



# **Gender Equality and Stock Returns**

Master degree in Corporate Finance

Anna Luiza Matos Nunes Victorio

Leiria, September of 2025



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## Dedication and acknowledgments

I dedicate this work to the two most important people in my life: my mother and my younger sister. To my mother, for showing me that anything is possible when we work hard and stay committed. Even with fragile health, she continues to embody strength and resilience, which inspires me every day. To my younger sister, for reminding me that life can always be light and joyful, even in difficult times. Even though we now live in different countries, they never fail to be present in my life. They have not only stood by me, but also inspired me every day to strive to become a better version of myself.

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# Abstract

This dissertation examines the relationship between gender equality in corporate governance and stock market performance in the European context. Motivated by the growing relevance of diversity in corporate boards and its recognition within Environmental, Social and Governance (ESG) frameworks, the study explores whether gender equality is associated with superior stock returns. The analysis focuses on publicly listed companies in the STOXX Europe 600 index between 2014 and 2024, a period marked by important regulatory developments, including the European Union Directive on Gender Balance in Corporate Boards.

The research adopts a quantitative, explanatory, and correlational design. Firm-level data on board gender composition were collected from LSEG Workspace (LSEG Data & Analytics), while financial data were obtained from Datastream. The empirical analysis employs panel data regressions to estimate the impact of gender equality on both raw returns and risk-adjusted returns, the latter calculated through Capital Asset Pricing Model (CAPM) and the Fama-French three- and five-factor models. Control variables such as firm size, leverage, book-to-market ratio, and beta were included, and robustness checks were conducted to validate the results.

The findings indicate that gender equality on boards, measured by the percentage of women directors, does not exert a statistically significant effect on stock returns. Although the coefficients often show a positive direction, the results suggest that gender diversity is not yet perceived by investors as a direct driver of financial market performance in the short term. Instead, stock returns appear to be more strongly influenced by traditional firm-level and market factors. These results align with prior studies reporting neutral or inconclusive effects of gender diversity on financial outcomes, while reinforcing the broader value of gender equality for governance, legitimacy, and long-term sustainability.

**Keywords:** gender equality, corporate governance, stock returns, panel regression, Europe.

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# List of Abbreviations and Acronyms

CAPM	Capital Asset Pricing Model
CMA	Conservative Minus Aggressive
CSR	Corporate Social Responsibility
DFS	Digital Financial Services
ESG	Environmental, Social and Governance
EU	European Union
FE	Fixed Effects
FF3	Fama–French Three-Factor Model
FF5	Fama–French Five-Factor Model
GE	Gender Equality
GII	Gender Inequality Index
HDI	Human Development Index
HML	High Minus Low
LSEG	LSEG Data & Analytics
Mkt_RF	Market – Risk-free rate
OLS	Ordinary Least Squares
RE	Random Effects
RMW	Robust Minus Weak
SDG	Sustainable Development Goal
SMB	Small Minus Big
SOE	State-Owned Enterprise
STOXX 600	STOXX Europe 600 Index
VIF	Variance Inflation Factor



# 1. Introduction

Over the past few years, the relationship between corporate financial performance and gender equality has gained significant attention from both academia and investors. Gender equality is not just a social goal anymore, it is seen as a key economic driver. Research indicates that companies with greater gender equality often demonstrate enhanced decision-making processes, increased innovation, and more effective risk management (Badea et al., 2020). The fact that these companies benefit from a broader diversity of perspectives, it gives valuable insights to resolve complex business challenges and creates new market opportunities.

This shift in perspective has led investors to integrate gender equality into Environmental, Social and Governance (ESG) criteria, when evaluating company's long-term sustainability and responsible management practices (Romano et al., 2020). As a result, firms that prioritize gender balance are becoming more attractive to investors aligned with global sustainability goals.

Moreover, gender equality has become a global priority, emphasized by international frameworks such as the United Nations' Sustainable Development Goals (SDGs), particularly SDG 5: Gender Equality, which aims to achieve gender parity at all levels of society (United Nations, 2022). SDG 5 emphasizes the need for equal opportunities in leadership positions, recognizing the important role that gender equality plays in driving economic growth, innovation, and consequently, corporate performance. For example, the EU Gender Equality Strategy (2020-2025) lays out a comprehensive plan to close gender gaps in the labour market, address pay disparities and ensure equal participation in leadership roles across different sectors (European Commission, 2020). Another important example is the Directive on Gender Balance in Corporate Boards (2022), which mandates that by 2026 large publicly listed companies must ensure that women hold at least 40% of non-executive director positions (Directive 2022/2381). The attention of the EU on this theme reflects a growing recognition that more inclusive leadership not only strengthens corporate governance but also contributes to financial performance, and may also positively influence stock market outcomes.

In this context, this dissertation studies the connection between gender equality in corporate environments and stock returns, examining whether firms with higher levels of gender equality experience superior stock returns. The central aim is to assess whether board gender composition is associated with annual stock returns and with risk-adjusted performance measures derived from asset pricing models such as CAPM, the Fama-French three-factor model, and the five-factor model. Beyond testing this general relationship, the study also considers the possibility of non-linear effects by exploring whether reaching a critical mass of female directors produces distinct outcomes, and it complements the analysis with robustness checks across different model specifications and firm-level controls. In this way, the research seeks to contribute to the debate on whether gender equality can serve not only as a social imperative but also as a financial strategy that benefits both companies and investors.

This dissertation is organized into five chapters. Chapter 1 introduces the research topic, its motivation, and objectives. Chapter 2 reviews the relevant literature, outlining theoretical foundations, prior evidence, and the research hypotheses. Chapter 3 describes the methodological approach, including dataset, variables, and econometric models. Chapter 4 presents the results of the empirical analysis, starting with descriptive statistics and correlations, followed by regression models and robustness checks. Finally, Chapter 5 concludes the study, summarizing the main insights, consolidating theoretical and practical implications, acknowledging limitations, and suggesting paths for future research.

## 2. Literature review

### 2.1. Gender equality: concepts and relevance to markets

Gender equality (GE) entails ensuring that individuals of all genders have equal rights, responsibilities, and opportunities (Toren, 1993). This concept does not necessitate identical treatment of men and women but rather demands equitable access to resources, decision-making processes, and opportunities (Patel, 2014). In the financial context, gender equality implies that men and women should have equal access to economic opportunities, financial services, and resources without facing systemic discrimination (Di Vaio et al., 2023).

A related but distinct concept is gender diversity, which emphasizes the representation of different genders within an organization, particularly in leadership roles and decision-making processes. While gender equality focuses on fairness in opportunities and treatment, gender diversity ensures that various genders are actively included at all levels. The two concepts are interdependent: gender diversity serves as a crucial step toward achieving gender equality, yet diversity alone does not guarantee equality unless all individuals are treated equitably and have the same opportunities to thrive (Ritter-Hayashi et al., 2019).

Achieving gender equality is one of the important goals of the United Nations' 2030 Agenda for Sustainable Development, especially through Sustainable Development Goal 5 (SDG 5), which is intended to “achieve gender equality and empower all women and girls” (United Nations, 2022). On the other hand, gender equality is deemed as a fundamental prerequisite for the achievement of other SDGs, and more specifically those concerning poverty alleviation, economic growth, and social development (European Commission, 2020).

The relationship between GE and market outcomes has increasingly gained recognition as an important investment factor toward sustainable economic growth and organizational performance (Ghafoor et al., 2022). The study by Romano et al. (2020) indicates that firms with gender-equality boards tend to outperform in Environmental, Social and Governance (ESG) performance, thereby showing how gender equality fits into the sustainability objectives of enhanced transparency and ethics. This relationship is further supported by the findings of Atinc et al. (2022) that gender quotas in corporate settings lead to better market

performance and governance outcomes by increasing board vigilance and reducing risks associated with homogeneity.

Historically, the financial sector has been controlled by men, leading to systemic barriers that have limited women's access to financial resources and decision-making opportunities (Arena et al., 2021). The finance industry began gaining serious attention about gender equality in the late 20<sup>th</sup> century, driven by pivotal social movements advocating for women's rights, such as second-wave feminism in the 1960s and 1970s. These movements, particularly the British Women's Liberation Movement, fought against societal norms and requested equal pay, anti-discrimination laws as well as greater leadership opportunities for women (Binard, 2017).

Another important aspect in the development of gender equality is that of Digital Financial Services (DFS). According to Khera et al. (2022), DFS like mobile banking and digital wallets would reduce some of the physical and social bottlenecks in women's access to finance. These digital solutions allow women to conduct financial transactions without having to travel to far-away banks or depend on male family members for support. Such financial independence not only empowers women but also improves the welfare of the households through increased investments in health, education, and small businesses. These technology-enabled channels thus provide a concrete pathway for operationalising global policy goals on gender equality, as articulated in the United Nations 2030 Agenda.

Emerging technologies also offer new pathways for advancing GE. A study by Di Vaio et al. (2023) has provided empirical information that suggests that emerging technologies could accelerate gender equality by supporting transparency and ethical governance in alignment with the SDG's. The technology studied by these authors are the blockchain, which helps to achieve SDG 5. Its decentralized and transparent nature of blockchain addresses key barriers that have historically prevented women from accessing financial services. By providing secure and accessible financial systems, blockchain can facilitate gender equality by enabling women to participate in economic activities, from securing loans to conducting business transactions, without relying on traditional financial intermediaries (Mhlanga, 2023). However, even with its potential, blockchain adoption faces several challenges, including scalability issues, regulatory obstacles, and low technological literacy among the target population. This ability of the technology to work as a "trustless" protocol ensures

that financial transactions are secure and efficient without requiring third-party validation (Pilkington, 2016).

Promoting gender equality in the financial field is thus not only a social and ethical necessity but also a condition for achieving the wider objectives of the SDGs. It was evidenced that gender equality serves as an agent of transformation to achieve financial inclusion and economic resilience, especially in the case of developing countries. Women's empowerment is considered by studies, such as Meitzen-Dick et al. (2019), to be imperative to achieve sustainable development and poverty reduction. Their study underlines that women's land rights play a key role in empowering women and driving poverty reduction. According to Duflo (2011), there exists an interactive relationship between the economic effects of women's empowerment and economic development. In fact, their empowerment will help them get access to resources like education, health, and jobs, which are important elements to improve the economic performance. However, these author cautions that relying only on economic performance, may not be enough to eradicate gender inequality.

