicollinearity among variables. To further confirm this absence, we computed the variance inflation factor (*VIF*). As shown in the last column of Table 2, all *VIF* values are below the threshold of 10, aligning with the guidelines set by Gujarati and Porter (2021) and affirming the absence of multicollinearity issues in our analysis.

Table 2. The correlation between the variables in the study

Variables	IE	TCA	INDI	DUAL	GENR	TAIL	ROA	AGE	Z-SCORE	END	VIF	1/VIF
IE	1.000	-	-	-	-	-	-	-	-	-	1.176	0.850
TCA	0.017	1.000	-	-	-	-	-	-	-	-	1.065	0.939
INDI	-0.321**	0.086**	1.000	-	-	-	-	-	-	-	1.248	0.801
DUAL	0.233**	0.622*	-0.099	1.000	-	-	-	-	-	-	1.064	0.940
GENR	0.162**	0.228***	0.021**	0.298	1.000	-	-	-	-	-	1.055	0.948
TAIL	0.101***	0.037*	-0.115**	0.002	0.240	1.000	-	-	-	-	1.002	0.998
ROA	0.322**	0.203*	-0.522	0.532	-0.429***	-0.075	1.000	-	-	-	1.155	0.866
AGE	-0.227**	0.096*	0.001**	0.322***	-0.062**	0.122	0.287	1.000	-	-	1.026	0.975
Z-SCORE	0.235***	0.110**	-0.270	0.166	-0.051	1.000	0.116**	0.066	1.000	-	1.074	0.931
END	-0.022	0.447***	0.217**	-0.012***	-0.292***	-0.124**	0.441	0.429	0.091	1.000	1.204	0.831

*Note: *** significant at the 0.01 level; ** significant at the 0.05 level; * significant at the 0.10 level.*

4.3. Regression analysis

Table 3 presents the results of the multiple linear regression analysis conducted using the fixed effects model to assess our research hypotheses. The dependent variable measures absolute values of residuals multiplied by (-1), where higher values of (*IE*) indicate greater efficiency in investment policies. Two statistical tests were conducted to determine the most suitable panel data model. The F-test, assessing the choice between fixed effects and pooled ordinary least square (OLS) estimator, resulted in a significant F-statistic of 15.65 ($p < 0.01$), favouring the fixed effects model. The Hausman test, comparing fixed effects and random effects estimators, also yielded a significant p-value (25.60; $p < 0.1$), confirming the superiority of the fixed-effects estimator. Hence, our analysis relies on the fixed effects model.

The R-squared (R^2) value of 0.371 suggests that the variables in the model account for approximately 37% of the variation in corporate debt levels. Moreover, the linear regression model is statistically significant (p-value = 0.000). In comparison to prior research, the model's explanatory power is considered satisfactory (Shin et al., 2019).

The multiple regression results presented in Table 3 show that the coefficient on investment efficiency is positively correlated with a board size (0.0330; $p < 0.05$) and the presence of independent directors (0.191; $p < 0.10$). These results support previous studies by Med Bechir and Jouirou (2021), Ashwin et al. (2016), and Chen et al. (2016). Therefore, *H3* is accepted. However, this correlation is relatively weak. This result implies that large boards of directors adopt better control of funds, which results in the efficient allocation of investments. Also, companies with a higher percentage of independent directors have higher financial returns and better stock performance. This is because independent directors can bring an outside perspective and sector expertise that can improve the company's investment decisions.

Table 3. The outcomes of the multiple regression analysis conducted using the fixed effects model

Variables	Model 3		Model 4	
	Coefficient	t-stat	Coefficient	t-stat
TCA	0.0330**	2.4913	0.0298**	2.5407
INDI	0.0037*	1.9030	0.0122*	1.8271
DUAL	-0.0104**	-0.0222	-0.0172	-0.1084
GENR	0.0318***	2.0152	0.0322***	2.0149
TCA x GENR	-	-	0.0194***	3.1253
INDI x GENR	-	-	0.0269***	2.6174
DUAL x GENR	-	-	0.0127***	3.1792
TAIL	0.0012***	1.9525	0.0012***	1.9527
ROA	-0.3093***	-2.5530	-0.3093***	-2.5536
AGE	-0.0064**	2.0361	-0.0064**	2.0361
Z-SCORE	-0.0066**	-2.1431	-0.0057**	-2.3920
END	-0.0133***	-2.0543	-0.0205***	-2.0016
SEC	Yes	Yes	Yes	Yes
YEAR	Yes	Yes	Yes	Yes
Constant	−3.6303*	1.6428	−3.5913*	1.6061
Errors standard	Grouped	Grouped	Grouped	Grouped
	F-statistics: 13.902 Sig. = 0.000 R^2 = 0.371 Adjusted R^2 = 0.411		F-test (Fixed effect): 15.65*** Sig. = 0.000 Hausman test: 25.60 Sig = 0.07	

*Note: * significant at 0.10 level ($p \leq 0.10$); ** significant at 0.05 level ($p \leq 0.05$); *** significant at 0.01 level ($p \leq 0.01$).*

5. DISCUSSION

Concerning CEO duality, the results show that the *DUAL* variable has a negative and significant impact on investment efficiency (0.0104; $p < 0.05$). This leads us to accept *H3*. This result supports that of Azhar et al. (2019), Chen et al. (2020), and Chen et al. (2017). CEO duality may cause incentives to maximize short-term outcomes rather than long-term outcomes. This can lead to decisions that negatively impact investment efficiency, such as increasing R&D, marketing, or operational spending to increase short-term profits at the expense of long-term investments.

In the context of moderating gender diversity (Model 3), our analysis reveals that gender diversity not only exerts a direct and significant positive impact on investment efficiency but also moderates the relationship between board characteristics and investment efficiency. The results presented in Model 3 of Table 3 indicate a noteworthy and statistically significant effect of the interaction between gender diversity and board size. The coefficient for this interaction stands at 0.0194 with a significance level of $p < 0.01$. Consequently, we substantiate the acceptance of *H4a*. This implies that when the proportion of women on the board increases, the influence of board size on investment efficiency becomes more positive. This finding can be attributed to the fact that larger boards encompass a diverse array of knowledge, skills, and ideas, which are instrumental in enhancing investment quality.

In terms of board independence, our findings unveil a positive and significant coefficient (0.0269; $p < 0.10$) pertaining to the relationship between board independence and gender diversity's impact on a firm's debt level. This result aligns with *H4b*, signifying that the effect of board independence on investment efficiency is more positive when there is a high level of gender diversity on the board. In other words, companies with independent directors tend to exhibit reduced exposure to risks associated with earnings management and conflicts of interest, which, in turn, may translate to improved long-term investment performance. In this context, gender diversity within the board of directors plays a pivotal role in reinforcing this assurance, as female board members are inclined to act in the best interest of creditors. Finally, the results obtained from Model 4 show that the positive effect of CEO duality is significant (0.0127; $p < 0.10$) on investment efficiency in the presence of the moderating effect of gender diversity. Therefore, *H4c* is accepted. This says that the presence of women on boards can indeed mitigate the negative effects of CEO duality and opportunistic behavior and thus limit the negative influence of dual roles. This says that companies with a higher proportion of women on the board tend to have higher returns on investment when the CEO is also chairman of the board.

We can conclude that a higher proportion of women on the board is likely to improve the quality of financial reporting and is thus validated. Therefore, we could accept *H4*.

As for the control variables, the results of the regression show that the coefficients relating to the variables *TAIL, ROA*, and *AGE* are statistically significant and positive respectively at the 1%, 1%, and 5% thresholds. These results suggest that the resources entrusted by shareholders are invested more efficiently in old and/or large companies. Furthermore, the regression results show a significant negative effect of bankruptcy risk and debt at the 5% and 1% threshold, respectively.

In synthesis, this in-depth analysis of our results shows that board composition, gender diversity, and CEO duality are crucial factors influencing the effectiveness of corporate investment policies. The presence of independent directors and gender diversity appear to reinforce the benefits of a larger board, while gender diversity mitigates the negative effects of CEO duality. These results highlight the importance of corporate governance and gender diversity in improving the quality of investment decisions and, consequently, overall company performance.

Addressing the endogeneity of variables is a common challenge encountered in studies examining the relationship between corporate governance and investment and financing matters. To ensure the robustness of our study's findings, we employed a generalized method of moments (GMM) robustness test. This approach enables us to confirm the stability and reliability of our results. To mitigate the various sources of endogeneity issues, we employed dynamic panel data analysis, utilizing the GMM estimator as developed by Arellano and Bond (1991). This approach allows us to control for potential endogeneity problems by selecting more effective instruments.