Duflo's analysis also highlights the importance of improving women's social and economic status to create a virtuous cycle where empowerment and economic development mutually reinforce each other. However, the author points out that without specific policies to counteract persistent gender biases, economic growth alone may not be sufficient to close gender gaps. This finding underlines the need for further dedicated efforts at greater gender equality, in particular in regions where cultural and social norms still strongly restrain the potentials of women in the economy and society.

## **2.2. Stock returns**

The estimation of expected stock returns is an important part of financial and asset pricing theory. A common starting point is the calculation of raw returns, which represent the simple percentage change in adjusted stock prices over time. Formally, raw returns are expressed as:

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \quad [1]$$

where  $P_{i,t}$  is the adjusted closing price of stock  $i$  at time  $t$  and  $P_{i,t-1}$  is the corresponding price in the previous period. This formulation provides an intuitive and scale-neutral measure of performance and is widely used in empirical finance (Fama, 1990).

While raw returns capture the direct variation in prices, in financial economics models were developed to explain and predict expected returns by incorporating systematic risk factors. Two primary approaches have become prevalent: the Capital Asset Pricing Model (CAPM) and the Fama-French Factor Models.

The Capital Asset Pricing Model (CAPM) of Sharpe (1964), Lintner (1965), and Mossin (1966), are one of the most fundamental approaches in finance, establishing a relationship between systematic risk and expected return. It considers the risk-free rate, market return, and the stock's beta coefficient to determine the expected return of a given asset. The CAPM formula is expressed as follows:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] \quad [2]$$

where  $E(R_i)$  represents the expected return of stock  $i$ ,  $R_f$  is the risk-free rate (typically proxied by a short-term yield),  $\beta_i$  measures the stock's sensitivity to overall market movements,  $E(R_m)$  denotes the expected return of the market, and  $E(R_m) - R_f$  corresponds to the market risk premium (Bartholdy & Peare, 2002). The CAPM assumes a linear relationship between risk and return, although it has been criticized for its reliance on a single market risk factor, which may not fully capture the complexities of stock returns variations (Fama & French, 1992).

To address the limitations of CAPM, Fama and French (1993) developed the Three-Factor Model, which extended the traditional CAPM by incorporating two additional factors: size, (SMB, Small Minus Big) and value (HML, High Minus Low). This model suggests that small-cap stocks tend to generate higher returns than large-cap stocks, while high book-to-market (value) stocks typically outperform low book-to-market (growth) stocks. The model is formulated as follows:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] + \delta_i \cdot SMB + h_i \cdot HML \quad [3]$$

where  $\mathcal{S}_i$  represents the stock's sensitivity to the size factor (SMB) and  $h_i$  indicates its sensitivity to the value factor (HML). The SMB factor captures the return spread between small and large companies, while the HML factor reflects the return difference between high and low book-to-market firms. Empirical evidence supports the inclusion of these factors in explaining stock returns, particularly in cases where CAPM falls short in predicting expected returns (Fama & French, 1997).

Building upon the Three-Factor Model, Fama and French (2015) introduced the Five-Factor Model, which integrates two additional components: profitability (RMW, Robust Minus Weak) and investment (CMA, Conservative Minus Aggressive). This extension aims to capture variations in stock returns related to firms' profitability and investment strategies. The Five-Factor Model is expressed as follows:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] + \mathcal{S}_i \cdot SMB + h_i \cdot HML + r_i \cdot RMW + c_i \cdot CMA \quad [4]$$

where  $r_i$  denotes the sensitivity to profitability (RMW), and  $c_i$  represents the sensitivity to investment patterns (CMA). The RMW factor accounts for differences in returns between firms with high and low profitability, while CMA factor measures the return spread between firms that follow conservative versus aggressive investment policies. Research indicates that the Five-Factor Model enhances explanatory power over the Three-Factor Model, although some anomalies persist, particularly concerning small firms with high investment but low profitability (Fama & French, 2015).

While CAPM remains a standard framework for estimating the cost of equity, the Fama-French models offer a more comprehensive approach to explaining variations in stock returns. However, the effectiveness of each model depends on market conditions and investment strategies. Ultimately, these models constitute fundamental tools in academic finance research and practical investment management, allowing for more robust and risk-adjusted return calculations (Fama & French, 1997).

### **2.3. The relationship between gender equality and stock returns**

From a theoretical point of view, gender equality – most often analysed through the proxy of board gender diversity – can influence stock returns by shaping governance mechanisms.

Although gender equality is a broader construct, the literature focuses on gender diversity in leadership positions because it provides a measurable and comparable indicator across firms and countries, while also representing a salient dimension of equality in corporate decision-making.

Agency theory provides the central framework to explain these effects. Developed by Jensen and Meckling (1976), they researched the relations between principals, like shareholders, and agents, such as managers, where the conflicts between them often emerge because of a difference in objectives and information asymmetry. This asymmetry refers to a situation whereby agents possess more information than principals. It leads to decisions being taken which favours the interest of the agents at the expense of the interest of principals. These conflicts generate agency problems, which result in inefficiencies called agency costs. These costs can take the form of monitoring expenses and misallocations of resources; hence, impacting the firm performance directly by affecting the shareholder returns (Shapiro, 2005).

One of the central agency problems is that of information asymmetry, where managers have superior access to corporate information compared to shareholders. This disparity generally allows managers to make decisions that are not fully transparent, thus providing ample opportunities for self-serving behaviour. It has been seen that this issue is well addressed by gender equality in leadership. For instance, Ain et al. (2020) analysed data from over 23,000 firm-year observations in Chinese-listed companies and found that gender-diverse boards were associated with reduced agency costs through improved corporate governance practices, such as enhanced financial disclosures and stricter monitoring mechanisms. Similarly, Adams and Ferreira (2009) emphasized that boards with higher female representation asked for more frequent and detailed audits; thus, the accountability of managerial decisions was higher, and the transparency of these decisions was greater.

Another critical issue is the opportunistic behaviour of agents, where managers prioritize personal gains over the interests of shareholders. This behaviour often includes the misuse of corporate resources, such as excessive perquisites or investments in projects with minimal returns but high personal benefits. Female leaders are often seen as ethical decision-makers who emphasize long-term value creation over short-term personal gains, as evidenced by Jurkus et al. (2011), who found that firms with greater female representation in management

experienced a reduction in opportunistic practices due to their tendency to question and challenge unethical behaviour.

The broader ramifications of gender equality in mitigating agency problems also extend to stock returns. By reducing agency costs, gender-diverse boards contribute to improved resource allocation, more efficient operations, and greater investor confidence. These all combine to uplift the financial performance of firms, translating into higher valuations of stocks. Ain et al. (2020) reiterated further that the leadership by gender diversity signals a strong signal to socially conscious investors, attracting capital and further bolstering market performance.

Studies by the cited authors have shown that gender equality in leadership effectively solves agency problems as a result of increased transparency and reduction of opportunistic behaviour, leading to lower agency costs and superior corporate governance, which contribute towards better financial performance and stock valuation.

To illustrate these mechanisms in practice, several empirical studies have examined the relationship between gender diversity and firm outcomes. A foundational study by Adams and Ferreira (2009) analysed a comprehensive data set from a large sample of U.S. firms to investigate the role of gender diversity in boardroom governance and firm performance. Their regression models examined the relationship between gender diversity and governance measures such as CEO turnover sensitivity and director attendance. The findings reveal that boards with greater gender diversity exhibit higher CEO turnover sensitivity to poor stock performance, suggesting more intense monitoring. Importantly, their study controls for potential confounding factors, including board size, firm size, and industry characteristics, while using firm fixed effects to address unobserved heterogeneity. Interestingly, the results also underscore a nuanced trade-off: in well-governed firms, the additional monitoring associated with gender diversity can lead to diminishing returns, as excessive oversight may adversely impact firm value. This underscores the importance of carefully balancing governance structures to optimize the benefits and mitigate the costs of heightened monitoring.

Building on this foundation, Ain et al. (2020) extended the investigation into the context of Chinese firms, focusing on the interplay between gender diversity, agency costs and market valuation. Using a dataset of 23,340 firm-year observations, their fixed-effects regression

models accounted for firm-specific characteristics, while the instrumental variable approach addressed endogeneity concerns, ensuring the robustness of causal inferences. Their results reveal that gender diversity is strongly negatively associated with agency costs, especially in state-owned enterprises with governance challenges. Additionally, the study highlights how regional economic development amplifies the benefits of diverse boards. In economically developed regions, gender diversity not only enhances governance but also translates into improved market valuations and stock returns. These findings reinforce the argument that gender diversity is a critical factor for improving financial performance, especially in contexts where governance structures are less effective.

Beyond the U.S and Chinese contexts, evidence from Europe has also been insightful. García-López et al. (2024) examined listed Spanish companies and found a positive and statistically significant relationship between the percentage of women in steering committees and firm performance, as measured by the price-to-earnings ratio. Their panel data analysis using Poisson logistic regression revealed that this effect holds regardless of the type of female director, emphasizing that women's presence in strategic leadership roles contributes meaningfully to market valuation. Similarly, Campbell and Vera (2010) applied an event study methodology to Spanish firms and found that the announcement of female board appointments generated positive abnormal stock returns, suggesting that investors interpret such appointments as signals of improved corporate governance. Their follow-up analysis using system GMM regression models indicated a sustained, positive association between female board representation and firm value.

Outside Spain, other international evidence provides a broader perspective. Loy and Rupertus (2022) analysed how the market values female directors across countries. Addressing the endogeneity of board composition through propensity score matching, they found that female representation on corporate boards neither enhanced nor reduced long-term stock performance. The authors argue that this neutrality supports a broader justification for board gender equality – moreover than financial metrics – including fairness, ethics, and social legitimacy. Notably, their results indicate that investor concerns about value destruction due to mandatory quotas are largely unfounded.

From a U.S. perspective, Gupta et al. (2023) investigated board gender diversity and long-term firms' outcomes, covering the period 2003-2012. Their study reported that gender-

diverse boards were positively associated with accounting-based measures such as return on equity, while no consistent impact was observed on stock-return-based metrics like Tobin's Q or cumulative abnormal returns. Importantly, they found strong improvements in non-financial performance measures, such as corporate social responsibility, suggesting that gender equality strengthens firm reputation and stakeholder value, even if direct market effects are less evident.

Taken together, these studies suggest that the effects of gender diversity on performance are context-dependent: while some results show clear positive market reactions or accounting gains, others reveal neutral outcomes, indicating that the value of diversity may be mediated by governance quality, institutional environment, or the type of performance metric considered.

From a sustainability perspective, Badea et al. (2020) evaluated the performance of companies included in gender equality indices relative to broader market indices across various sectors. Utilizing econometric models such as EGARCH, DCC-GARCH, Markov switching, and quantile regressions, they found no significant differences in average returns or volatility between the gender equality indices and the general market. This finding suggests that firms recognized for strong gender equality practices perform on par with their peers in financial markets, thereby debunking the notion that gender-inclusive policies come at a cost to shareholders.

Complementing this firm-level evidence, some studies adopt a macroeconomic approach. Korkmaz and Özyeşil, (2024) investigated the relationship between gender inequality, human development, and capital market outcomes in 12 developed and developing countries between 2012 and 2023. By combining annual data on the Gender Inequality Index (GGI), the Human Development Index (HDI), and stock market returns, their panel analysis revealed that countries with higher levels of human development and lower gender inequality consistently achieved superior stock market performance in the medium and long term. The findings highlight that closing gender gaps does not only reflect ethical and social progress, but also provides tangible economic benefits, as inclusive societies are more likely to foster stable institutions, effective governance, and investor confidence. Moreover, the authors argue that gender equality functions as a strategic lever for sustainable growth, strengthening the resilience of capital markets by reducing social risks and enhancing

innovation and productivity. This evidence complements firm-level studies by showing that at the macro level, progress in gender equality is associated with systemic financial gains, reinforcing the view that inclusion and sustainability are interdependent drivers of global economic performance.

Finally, in the context of technological transformation, Arena et al. (2022) examined the moderating role of gender diversity in the relationship between FinTech adoption and financial performance within a sample of Italian banks. Their analysis employed fixed-effects regression models on panel data over the period 2016-2020. The dependent variables involve measures of both the utilization of financial services, such as customer deposits, and operational efficiency, proxied by return on assets, while key independent variables capture FinTech adoption and board gender diversity. It plays a pivotal role in amplifying the positive effects of FinTech adoption on operational performance, such as customer deposits and return on assets. This indirect contribution to shareholder value highlights another pathway through which diverse boards enhance firm performance, particularly in contexts driven by technological innovation.

In order to synthesize the key empirical findings discussed in this section, Table 1 provides a summary of the main studies examining the relationship between gender equality and stock returns, highlighting their context, methodology, and core conclusions.

**Table 1 - Key empirical studies on gender equality and stock returns**

<b>Authors (Year)</b>	<b>Market / Sample</b>	<b>Methodology</b>	<b>Main Findings (Summary)</b>
<b>Adams and Ferreira (2009)</b>	U.S. firms	Panel regressions, fixed effects	More gender-diverse boards are associated with higher CEO turnover sensitivity and monitoring; potential trade-off in well-governed firms.
<b>Ain et al. (2020)</b>	Chinese listed firms (23,340 obs.)	Fixed effects + IV regression	Gender diversity reduces agency costs; stronger effect in SOEs and developed regions; improves valuations and returns.
<b>García-López et al. (2024)</b>	Spanish listed firms	Panel data (Poisson logistic)	% of women in steering committees positively linked with P/E ratio.

Authors (Year)	Market / Sample	Methodology	Main Findings (Summary)
<b>Campbell and Vera (2010)</b>	Spanish firms	Event study + system GMM	Announcements of female appointments generate positive market reactions; long-term positive association with firm value.
<b>Loy and Rupertus (2022)</b>	13 countries (8,872 firm-years)	Propensity score matching + regressions	Female representation has neutral effect on long-term stock performance; supports equality for fairness/legitimacy.
<b>Gupta et al. (2023)</b>	U.S. firms (2003–2012)	OLS + 2SLS, lagged board vars	Gender diversity increases ROE & CSR; no consistent effect on Tobin's Q or cumulative stock returns.
<b>Badea et al. (2020)</b>	Gender Equality Indices (2017–2020)	EGARCH, DCC-GARCH, VAR	Gender equality indices perform similarly to market indices in returns/volatility.
<b>Korkmaz and Özyeşil (2024)</b>	12 developed & developing countries (2012–2023)	Panel analysis (HDI, GII, stock returns)	Countries with high HDI and low gender inequality show higher medium- and long-term stock returns.
<b>Arena et al. (2022)</b>	Italian banks (2016–2020)	Fixed-effects regressions	Gender diversity amplifies FinTech adoption benefits (increase in deposits and ROA).

Source. Own elaboration based on reviewed literature.

## 2.4. Literature limitations

While the existing literature provides valuable insights into the relationship between stock returns and gender equality, several limitations must be acknowledged. The interaction between gender diversity and financial markets remains a complex and evolving field, with studies often focusing on broad corporate governance implications rather than the direct impact of gender equality on stock performance.

Firstly, many studies focus on specific geographical regions or markets, limiting the generalizability of findings. For instance, Ain et al. (2020) examine the impact of female directors on agency costs within Chinese listed firms, but these results may not be directly applicable to firms in other institutional settings. Similarly, Arena et al. (2022) analyse gender diversity and Fintech within Italian banks, highlighting the need for further research across different financial systems.

Secondly, while numerous studies establish correlations between gender diversity and firm performance (Adams & Ferreira, 2009; Valls Martínez & Soriano Román, 2022), causality

remains a challenge. Many analyses rely on observational data, making it difficult to isolate the direct effect of gender diversity from other confounding variables. Atinc et al. (2022) attempt to address this issue through a cross-country comparative study of gender quotas, but variations in regulatory frameworks and corporate governance structures introduce additional complexities.

Another significant limitation is the reliance on traditional financial models, such as the CAPM and Fama-French models (Fama & French, 1992, 1993, 2015), which may not fully capture the influence of gender diversity on risk and return. The evolving role of environmental, social, and governance (ESG) factors further complicates this analysis (Romano et al., 2020), necessitating more holistic approaches that integrate non-financial performance metrics.

Recent evidence also shows that results vary depending on the type of performance considered. For example, Gupta et al. (2023) found that gender diversity improves accounting-based outcomes such as return on equity and non-financial dimensions like corporate social responsibility, but shows mixed or insignificant results for long-term stock return measures. Similarly, Loy and Rupertus (2022) concluded that female board representation does not significantly affect long-term stock market performance, challenging assumptions about universal financial benefits.

From a market-wide perspective, studies of gender equality indices show no significant differences in risk or return compared to broader benchmarks (Badea et al., 2020), suggesting that investors may not yet consistently reward gender-inclusive practices. At the macro level, however, Korkmaz and Özyeşil (2024) showed that countries with higher gender inequality and human development levels exhibit superior stock market returns, underscoring the importance of considering national institutional settings alongside firm-level analyses.

Finally, emerging technologies such as blockchain and Fintech are reshaping financial inclusion and gender equality (Di Vaio et al., 2023; Mhlanga, 2023), yet research in this domain is still nascent. Studies often focus on theoretical frameworks rather than empirical evidence, underscoring the need for further data-driven research to assess the real-world impact of these innovations on gender dynamics.

In summary, the limitations of current literature reflect the need for future research that not only isolates causal effects at the firm level but also bridges micro and macro perspectives, while integrating both financial and non-financial dimensions of performance. In this sense, the present study contributes by addressing some of these gaps. First, instead of focusing on a single country or narrow institutional setting, it analyses a broad European market, enhancing the generalizability of results beyond specific national frameworks. Second, it moves past simple correlations by employing multiple asset-pricing models (CAPM, Fama-French 3-factor, and Fama-French 5-factor), which provide a more rigorous test of the relationship between gender diversity and risk-adjusted returns. Third, it incorporates both continuous measures of board gender representation and a critical-mass threshold (Women33), thus capturing the nuanced effects of gender equality at different levels of representation. Finally, by concentrating specifically on stock returns and alphas, the study directly tests market-based outcomes, thereby moving closer to isolating the financial implications of gender equality and partially escaping the broader governance-only focus that characterizes much of the prior literature.

## **2.5. Research Hypotheses**

Building upon the literature reviewed and the identified limitations in the previous sub-chapter, this study aims to empirically investigate the relationship between gender equality and stock returns. Informed by both theoretical frameworks and prior empirical findings, the following hypotheses are proposed:

**H1:** Firms with higher levels of gender equality exhibit higher annual stock returns.

**H2:** Gender diversity in leadership positions is positively associated with risk-adjusted stock performance as estimated through CAPM and Fama-French models.

These hypotheses will be examined empirically in subsequent chapters. This relationship is grounded in the idea that inclusive corporate governance contributes to better decision-making, risk management, and overall firm reputation, all of which can increase investor confidence and positively influence market valuation.

### 3. Methodology

This research adopts a quantitative, explanatory, and correlational research design to investigate the relationship between gender equality in corporate governance and stock returns. The methodological framework is directly inspired by the work of Ghafoor et al. (2022), who assessed the impact of board-gender diversity on firm financial performance using panel data and board composition metrics. In this dissertation, a similar empirical design is applied with a focus on stock returns and gender-related corporate governance indicator, using a dataset sourced from Datastream and LSEG Workspace.

The sample comprises publicly listed companies within the STOXX Europe 600 index, covering a wide range of large and mid-sized firms across various European countries and economic sectors. This index was selected for its alignment with the European Union's policy emphasis on gender equality, particularly the Directive on Gender Balance in Corporate Boards (Directive 2022/2381), and the availability of ESG disclosures across European markets. The observation period spans from December 2014 to December 2024, resulting in an unbalanced panel dataset at the firm-year level, since not all firms report information for every year within the period.

Monthly stock prices, used to calculate annual stock returns, are obtained from the Datastream database. The dependent variable, stock return, is calculated using adjusted closing prices, and it is also used for robustness checks. To account for risk-adjusted performance, the study estimates alphas derived from the Capital Asset Pricing Model (CAPM) and the Fama-French Three-Factor and Five-Factor models. The market risk premium (Mkt-RF), risk-free rate (RF), and the Fama-French factors (SMB, HML, RMW, CMA) are sourced from the Bloomberg database. The raw returns were computed according to equation [1], while the estimation of alphas follows the asset pricing models presented in Section 2.2. For clarity, the definition of all variables used in these computations is provided in Table 2. These models allow for the isolation of firm-specific return components by accounting for systematic market risk and other firm characteristics.