Moreover, we assessed dynamic impacts by incorporating a one-year lagged value of the dependent variable $IE_{(t-1)}$ as an explanatory variable within the econometric model of the study. This step was taken to account for potential temporal dependencies and ensure the accuracy of our analysis. In this context, we can elucidate the one-year lagged model with the following formula:

$$IE_{it} = \beta_0 + \beta_1 IE_{i(t-1)} + \beta_2 TCA_{it} + \beta_3 IND_{it} + \beta_4 DUAL_{it} + \beta_5 GENR_{it} + \beta_6 TCA \times GENR_{it} + \beta_7 IND \times GENR_{it} + \beta_8 DUAL \times GENR_{it} + \beta_9 TAIL_{it} + \beta_{10} ROA_{it} + \beta_{11} AGE_{it} + \beta_{12} Z - SCORE_{it} + \beta_{13} END_{it} + \sum ANNEE_{it} \sum SEC_{it} + \varepsilon \quad (5)$$

The results of the dynamic modelling with GMM are presented in Table 4.

The results obtained from the dynamic GMM modelling with a lag of one year (Table 4) are consistent with those obtained from the linear regression previously (Table 3). We can conclude that both methods are valid for assessing the relationship between the variables studied. This may enhance the robustness and reliability of the results obtained and increase confidence in the quality of the conclusions drawn.

Table 4. Results of the regression test using the GMM model

Variables	Coefficient	t-stat	Coefficient	t-stat
$IE_{(t-1)}$	0.3382***	1.399	0.3382***	1.399
TCA	0.0321**	2.4834	0.0306**	2.5499
INDI	0.0112*	1.9283	0.0124*	1.8287
DUAL	-0.0255**	-0.0200	-0.0261	-0.1142
GENR	0.0211***	2.0199	0.0293***	2.0206
TCA x GENR	-	-	0.0187***	3.1018
INDI x GENR	-	-	0.0308***	2.6566
DUAL x GENR	-	-	0.0225***	3.1134
TAIL	0.0128***	1.9600	0.0107***	1.9588
ROA	-0.2805***	-2.5487	-0.3122***	-2.4761
AGE	-0.0133**	2.0242	-0.0055**	2.0370
Z-SCORE	-0.0160**	-2.1455	-0.0096**	-2.3741
END	-0.0221***	-2.0720	-0.0318***	-2.0109
SEC	Yes	Yes	Yes	Yes
YEAR	Yes	Yes	Yes	Yes
F-statistics: 16.028 Sig. = 0.000 Arellano–Bond/AR (2) (p-value): 0.544 Sargan statistic (overidentification test of all instruments: 0.336 Chi-sq (13) p-value = 0.2913				

*Note: * significant at 0.10 level (p ≤ 0.10); ** significant at 0.05 level (p ≤ 0.05); *** significant at 0.01 level (p ≤ 0.01).*

6. CONCLUSION

This study has empirically examined how gender diversity on the board of directors contributes to improving investment efficiency in Moroccan-listed companies. Based on a sample of 216 observations of Moroccan companies listed on the Casablanca Stock Exchange, we observed that gender diversity on the board of directors positively contributes to the improvement of investment quality and efficiency. This suggests that a higher proportion of women on boards is likely to better monitor the opportunistic actions of managers, and that the risk-averse nature of women, who are more opposed to over- and under-investment decisions, improves investment quality. These results, supported by agency theory and social feminist theory, prove that the controlling role of women directors is accompanied by a risk-averse character that tends to accentuate control and prevent any over or under-investment decision. As a corollary, our study suggests that gender diversity moderates the relationship between board characteristics and investment efficiency.

This research contributes valuable insights to the existing literature illuminating the indirect connection between women's representation on boards and the effectiveness of investment policies. While our paper strives to offer an understanding of how gender diversity moderates the interplay between board attributes and corporate financing choices, we acknowledge certain limitations in our study that pave the way for further investigation.

One notable constraint is related to the database utilized in this research, which solely provided information on the number of directors without offering specific details about each director's attributes such as age, nationality, education level, and more. The inclusion of more comprehensive data could present opportunities for future research endeavors. Moreover, future studies might consider expanding the scope of variables under examination. Specifically, researchers could explore variables linked to directors' compensation and ownership structures. Additionally, investigations could delve into various aspects of directors, encompassing factors like age, educational background, and professional experience. Regrettably, the absence of such data limited our ability to elucidate the behavior of managers in making corporate financial decisions.

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