Table 2 - Summary of Variables, Sources, and Construction

Variable	Role	Source	Construction / Definition
<b>Return</b>	Dependent	Own calc. (Datastream prices)	% change in adjusted closing prices over the year (annual frequency): $R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}$ where $P_{i,t}$ is the adjusted closing price at year-end.
<b>Alpha_CAPM</b>	Dependent (risk-adjusted)	Own calc. (Datastream prices; Bloomberg factors)	Intercept from time-series regression: $R_{i,t} - R_{f,t} = \alpha_i + \beta_i(R_{m,t} - R_{f,t}) + \varepsilon_{i,t}$
<b>Alpha_FF3</b>	Dependent (risk-adjusted)	Own calc. (Datastream prices; Bloomberg factors)	Intercept from time-series regression: $R_{i,t} - R_{f,t} = \alpha_i + \beta_i(R_{m,t} - R_{f,t}) + s_iSMB_t + h_iHML_t + \varepsilon_{i,t}$
<b>Alpha_FF5</b>	Dependent (risk-adjusted)	Own calc. (Datastream prices; Bloomberg factors)	Intercept from time-series regression: $R_{i,t} - R_{f,t} = \alpha_i + \beta_i(R_{m,t} - R_{f,t}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + \varepsilon_{i,t}$
<b>Pct_Women_Board</b>	Main independent	LSEG Workspace	Female directors $\div$ total directors $\times$ 100 at fiscal year-end
<b>Leverage</b>	Control	Datastream	Total debt $\div$ total assets
<b>Book-to-market (B_M)</b>	Control	Datastream	Book value of equity $\div$ market capitalization at fiscal year-end (annual, decimal).
<b>Size</b>	Control	Datastream	Natural logarithm of total assets at fiscal year-end.
<b>Beta</b>	Control	Datastream	Firm-level beta estimated from historical return data.
<b>Market excess return (Mkt_RF)</b>	Factor	Bloomberg	$R_{m,t} - R_{f,t}$ . Annual market return minus annual risk-free rate.
<b>SMB</b>	Factor	Bloomberg	Annual return of small minus big stock portfolios.
<b>HML</b>	Factor	Bloomberg	Annual return of high minus low book-to-market portfolios.
<b>RMW</b>	Factor	Bloomberg	Annual return of robust minus weak profitability portfolios.
<b>CMA</b>	Factor	Bloomberg	Annual return of conservative minus aggressive investment portfolios.

<b>Variable</b>	<b>Role</b>	<b>Source</b>	<b>Construction / Definition</b>
<b>Risk-free rate (RF)</b>	Factor	Bloomberg	1-year sovereign bond yield, annual average or year-end observation.
<b>Year effects (<math>\lambda_t</math>)</b>	Control	Own coding	One dummy per calendar year (2014–2024) to capture macro/market shocks.
<b>Firm effects (<math>\mu_i</math>)</b>	Control	Model spec.	Unobserved, time-invariant firm traits; absorbed in FE or modelled as RE.

*Scope and frequency.* STOXX Europe 600 constituents; December 2014–December 2024.

*Note.* All variables are annual, and their names are consistent with those used in the descriptive statistics and regression analysis.

*Source.* Own elaboration based on Datastream, LSEG Workspace, and author calculation (SPSS/Excel/Gretl).

Gender equality in leadership is measured using the percentage of women on the board of directors, sourced from LSEG Workspace. As the study uses only publicly available secondary data from established databases, it poses no ethical risks.

To isolate the effect of gender equality on stock performance, the analysis controls for several firm-level variables, including firm size (measured as the natural logarithm of total assets), leverage (measured as the debt-to-asset ratio), book-to-market ratio, and beta (systematic risk estimated from the market model). These variables are sourced from Datastream financial fundamentals. Additionally, year fixed effects are included to control for macroeconomic and temporal shocks.

Table 2 shows that the dependent variables focus on firm performance, measured both by raw and risk-adjusted stock returns. Gender diversity on boards is the main explanatory variable, while standard firm-level controls such as size, leverage, book-to-market ratio, and beta are included. Additional factors from the Fama-French models capture broader risk dimensions, ensuring a consistent framework for testing the research hypotheses.

The following general regression equation is applied:

$$R_{it} = \alpha + \beta_1 GE_{it} + \beta_2 X_{it} + \mu_i + \lambda_i + \epsilon_{it} \quad [5]$$

where  $R_{it}$  represents the stock return for firm  $i$  at time  $t$ ,  $GE_{it}$  denotes the gender equality metric,  $X_{it}$  is a vector of control variables,  $\mu_i$  captures firm-specific effects, and  $\lambda_i$  captures time-specific effects.

The empirical analysis relies on panel data methods, and the appropriate specification was selected based on standard diagnostic tests. Specifically, the F-test, the Breusch-Pagan Lagrange Multiplier (BP) test, and the Hausman test were conducted for each dependent variable to assess whether pooled Ordinary Least Squares (OLS), fixed effects (FE), or random effects (RE) were most suitable.

Descriptive statistics and correlation analyses are initially presented to understand the distribution and relationships between the variables. Multicollinearity is tested using the Variance Inflation Factor (VIF) to ensure that the explanatory variables are independent.

Robustness checks were conducted by re-estimating the main regression models with the inclusion of an alternative specification of gender diversity. In particular, a critical-mass

indicator (Women33) was created, equal to 1 when at least one-third of board members were women and 0 otherwise. This variable was then used as the main regressor in place of the continuous measure of female board representation.

As mentioned, this methodological approach closely follows that of Ghafoor et al. (2022), who utilized firm-level panel data, board diversity indicators, and regression analysis to assess the influence of gender diversity on firm performance. In this study, the same analytical logic is applied but redirected towards stock market outcomes, integrating established asset pricing models such as CAPM and Fama-French to provide a rigorous assessment of the relationship between gender equality and stock returns.

## 4. Results

This chapter presents the empirical results of the study. Following the methodological structure outlined in the previous section, the analysis begins with descriptive statistics and correlation matrices to offer a general overview of the dataset. Next, multicollinearity diagnostics are conducted to verify the independence of explanatory variables. The core of the chapter comprises the results of the panel regressions, which investigate the relationship between gender diversity and firm performance, using both raw and risk-adjusted returns. Additional robustness checks are also discussed.

The regression models were designed in alignment with prior studies on board gender diversity and financial outcomes (Adams & Ferreira, 2009; Ghafoor et al., 2022), and the statistical significance of each coefficient is assessed at the 1%, 5% and 10% levels.

### 4.1. Descriptive Statistics

Table 3 presents the descriptive statistics for the main variables used in the analysis. The average annual stock return is approximately 9.94%, with a standard deviation of 30.50%. This indicates substantial variation in performance across firms, which is expected given the heterogeneity of the STOXX Europe 600 constituents. The minimum observed return is -76.2%, and the maximum is 254.8%.

Regarding gender diversity, the proportion of women on the board (Pct\_Women\_Board) has a mean of 33.26%, with values ranging from 4.35% to a maximum of 75%. This suggests considerable variation in board gender composition across firms, but also a general trend towards increased female representation in corporate governance structures, consistent with recent EU-level regulatory efforts (Directive 2022/2381).

Among the control variables, Leverage shows an average of 0.249, with a standard deviation of 0.1562, which indicates moderate variation across firms, although some high observations remain, as suggested by the maximum of 1.319. The book-to-market ratio (B/M) has a mean of 0.60, while the Beta is 1.007, indicating that, on average, firms exhibit systematic risk levels similar to the overall market.

**Table 3 - Descriptive Statistics for Key Variables**

<b>Variable</b>	<b>N</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>Std. Dev.</b>
Return	3528	-0.7622	2.5478	0.0994	0.3050
Pct_Women_Board	3887	4.3478	75.0000	33.2618	11.7103
Leverage	6100	0.0002	1.3191	0.2488	0.1562
Size	6104	9.5353	21.7911	16.3789	1.8325
B_M	5299	-0.81136	7.2289	0.6010	0.5546
Beta	4455	-0.3764	3.1636	1.0066	0.4396
Mkt_RF	6578	-17.4500	25.1500	4.1691	13.7586
SMB	6578	-9.1800	12.1700	0.2618	6.5677
HML	6578	-22.5800	22.9900	-0.0082	12.4744
RMW	6578	-9.9700	10.9200	2.3118	5.6049
CMA	6578	-20.6800	13.7900	-1.1336	8.8971
RF	5980	0.0100	5.1300	1.6740	1.7933

*Source.* Own elaboration based on data from Datastream, LSEG Workspace and SPSS.

Regarding the Fama-French factors, the market risk premium (Mkt\_RF) averages 4.17%, while the size (SMB) and value (HML) premiums display greater variability. Notably, the profit factor (RMW) has a mean of 2.31%, and the investment factor (CMA) is negative on average (-1.13%), suggesting a tendency for firms in the sample to follow more aggressive investment policies. The risk-free rate (RF) averages 1.67% over the sample period.

## **4.2. Correlation Analysis**

To assess the initial relationships between the main variables of interest, a Table 4 shows a Pearson correlation matrix. The results provide insights into the strength and direction of the linear associations between gender diversity, firm characteristics, and stock performance indicators.

Table 4 - Pearson Correlation Matrix of Main Variables

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Return	1.0000	-0.0208	-0.0640**	-0.1480**	-0.1240**	-0.0211	0.3150**	0.0257	-0.0470**	0.1490**	-0.0380*
2. Pct_Women_Board	-0.0208	1.0000	0.0820**	0.1420**	0.0610**	0.0800**	0.0046	-0.2290**	0.1960**	-0.2710**	0.1070**
3. Leverage	-0.0640**	0.0820**	1.0000	0.0158	-0.0210	-0.0261	0.0225	0.0022	-0.0221	0.0052	-0.0290*
4. Size	-0.1480**	0.1420**	0.0158	1.0000	0.4990**	0.0970**	0.0033	-0.0650**	0.0550**	-0.0740**	0.0280*
5. B_M	-0.1240**	0.0610**	-0.0210	0.4990**	1.0000	0.1300**	-0.0009	-0.0024	0.0122	-0.0310*	0.0006
6. Beta	-0.0211	0.0800**	-0.0261	0.0970**	0.1300**	1.0000	0.0056	-0.0590**	0.0510**	-0.0620**	0.0177
7. Mkt_RF	0.3150**	0.0046	0.0225	0.0033	-0.0009	0.0056	1.0000	0.4160**	-0.3060**	0.3320**	-0.4010**
8. SMB	0.0257	-0.2290**	0.0022	-0.0650**	-0.0024	-0.0590**	0.4160**	1.0000	-0.6960**	0.4970**	-0.6670**
9. HML	-0.0470**	0.1960**	-0.0221	0.0550**	0.0122	0.0510**	-0.3060**	-0.6960**	1.0000	-0.6660**	0.9300**
10. RMW	0.1490**	-0.2710**	0.0052	-0.0740**	-0.0310*	-0.0620**	0.3320**	0.4970**	-0.6660**	1.0000	-0.6140**
11. CMA	-0.0380*	0.1070**	-0.0290*	0.0280*	0.0006	0.0177	-0.4010**	-0.6670**	0.9300**	-0.6140**	1.0000

Note. Pearson correlation coefficient are reported. \* Correlation is significant at the 0.05 level (2-tailed). \*\* Correlation is significant at the 0.01 level (2-tailed).

Source. Own elaboration based on data from Datastream, LSEG Workspace and SPSS.

The proportion of women on the board (Pct\_Women\_Board) shows small but statistically significant positive correlations with firm size ( $r = 0.1420$ ,  $p < 0.01$ ) and market beta ( $r = 0.0800$ ,  $p < 0.01$ ), suggesting that larger firms and those with higher exposure to market risk tend to have more gender-diverse boards. At the same time, gender diversity is negatively associated with common risk factors such as SMB (small-minus-big;  $r = -0.2290$ ,  $p < 0.01$ ) and RMW (robust-minus-weak profitability;  $r = -0.2710$ ,  $p < 0.01$ ), indicating that companies with greater female representation are typically larger, less reliant on small-cap characteristics, and not concentrated in high-profitability segments. Importantly, the correlation between Pct\_Women\_Board and stock returns is weak and statistically insignificant ( $r = -0.0208$ ,  $p > 0.10$ ), implying that gender diversity on boards, on its own, is not directly linked to abnormal performance at the firm level.

Beyond gender diversity, several firm characteristics display meaningful associations. Size is positively correlated with the book-to-market ratio ( $r = 0.4990$ ,  $p < 0.01$ ) and negatively correlated with SMB ( $r = -0.0650$ ,  $p < 0.01$ ), which is consistent with well-established asset pricing patterns. Stock returns, meanwhile, are positively related to market excess returns (Mkt\_RF;  $r = 0.3150$ ,  $p < 0.01$ ) and RMW ( $r = 0.1490$ ,  $p < 0.01$ ), but negatively related to leverage ( $r = -0.0640$ ,  $p < 0.01$ ), firm size ( $r = -0.1480$ ,  $p < 0.01$ ), and the book-to-market ratio ( $r = -0.1240$ ,  $p < 0.01$ ). These results highlight the importance of accounting for standard risk factors and firm characteristics in the subsequent multivariate analysis.

Several factor-factor correlations are sizeable, signalling potential multicollinearity if the variables are entered jointly in the regressions. In particular, HML and CMA are very highly correlated ( $r = 0.9300$ ), and there are additional strong associations such as SMB-HML ( $r = -0.6960$ ), HML-RMW ( $r = -0.6660$ ), and SMB-CMA ( $r = -0.6670$ ). These magnitudes indicate that the corresponding explanatory variables share substantial common variation, which can inflate standard errors, destabilise coefficient estimates, and complicate inference on individual effects even when overall model fit remains satisfactory. From an economic perspective, these patterns are not unexpected. Value (HML) and investment (CMA) often co-move because high book-to-market “value” firms typically adopt more conservative investment policies, while profitability (RMW) and size (SMB) are linked to firms’ financing and operational structures. Consistent with the asset pricing literature, HML can

become partly redundant once RMW and CMA are included (Fama & French, 2015), which helps explain the very high HML–CMA correlation observed here.

### 4.3. Regression Analysis

#### 4.3.1. Preliminary panel diagnostics and model selection

This subsection documents how the appropriate panel specification was chosen before reporting the main regression. The empirical strategy follows the standard panel data econometric framework outlined by Baltagi (2013) and Wooldridge (2010).

Preliminary panel diagnostics were conducted to determine the most appropriate specification for each dependent variable. For Return, the F-test did not reject the null of no firm effects, while the Breusch–Pagan LM test did not reject the null of no random effects. However, the Hausman test strongly rejected the null of random effects consistency, and the Wald test provided strong evidence of year effects. Taken together, these results reported in Table 5 indicate that the most suitable baseline specification for Return is a pooled OLS model with year fixed effects and firm-clustered robust standard errors.

Table 5 - Panel-model selection diagnostics

Test	Return	Alpha_CAPM	Alpha_FF3	Alpha_FF5
F-test: pooled OLS vs FE H0: no firm FE	$F(384, 1782) = 1.0379$ , $p = 0.3132 \rightarrow$ Fail to reject $\rightarrow$ FE not required	(not significant, consistent with pooled)	(not significant, consistent with pooled)	(not significant, consistent with pooled)
Breusch–Pagan LM: pooled vs RE H0: no RE	$\chi^2(1) = 1.6716$ , $p = 0.1961 \rightarrow$ Fail to reject $\rightarrow$ RE not required	$\chi^2(1) = 80.0124$ , $p < 0.001 \rightarrow$ Reject $\rightarrow$ RE required	$\chi^2(1) = 80.0124$ , $p < 0.001 \rightarrow$ Reject $\rightarrow$ RE required	$\chi^2(1) = 80.0124$ , $p < 0.001 \rightarrow$ Reject $\rightarrow$ RE required
Hausman: FE vs RE H0: RE consistent	$\chi^2(11) = 35.1010$ , $p = 0.0002 \rightarrow$ Reject $\rightarrow$ RE inconsistent	$\chi^2(14) = 6.1161$ , $p = 0.9635 \rightarrow$ Fail to reject $\rightarrow$ RE consistent	$\chi^2(14) = 6.1161$ , $p = 0.9635 \rightarrow$ Fail to reject $\rightarrow$ RE consistent	$\chi^2(14) = 6.1161$ , $p = 0.9635 \rightarrow$ Fail to reject $\rightarrow$ RE consistent
Wald test: time effects H0: no year dummies	$\chi^2(3) = 127.1200$ , $p < 0.001 \rightarrow$ Reject $\rightarrow$ Year effects required	$\chi^2(3) = 12.9000$ , $p < 0.001 \rightarrow$ Reject $\rightarrow$ Year effects required	$\chi^2(3) = 15178.9000$ , $p < 0.001 \rightarrow$ Reject $\rightarrow$ Year effects required	$\chi^2(3) = 20492.6000$ , $p < 0.001 \rightarrow$ Reject $\rightarrow$ Year effects required

*Note.* All models were estimated with the same set of regressors (Pct\_Women\_Board, Leverage, B\_M, Beta, Mkt\_RF, SMB, HML, RMW, CMA, RF).

*Source.* Own elaboration based on data from Datastream, LSEG Workspace and Gretl.

For Alpha\_CAPM, the F-test results were again consistent with the pooled specification. However, the LM test strongly rejected the null of no random effects, and the Hausman test did not reject the null that random effects are consistent. The Wald test confirmed the presence of significant year effects. Thus, the appropriate specification for Alpha\_CAPM is a random effects model with year dummies and firm-clustered robust standard errors.

A similar pattern emerged for Alpha\_FF3 and Alpha\_FF5. In both cases, the LM test supported the presence of random effects, the Hausman test confirmed their consistency, and the Wald test strongly supported year effects. Consequently, the preferred specification for Alpha\_FF3 and Alpha\_FF5 is also a random effects model with year dummies and firm-clustered robust standard errors.

Overall, the diagnostics indicate that while stock returns are best modelled with pooled OLS including time fixed effects, alpha measures derived from asset pricing models (CAPM, FF3, FF5) are better captured by random effects models that account for firm-specific unobserved heterogeneity. In all specifications, year dummies are retained to control for common market-wide shocks affecting all firms simultaneously.

This section presents the results of the panel data regression models conducted to examine the relationship between gender diversity and stock returns. Following the methodology outlined in Chapter 3, the dependent variables are raw returns and risk-adjusted alphas derived from asset pricing models (CAPM, Fama-French Three-Factor, and Five-Factor models). The primary independent variable is the percentage of women on the board (Pct\_Women\_Board), and all models include control variables such as size, firm leverage, book-to-market ratio (B\_M), and beta, as well as year and firm fixed effects.

The results are presented progressively, starting with the model using raw returns as the dependent variable.

#### **4.3.2. Regression Results on Raw Returns**

This subsection examines whether gender diversity in corporate boards is significantly associated with raw stock returns. The results are reported in Table 6.

The coefficient on Pct\_Women\_Board is negative and economically small ( $-0.0001$ ) and statistically indistinguishable from zero ( $p = 0.6701$ ). Conditional on controls and time

effects, the share of women on the board does not exhibit a measurable association with firms' raw annual returns in this sample.

**Table 6 - Panel with Random Effects for Raw Return**

<b>Regressor</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>t</b>	<b>p-value</b>	<b>VIF</b>
<b>const</b>	0.3336	0.0619	5.3820	<0.0001***	-
<b>Pct_Women_Board</b>	-0.0001	0.0005	-0.1636	0.8701	1.2560
<b>Leverage</b>	-0.1100	0.0387	-2.8430	0.0047***	1.0250
<b>Size</b>	-0.0123	0.0034	-3.5620	0.0004***	1.4900
<b>B_M</b>	-0.0416	0.0114	-3.6440	0.0003***	1.4970
<b>Beta</b>	0.0003	0.0129	0.0270	0.9785	1.0440
<b>dt_2</b>	0.0636	0.0214	2.9800	0.0031***	1.8880
<b>dt_3</b>	-0.0524	0.0329	-1.5900	0.1118	1.9420
<b>dt_4</b>	-0.0670	0.0197	-3.4100	0.0007***	2.0060
<b>dt_5</b>	-0.2036	0.0225	-9.0500	<0.0001***	2.1100
<b>dt_6</b>	-0.2319	0.0284	-8.1500	<0.0001***	2.1950
<b>dt_7</b>	-0.1196	0.0278	-4.3800	<0.0001***	2.2690
<b>dt_8</b>	0.1827	0.0273	6.6800	<0.0001***	2.2960
<b>dt_9</b>	-0.2111	0.0267	-7.9000	<0.0001***	2.3570
<b>dt_10</b>	0.1056	0.0253	4.1800	<0.0001***	2.4110
<b>dt_11</b>	0.0271	0.0309	0.8800	0.3799	2.2570

*Note.* Dependent variable: Return. Coefficients rounded to 4 significant digits. Statistical significance levels: \*\*\* 1%, \*\* 5%, \* 10%.

*Source.* Own elaboration based on data from Datastream, LSEG Workspace and Gretl.

Among the covariates, both Size ( $-0.0121$ ,  $p < 0.001$ ) and book-to-market (B\_M) ratio is strongly negative ( $-0.0147$ ,  $p < 0.001$ ), display negative and statistically significant coefficients, indicating that larger firms and those with higher book-to-market ratios tend to earn lower raw returns after controlling for other firm characteristics and year effects. By contrast, Leverage is statistically null, while Beta shows a small but positive and significant

association with returns (0.0006,  $p < 0.01$ ), implying that firms with higher market exposure experience slightly higher raw returns, though the economic magnitude is minor.

The series of year dummies is jointly highly significant, underscoring the importance of controlling for macro-financial conditions and market-wide shocks. The coefficient pattern reveals pronounced negative return environments in several years, particularly dt\_5 (2018,  $-0.2036$ ,  $p < 0.001$ ), dt\_6 (2019,  $-0.2319$ ,  $p < 0.001$ ), and dt\_9 (2022,  $-0.2111$ ,  $p < 0.001$ ). At the same time, there are positive years such as dt\_2 (2015,  $0.0636$ ,  $p < 0.01$ ), dt\_8 (2021,  $0.1827$ ,  $p < 0.001$ ), and dt\_10 (2023,  $0.1056$ ,  $p < 0.001$ ), highlighting the role of episodic market conditions in shaping firm-level returns. It should be noted that these coefficients represent differences relative to the base year dt\_1 (2014), and returns are only effectively negative when the sum of the model constant and the dummy coefficient falls below zero.

Variance inflation factors (VIFs) were also examined to assess potential multicollinearity among the regressors. All main explanatory variables, including Pct\_Women\_Board (VIF = 1.256), Leverage (1.025), Size (1.490), B\_M (1.497), and Beta (1.044), present values comfortably below the conventional thresholds of concern. This suggests that correlations among the key firm-level controls are modest and unlikely to distort the estimated coefficients or their statistical significance. The year dummies naturally display somewhat higher VIFs, ranging from about 1.0 to 2.4, reflecting the partial overlap among time indicators. However, these values remain low in absolute terms and are not problematic for the interpretation of the results. Taken together, the VIF analysis supports the stability of the estimated model and indicates that the absence of significance for Pct\_Women\_Board is not a by-product of multicollinearity.

#### **4.3.3. Regression Results with CAPM Alpha**

This regression model examines the effect of gender diversity on stock performance using the alpha estimated from the Capital Asset Pricing Model (CAPM) as the dependent variable, with results reported in Table 7.

The coefficient on Pct\_Women\_Board is economically negligible ( $-0.0004$ ) and statistically indistinguishable from zero ( $p = 0.9616$ ). After controlling for firm characteristics and year effects, board gender diversity does not exhibit a measurable association with CAPM alpha in this sample.

Table 7 - Panel with Random Effects for Alpha\_CAPM

Regressor	Coef.	Std. Err.	z	p-value	VIF
<b>const</b>	4.6857	0.9443	4.9620	<0.0001***	-
<b>Pct_Women_Board</b>	-0.0004	0.0086	-0.0482	0.9616	1.1470
<b>Leverage</b>	-0.4322	0.4408	-0.9806	0.3268	1.0250
<b>Size</b>	0.1108	0.0510	2.1720	0.0298**	1.4890
<b>B_M</b>	-0.4136	0.1670	-2.4770	0.0133**	1.4970
<b>Beta</b>	-6.7901	0.3367	-20.1700	<0.0001***	1.0420
<b>dt_2</b>	-0.0092	0.4094	-0.2314	0.8170	1.3860
<b>dt_3</b>	-0.8900	0.3980	-2.2340	0.0255**	1.3870
<b>dt_4</b>	-24.2286	0.6186	-39.1700	<0.0001***	1.3970
<b>dt_5</b>	12.8952	0.5939	21.7100	<0.0001***	1.4300
<b>dt_6</b>	-20.7359	0.6149	-33.7300	<0.0001***	1.4560
<b>dt_7</b>	-12.8624	0.5923	-21.7200	<0.0001***	1.4760
<b>dt_8</b>	-15.9942	0.7067	-22.6300	<0.0001***	1.4710
<b>dt_9</b>	18.3796	0.6011	30.5700	<0.0001***	1.4900
<b>dt_10</b>	-18.3759	0.5429	-33.8500	<0.0001***	1.5080

*Note.* Dependent variable: Alpha\_CAPM. Estimates are random-effects GLS with year dummies; standard errors are clustered at the firm level. Coefficients rounded to 4 significant digits. Statistical significance levels: \*\*\* 1%, \*\* 5%, \* 10%.

*Source.* Own elaboration based on data from Datastream, LSEG Workspace and Gretl.

Among the controls, Beta is large and negative ( $-6.7907$ ,  $p < 0.0001$ ), consistent with firms with higher market exposure displaying lower abnormal performance once CAPM risk is accounted for. Size enters positively and significantly ( $0.1108$ ,  $p = 0.0298$ ), while B\_M is negative and significant ( $-0.4136$ ,  $p = 0.0133$ ), indicating that larger firms tend to earn slightly higher CAPM alphas whereas higher book-to-market firms tend to earn lower alphas, conditional on other covariates. Leverage is statistically null.

Year effects are jointly very strong, with sizeable negative coefficients in many years, particularly dt\_4 (2017), dt\_6 (2019), dt\_7 (2020), dt\_8 (2021), and dt\_10 (2023), while

positive effects appear in dt\_5 (2018) and dt\_9 (2022). This pattern highlights substantial time heterogeneity and the importance of absorbing macro-financial shocks via year dummies. The dummy coefficients represent relative shifts compared to the baseline year 2014 (dt\_1). A negative sign shows lower returns than in the base year, though returns themselves fall below zero only if the intercept and dummy jointly yield a negative figure.

A check for multicollinearity shows that all variance inflation factors are comfortably low. For the main firm-level regressors, values range between about 1.0 and 1.5 (Pct\_Women\_Board: 1.15, Leverage: 1.03, Size: 1.49, B\_M: 1.50, Beta: 1.04), which is well below the conventional cut-offs used to signal concern. The year dummies display slightly higher VIFs, around 1.4 to 1.5, but these are also unproblematic and largely reflect their mechanical correlation as time indicators. Taken together, the diagnostics suggest that the estimates are not distorted by multicollinearity, reinforcing the interpretation that the null effect of board gender diversity on CAPM alpha is not a by-product of unstable covariates.

Within this framework, board gender composition does not affect firms' abnormal returns once market risk, firm fundamentals, and common time shocks are taken into account. The results emphasize the central role of systematic risk (beta) and time variation, while gender diversity appears neutral for short-run CAPM-adjusted performance in this European sample.

#### **4.3.4. Regression Results with Fama-French Three-Factor Alpha**

To further assess the relationship between gender diversity and stock performance, the Fama-French Three-Factor model (FF3) is employed to estimate risk-adjusted returns. This model includes market, size and value factors, allowing for a more refined assessment of abnormal returns beyond what is captured by the CAPM (Bartholdy & Peare, 2002). The corresponding regression outcomes are presented in Table 8.

Using the Fama–French three-factor alpha as the dependent variable, the coefficient on Pct\_Women\_Board is essentially zero (0.0004) and statistically insignificant ( $p = 0.9616$ ). Once standard firm controls and time effects are in place, board gender diversity does not show a measurable association with FF3 risk-adjusted performance.

Table 8 - Panel with Random Effects for Alpha\_FF3

Regressor	Coef.	Std. Err.	z	p-value	VIF
const	0.5657	0.9443	0.5991	0.5491	-
Pct_Women_Board	-0.0004	0.0086	0.0482	0.9616	1.1470
Leverage	-0.4322	0.4408	-0.9806	0.3268	1.0250
Size	0.1108	0.0510	2.1720	0.0298**	1.4890
B_M	-0.4136	0.1670	-2.4770	0.0133**	1.4970
Beta	-6.7901	0.3367	-20.1700	<0.0001***	1.0420
dt_2	10.5370	0.4010	26.2100	<0.0001***	1.3860
dt_3	-13.0500	0.3983	-32.7600	<0.0001***	1.3870
dt_4	-27.6886	0.6186	-44.7600	<0.0001***	1.3970
dt_5	25.7152	0.5939	43.3000	<0.0001***	1.4300
dt_6	-5.9359	0.6149	-9.6540	<0.0001***	1.4560
dt_7	1.6676	0.5923	2.8150	0.0049***	1.4760
dt_8	-15.4124	0.7067	-21.8100	<0.0001***	1.4710
dt_9	8.6896	0.6011	14.4600	<0.0001***	1.4900
dt_10	-15.0059	0.5429	-27.6400	<0.0001***	1.5080

*Note.* Dependent variable: Alpha\_FF3. Estimates are random-effects GLS with year dummies; standard errors are clustered at the firm level. Coefficients rounded to 4 significant digits. Statistical significance levels: \*\*\* 1%, \*\* 5%, \* 10%.

*Source.* Own elaboration based on data from Datastream, LSEG Workspace and Gretl.

Among the controls, Beta is strongly negative and precisely estimated ( $-6.7901$ ,  $p < 0.001$ ), indicating that firms with higher market exposure tend to post lower abnormal returns after FF3 adjustment. The book-to-market ratio (B\_M) is also negative and significant ( $-0.4136$ ,  $p = 0.0133$ ), while Size and Leverage are statistically indistinguishable from zero in this specification.

The series of year dummies are large in magnitude and highly significant, alternating in sign—strong evidence of substantial time heterogeneity and the importance of absorbing macro-financial shocks with year fixed effects.

Finally, multicollinearity diagnostics using the Variance Inflation Factor (VIF) show values clustered between 1.0 and 1.5 for all regressors, indicating that collinearity among explanatory variables is not a concern in this model. This supports the stability of the estimated coefficients and strengthens the reliability of the inference.

Overall, the FF3 results align with previous evidence: gender representation on boards is neutral for risk-adjusted alphas once risk exposures, firm fundamentals, and time shocks are considered, while traditional risk factors—especially beta—remain the dominant drivers of abnormal performance.

#### **4.3.5. Regression Results with Fama-French Five-Factor Alpha**

The fourth model adopts the Fama-French Five-Factor (FF5) approach, integrating the market risk factor along with size, value, profitability, and investment factors to compute the risk-adjusted alpha (Fama & French, 2015). This model provides a more comprehensive assessment of stock performance by capturing additional dimensions of risk and firm characteristics that may influence returns. As in the previous regressions, the independent variables include the percentage of women on the board (Pct\_Women\_Board) and the control variables: leverage, size, book-to-market ratio (B\_M), and beta. The estimation results are summarised in Table 9.

Using the Fama–French five-factor alpha as the dependent variable, the coefficient on Pct\_Women\_Board is economically negligible ( $-0.0004$ ) and statistically indistinguishable from zero ( $p = 0.9616$ ). Once firm controls and year effects are included, board gender diversity shows no measurable association with FF5 risk-adjusted performance.

Among the covariates, Beta remains large and negative ( $-6.7906$ ,  $p < 0.001$ ), indicating that firms with greater market exposure tend to post lower abnormal returns after FF5 adjustment. The book-to-market ratio (B\_M) is also negative and significant ( $-0.4136$ ,  $p = 0.0133$ ), while Size enters positively and significantly ( $0.1108$ ,  $p = 0.0298$ ). Leverage is statistically null.

Table 9 - Panel with Random Effects for Alpha\_FF5

Regressor	Coef.	Std. Err.	z	p-value	VIF
<b>const</b>	6.8657	0.9443	7.2710	<0.0001***	-
<b>Pct_Women_Board</b>	-0.0004	0.0086	-0.0482	0.9616	1.1470
<b>Leverage</b>	-0.4322	0.4407	-0.9806	0.3268	1.0250
<b>Size</b>	0.1108	0.0510	2.1720	0.0298**	1.4890
<b>B_M</b>	-0.4136	0.1670	-2.4770	0.0133**	1.4970
<b>Beta</b>	-6.7906	0.2887	-23.5100	<0.0001***	1.0420
<b>dt_2</b>	1.4472	0.4010	3.6100	0.0003***	1.3860
<b>dt_3</b>	-28.8400	0.3983	-72.4000	<0.0001***	1.3870
<b>dt_4</b>	-33.9986	0.6186	-54.9600	<0.0001***	1.3970
<b>dt_5</b>	20.8952	0.5939	35.1800	<0.0001***	1.4300
<b>dt_6</b>	-13.4459	0.6149	-21.8700	<0.0001***	1.4560
<b>dt_7</b>	11.3776	0.5923	19.2100	<0.0001***	1.4760
<b>dt_8</b>	-25.4224	0.7067	-35.9700	<0.0001***	1.4710
<b>dt_9</b>	-7.6804	0.6011	-12.7800	<0.0001***	1.4900
<b>dt_10</b>	-25.9359	0.5429	-47.7800	<0.0001***	1.5080

*Note.* Dependent variable: Alpha\_FF5. Estimates are random-effects GLS with year dummies; standard errors are clustered at the firm level. Coefficients rounded to 4 significant digits. Statistical significance levels: \*\*\* 1%, \*\* 5%, \* 10%.

*Source.* Own elaboration based on data from Datastream, LSEG Workspace and Gretl.

The year indicators are jointly powerful and alternate in sign, with large negatives for dt\_3 (2016), dt\_4 (2017), dt\_8 (2021), and dt\_10 (2023), and positives for dt\_5 (2018) and dt\_7 (2020), highlighting pronounced time heterogeneity and the importance of absorbing macro-financial shocks with year fixed effects. Because 2014 (dt\_1) is the omitted reference year, the reported coefficients should be interpreted as deviations relative to that base. Returns are effectively negative only if the constant term plus the dummy coefficient yields a value below zero.

Finally, the analysis of Variance Inflation Factors (VIFs) confirms the absence of problematic multicollinearity. All VIF values are close to 1 (ranging from 1.025 to 1.508), which suggests that the estimated coefficients are not distorted by collinearity among the regressors, strengthening the reliability of the inference.

Overall, the FF5 results reinforce the CAPM and FF3 evidence: gender representation on boards is neutral for risk-adjusted alphas, whereas systematic risk and common time shocks are the dominant drivers of abnormal performance in this sample.

#### **4.4. Robustness with a critical-mass test**

To ensure the consistency and reliability of the main findings, robustness tests were performed (Adams & Ferreira, 2009). To test whether reaching a “critical mass” of women on the board is associated with abnormal performance, a binary indicator was created in Gretl using

$$Women33 = (Pct\_Women\_Board \geq 0.33) \quad [6]$$

Thus, *Women33* = 1 when at least one-third of board seats are held by women in a given firm-year, and 0 otherwise.

In terms of econometric specification, the choice of estimator follows the model-selection diagnostics discussed earlier. For regressions using raw returns as the dependent variable, pooled OLS with year dummies is adopted, since both the Breusch–Pagan LM and Hausman tests indicate that random or fixed effects are unnecessary in this case. By contrast, for all specifications using risk-adjusted alphas (CAPM, Fama–French Three-Factor, and Five-Factor), the random-effects GLS estimator with year dummies and firm-clustered robust standard errors is employed, consistent with the panel-diagnostics results that reject pooled OLS but support the consistency of random effects.

The following subsections present the robustness results for Raw returns, Alpha\_CAPM, Alpha\_FF3, and Alpha\_FF5, with the critical-mass variable *Women33* included as the main regressor of interest.

#### 4.4.1. Raw returns

Table 10 - Robustness Regression – Raw returns

Regressor	Coef.	Std. Err.	t	p-value
<b>const</b>	0.4427	0.06777	6.5400	<0.0001***
<b>Women33</b>	0.0025	0.0125	0.1987	0.8426
<b>Leverage</b>	-0.1261	0.0370	-3.4130	0.0007***
<b>Size</b>	-0.0180	0.0038	-4.7490	<0.0001***
<b>B_M</b>	-0.0357	0.0112	-3.1780	0.0016***
<b>Beta</b>	0.0054	0.0133	-0.4074	0.6840

*Note.* Dependent variable: Return. Estimates are pooled OLS with year dummies, which are not included in the table above for brevity matters and are jointly significant at  $p < 0.001$ . Coefficients rounded to 4 significant digits. Statistical significance levels: \*\*\* 1%, \*\* 5%, \* 10%.

*Source.* Own elaboration based on data from Datastream, LSEG Workspace and Gretl.

As it can be seen in Table 10, the critical-mass indicator Women33 is economically small and statistically indistinguishable from zero (0.0025,  $p = 0.843$ ). This implies that, conditional on firm controls and time effects, reaching at least one-third female representation on the board is not associated with higher (or lower) raw returns.

Among the covariates, Leverage loads negatively and strongly ( $p = 0.0007$ ), Size and B\_M are negative and significant, and Beta is positive with a small but statistically clear effect. Together, these patterns are consistent with lower raw returns among larger and high book-to-market firms, while greater market exposure is associated with slightly higher contemporaneous returns.

Overall, the robustness check mirrors the baseline results for raw returns: there is no evidence that achieving a one-third “critical mass” of women on the board affects firms’ raw performance once standard controls and time effects are accounted for.

#### 4.4.2. Alpha\_CAPM

This specification tests whether attaining a critical mass of women on the board—defined as at least one-third of board seats in a given firm-year—is associated with abnormal returns measured by CAPM alpha. Evidence for this model is reported in Table 11.

Table 11 - Robustness Regression – Alpha\_CAPM

Variable	Coef.	Std. Err.	z	p-value
<b>const</b>	5.2563	0.9580	5.4870	<0.0001***
<b>Women33</b>	0.0518	0.2290	0.2262	0.8211
<b>Leverage</b>	-0.3281	0.4397	-0.7462	0.4555
<b>Size</b>	0.0830	0.0514	1.6160	0.1060
<b>B_M</b>	-0.3652	0.1648	-2.2160	0.0267**
<b>Beta</b>	-6.9932	0.3432	-20.3800	<0.0001***

*Note.* Dependent variable: Alpha\_CAPM. Estimates are random-effects GLS with year dummies, which are not included in the table above for brevity matters and they are jointly significant at  $p < 0.001$ ; standard errors are clustered at the firm level. Coefficients rounded to 4 significant digits. Statistical significance levels: \*\*\* 1%, \*\* 5%, \* 10%.

*Source.* Own elaboration based on data from Datastream, LSEG Workspace and Gretl.

The critical-mass indicator Women33 is economically small and statistically indistinguishable from zero (0.052,  $p = 0.821$ ). Conditional on standard firm controls and year effects, attaining at least one-third female representation on the board is not associated with CAPM alpha.

Among the controls, Beta is large and negative ( $-6.993$ ,  $p < 0.001$ ), consistent with lower abnormal performance among firms with greater market exposure once CAPM risk is accounted for. Size enters positively and significantly (0.083,  $p = 0.1060$ ), while B\_M is negative and significant ( $-0.365$ ,  $p = 0.027^{**}$ ), implying that larger firms tend to earn slightly higher alphas and higher book-to-market firms slightly lower alphas, holding other factors constant. Leverage is statistically null.

Overall, the critical-mass test corroborates the main results: crossing the one-third threshold does not translate into abnormal performance once risk exposures, firm characteristics, and time effects are controlled for.

#### 4.4.3. Alpha\_FF3

In this robustness check, the regression was estimated using the Fama-French three-factor model's alpha (Alpha\_FF3) as the dependent variable. The objective remains to assess the

relationship between gender diversity on corporate boards (Pct\_Women\_Board) and risk-adjusted performance, now under an alternative specification. The corresponding results are displayed in Table 12.

**Table 12 - Robustness Regression – Alpha\_FF3**

<b>Variable</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>z</b>	<b>p-value</b>
<b>const</b>	1.1363	0.9580	1.1860	0.2356
<b>Women33</b>	0.0518	0.2290	0.2262	0.8211
<b>Leverage</b>	-0.3281	0.4397	-0.7462	0.4555
<b>Size</b>	0.0830	0.0514	1.6160	0.1060
<b>B_M</b>	-0.3652	0.1648	-2.2160	0.0267**
<b>Beta</b>	-6.9932	0.3432	-20.3800	<0.0001***

*Note.* Dependent variable: Alpha\_FF3. Estimates are random-effects GLS with year dummies, which are not included in the table above for brevity matters and they are jointly significant at  $p < 0.001$ ; standard errors are clustered at the firm level. Coefficients rounded to 4 significant digits. Statistical significance levels: \*\*\* 1%, \*\* 5%, \* 10%.

*Source.* Own elaboration based on data from Datastream, LSEG Workspace and Gretl.

The critical-mass indicator (Women33) is small and far from significant (0.0518,  $p = 0.8211$ ). Hitting the one-third threshold of women on the board does not show any detectable link with FF3 alpha once controls and year effects are in place.

Among the controls, Beta is strongly negative and precisely estimated ( $-6.9932$ ,  $p < 0.0001$ ), indicating that firms with greater market exposure tend to earn lower abnormal returns after FF3 risk adjustment. The book-to-market ratio (B\_M) is also negative and statistically significant ( $-0.3652$ ,  $p = 0.0267$ ), suggesting that higher B\_M firms are associated with slightly lower FF3 alphas. Size is positive but not significant ( $p = 0.106$ ), and Leverage is economically small and statistically null ( $p \approx 0.456$ ).

Year dummies (not reported) are jointly significant, so time variation is important but does not change the main message: reaching a “critical mass” of women on the board is not associated with superior risk-adjusted performance under the FF3 framework. This robustness check is consistent with the baseline results using both raw returns and alternative alpha specifications.

#### 4.4.4. Alpha\_FF5

This regression examines the robustness of the main findings' using Alpha\_FF5 as the dependent variable. The objective is to isolate and test the direct effect of gender diversity on performance, controlling for potential overfitting from other variables.

Table 13 shows that *Women33* coefficient is positive but economically small and statistically insignificant (0.518,  $p = 0.821$ ). Reaching one-third female representation on the board shows no detectable association with FF5 alpha once firm controls and year effects are included.

Table 13 - Robustness Regression – Alpha\_FF5

Variable	Coef.	Std. Err.	z	p-value
const	7.4363	0.9580	7.7620	<0.0001***
<b>Women33</b>	0.0518	0.2290	0.2262	0.8211
<b>Leverage</b>	-0.3281	0.4397	-0.7462	0.4555
<b>Size</b>	0.0830	0.0514	1.6160	0.1060
<b>B_M</b>	-0.3652	0.1648	-2.2160	0.0267**
<b>Beta</b>	-6.9932	0.3432	-20.3800	<0.0001***

*Note.* Dependent variable: Alpha\_FF5. Estimates are random-effects GLS with year dummies, which are not included in the table above for brevity matters and they are jointly significant at  $p < 0.001$ ; standard errors are clustered at the firm level. Coefficients rounded to 4 significant digits. Statistical significance levels: \*\*\* 1%, \*\* 5%, \* 10%.

*Source.* Own elaboration based on data from Datastream, LSEG Workspace and Gretl.

Among the controls, Beta is strongly negative and precisely estimated ( $-6.9932$ ,  $p < 0.0001$ ): firms with higher market exposure post lower abnormal returns after FF5 adjustment. The book-to-market ratio (B\_M) is also negative and significant ( $-0.3652$ ,  $p = 0.0267$ ), indicating slightly lower alphas for higher B/M firms. Size is positive but statistically weak ( $p \approx 0.106$ ), and Leverage is economically small and insignificant.

## 4.5. Discussion

Across all model specifications – raw returns (pooled OLS with year effects) and risk-adjusted alphas under CAPM, FF3, and FF5 (RE with year effects) – the evidence is

consistent: neither the continuous measure of board gender representation nor the critical-mass threshold (Women33) is associated with superior performance. Instead, systematic risk (beta) and time variation dominate the explanation of returns and alphas, with  $B\_M$  also contributing negatively in most cases. Multicollinearity checks (VIFs) are comfortably low, so these results are not an artifact of unstable covariates. The similarity of coefficients across CAPM, FF3, and FF5 further reflects the construction of the alpha measures: the additional Fama-French factors (SMB, HML, RMW, CMA) vary across time but not across firms, and their effects are therefore absorbed by the year dummies. Consequently, the slope estimates remain nearly identical across models, and the differences are confined to intercepts and year effects. This reinforces the robustness of the findings, showing that the absence of significant effects for gender diversity is not sensitive to the choice of return specification or risk-adjustment model.

Before turning to the broader interpretation of these findings, it is worth recalling the diagnostic tests that guided the model choice, as these provide the foundation for the results. For raw returns, the F-test did not reject the null of no firm effects, the BP test did not support random effects, and the Hausman test rejected the consistency of RE. Taken together, these results indicated that a pooled OLS model with year fixed effects and firm-clustered standard errors was the most appropriate baseline. In contrast, for the risk-adjusted alphas (CAPM, FF3 and FF5), the BP test strongly rejected pooled OLS in favour of random effects, while the Hausman test did not reject the consistency of RE. The Wald test also confirmed the relevance of year effects. Consequently, these models were estimated using random-effects with year dummies and clustered standard errors.

On this basis, the regressions were re-estimated across all specifications to ensure robustness. Specifically, annual raw returns (pooled OLS with year dummies) and risk-adjusted returns based on CAPM, Fama-French three-factor, and five-factor alphas (random-effects with year dummies and clustered errors) were examined. This approach ensured that the findings were not driven by the functional form of the gender-diversity measure, confirming that the absence of significant effects held both when gender equality was treated as a continuous variable and when it was captured through a critical-mass threshold.

Taken together, the empirical results across raw returns and risk-adjusted alphas (CAPM, FF3, and FF5), including robustness checks with the critical-mass indicator, point to a

common conclusion: board gender diversity is not materially associated with contemporaneous stock performance in this European sample once standard firm characteristics, risk exposures, and time effects are controlled for.

In line with the evidence presented above, the research hypotheses are therefore evaluated as follows: H1—that higher gender equality is associated with higher annual stock returns—is not supported, as coefficients on gender diversity measures are economically small and statistically insignificant, and, H2—predicting a positive association between gender diversity and risk-adjusted performance—also finds no support across CAPM, FF3, and FF5 alphas.

These findings are aligned with the notion that investors may prioritize other financial and structural firm-level factors, such as size, leverage, and market-to-book ratio, when evaluating returns. Comparing to prior research, the evidence contrasts with studies that identified a positive and significant relationship between gender diversity and firm performance (Valls Martínez & Soriano Román, 2022). However, it is consistent with those reporting weak or no significant effects (Carter et al., 2010).

## 5. Conclusion

The dissertation examined whether gender equality on boards of directors has an impact on firms' stock returns in the European market. Motivated by the increasing relevance of diversity and corporate governance in both academic debate and regulatory frameworks, the study pursued to determine if investors attribute value to gender diversity in leadership.

Across all specifications using raw returns and risk-adjusted alphas (CAPM, FF3 and FF5), as well as robustness checks including a one-third "critical mass" indicator, the results consistently showed no statistically significant effect of gender diversity on stock performance. While some coefficients pointed in a positive direction, the dominant drivers of returns were firm-level variables such as size and book-to-market ratio, together with systematic risk and time shocks. These findings indicate that, in the European context, investors do not yet price gender diversity in boards as a determinant of financial performance.

The objectives defined in the introduction were fully achieved. The first was to assess whether gender equality at the board level is associated with firms' annual raw returns, and the findings indicate that this relationship is neutral in the short run. The second was to examine risk-adjusted performance using alphas from CAPM and the Fama-French three- and five-factor models, with results confirming that gender equality does not systematically lead to abnormal returns under these frameworks. The third was to test the presence of a critical-mass effect, revealing that reaching one-third female representation on board is not consistently linked to superior stock performance. Finally, the robustness checks confirmed that these results are stable across alternative model specifications and firm-level controls, reinforcing the reliability of the evidence.

From a theoretical perspective, the results contribute to the ongoing debate on corporate governance and performance. From agency theory perspective (Jensen & Meckling, 1976), diverse boards could mitigate conflicts of interest and improve monitoring. Institutional perspectives also provide an explanation: within the European market, gender diversity may be perceived more as a compliance with regulation than as a financial driver. This interpretation is consistent with studies that found no significant market reaction to gender diversity measures (Romano et al., 2020). In this sense, the study contributes by clarifying

that the financial impact of board gender diversity may be highly context-dependent, and more likely to emerge in the long term or through channels not captured by stock returns alone.

At the same time, the study provides methodological contributions by combining different asset-pricing models (CAPM, FF3 and FF5) with rigorous panel diagnostics to ensure appropriate econometric specifications. It also adds to the literature by testing the “critical mass” hypothesis in a European setting, showing that surpassing one-third female representation on boards is not associated with abnormal returns.

In a practical way, for firms, the findings imply that promoting gender equality should not be pursued solely as a mechanism to increase short-term returns, but as part of a broader strategy to enhance reputation, legitimacy, and long-term sustainability (Adams & Ferreira, 2009; Ghafoor et al., 2022). This aligns with the broader contribution of the dissertation, which emphasizes that the financial materiality of gender equality lies more in long-run resilience, stakeholder trust, and sustainable growth than in immediate market rewards.

Beyond academic debate, the dissertation also offers a practical contribution by providing managers and boards with a more realistic view: gender equality targets should not be pursued with the expectation of short-term market rewards, but rather as part of a broader strategy to strengthen reputation, legitimacy, and long-term resilience. The beneficiaries of this study are diverse. For academics and future researchers, the findings provide robust evidence that can inform meta-analyses and guide future designs that explore alternative outcomes, longer horizons, or new measures of diversity. For managers and board members, the results highlight the importance of framing diversity initiatives as drivers of legitimacy and long-term strategy rather than immediate financial gains. Investors and analysts, particularly those engaged in ESG evaluation, benefit from a clearer understanding that the financial materiality of gender diversity may lie more in risk management, reputation, and sustainability than in abnormal returns. Regulators and policymakers also gain valuable insights into the real effects of quotas and directives, which seem to reinforce compliance and governance quality more than short-run performance. Finally, civil society, non-governmental organizations, and employees can draw from this evidence that gender equality on boards is a valuable organisational and social goal in its own right, with potential long-term payoffs that may not be fully visible in short-term financial data.

The study has several limitations. First, the analysis was based on a limited time period, which may not capture long-term impacts of gender equality on stock returns. Second, the measure of gender equality was restricted to board composition, overlooking broader aspects such as leadership style, influence in decision-making, or organizational culture (Adams & Ferreira, 2009). Finally, the focus on stock returns alone excludes other relevant outcomes, such as risk management, cost of capital, or operational performance.

These limitations suggest directions for future research that could expand the time frame, incorporate multi-dimensional measures of gender equality, also investigate alternative outcomes beyond returns, such as volatility, risk exposure, or accounting-based performance, and exploit regulatory shocks or institutional differences across countries to identify causal effects more clearly.

In conclusion, while gender diversity in boards may not directly influence short-term stock returns, it remains a fundamental element of corporate governance and organisational development. Its value lies not only in potential long-run financial benefits, but also in its contribution to legitimacy, sustainability, and social progress.

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