Master Thesis U.S.E.

Female Board Representation and Firm Financial Performance in Private Firms: Evidence From the Belgian Manufacturing Sector[1]

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Abstract. This paper investigates the impact of Female Board Representation (FBR) on Firm Financial Performance (FFP) in Belgian manufacturing firms, focusing on differences between private and public firms. I aim to determine whether FBR influences FFP and whether the same mechanisms apply to private and public firms. Using an unbalanced panel dataset of 300 firms (i.e. 150 private and 150 public) from 2014-2021, I analyse the effect of FBR on Return on Equity (RoE). My findings indicate that FBR does not have a statistically significant direct impact on FFP in either firm type. However, firm size was found to moderate this relationship in both corporate structures, failing to provide evidence in favour of the notion that mechanisms in private firms may differ. Yet, the lack of a statistically significant relationship in the FBR-FFP relationship for both governance types still puts into question the applicability of standard economic theorems such as Agency Theory (AT). The findings highlight the need for context-aware research to ensure reliable insights to policymakers and practitioners alike.

Key Words. Corporate Governance, Privately Held Firms, Women Directors, Firm Performance

JEL Codes. G34, M14, L25

1. Introduction

Over the past decades, gender equality, and more specifically female under-representation in previously male-dominated positions has gained significant traction in the field of Corporate Governance (CG). Due to its relevance for both society and business, one aspect of CG has become the focus of scrutiny - the gender diversity of firms' boardrooms. Despite extensive coverage of this topic in academia throughout the past decades, findings relating Female Board Representation (FBR) to Firm Financial Performance (FFP) remain mostly focused on public firms and developed markets. While emerging markets are receiving increasingly more attention (e.g. Ararat, Aksu, and Tansel Cetin, 2015; Saeed, Belghitar, and Yousaf, 2016), private firms remain under-represented in existing literature (Benischke, Bhaskarabhatla, and Singh, 2023). Globally, however, most registered firms are private (La Porta, Lopez-De-Silanes, and Shleifer, 1999) (e.g. 99% in India (Benischke, et al., 2023), and 86%[2] in Belgium), underlining the importance that these businesses hold in the generation of wealth and employment (Banghøj, Gabrielsen, Petersen, and Plenborg, 2010; Benischke, et al., 2023; Brav, 2009).

What, however, is the argument for assuming that findings on public firms cannot be generalised for private firms? The majority of papers in the field are based on Agency Theory (AT) (Terjesen, Sealy, and Singh, 2009), which discusses the intricate relationship between principals (i.e. shareholders) and agents (i.e. managers) (Jensen and Meckling, 1976). Specifically, in Agency Theory, attention is given to the positive relationship between the separation of ownership and control, and increased principal-agent frictions (Fama and Jensen, 1983).

[2] Information from Orbis. 77,666 public limited companies and 515,385 private limited firms registered in Belgium in the Orbis database.

In the context of CG, these frictions lead to various adverse effects on firm outcomes such as lower profitability due to costs incurred from managers' opportunistic behaviours (e.g. excessive risk-taking) (Jensen and Meckling, 1976). Due to the significant implications for firm survival and performance, these frictions must be mitigated.

This can be achieved through monitoring of the agents' actions and decisions, which discourages opportunistic behaviour and aims to ensure that managers' behaviours are more aligned with the goals of the firm (Kirsch, 2018). To carry out these monitoring tasks, boards of directors (BoDs), acting as intermediaries between shareholders and managers, are implemented in firms (Jermias and Gani, 2014; Westphal and Zajac, 1995; Williamson, 1988). While BoDs are an effective tool to mitigate principal-agent issues (Byron and Post, 2015; Kirsch, 2018), frictions can be minimised further by improving the boards' monitoring capabilities (Jensen and Meckling, 1976).

Adams and Ferreira (2009) find that women directors are more likely to be on monitoring committees and show better attendance records for board meetings. According to the authors, attendance is crucial because it will significantly improve the access a director has to essential information, which is required to fulfil their monitoring responsibilities. Finally, directors on important committees (e.g. monitoring committee), have a greater influence on a firms' governance (Adams and Ferreira, 2009). Therefore, women directors can enhance board monitoring capabilities, mitigating principal-agent issues (Kirsch, 2018; Adams and Ferreira, 2009). Private firms, however, inherently suffer from much less separation between ownership and control (Benischke, et al., 2023). Therefore, the argument following AT that women directors improve board monitoring capabilities to reduce principal-agent issues becomes weaker.

Instead, I posit that in the realm of private firms, Resource Dependence Theory (RDT) more accurately describes the mechanisms which guide the relationship between FBR and FFP.

Specifically, RDT reasons that women directors, rather than primarily reducing principal-agent issues, improve boardrooms by providing new resources and perspectives (Pfeffer and Salancik, 1978), which male-dominated boards lack. For instance, women directors are found to behave more ethically, more risk averse, and to value long-term over short-term outcomes (Kirsch, 2018). As more women are introduced to previously male dominated boardrooms, which are often referred to as "old boys' networks" (Allemand, Bédard, Brullebaut, and Deschênes, 2021), a broader perspective is brought to these boardrooms (Bianco, Ciavarella, and Signoretti, 2015). Topics such as stakeholder-oriented concerns are also more likely to be discussed by women directors (Bianco, et al., 2015) since male directors do not consider them important. These factors ultimately lead to enhanced board effectiveness and improved firm outcomes (Kirsch, 2018).

With this paper, I strive to investigate the relationship of FBR on FFP in a private-firm context to shed light on the mechanisms which are at play. I aim to provide nuanced insights for researchers, private-firm owners and policymakers concerning best-practices in terms of gender equality and its implementation in boardrooms, considering implications on firm performance. Thus, resulting in the following research question:

How Does Female Board Representation Affect Firm Financial Performance in Private Firms, and do the Same Mechanisms Apply, Given Their Unique Governance-Context?

The rest of the paper is structured as follows. A comprehensive overview of the current state of literature in the field of Corporate Governance (CG) and Firm Performance (FP) will be given in part 2. The focus will be set on extant research on public firms due to the lack of papers on private firms. In part 3, I will provide insight into the theoretical foundations on which the hypotheses are based and discuss the resulting expectations for outcomes. Part 4 will

describe the sample and outline the data-collection process to foster replicability of the approach before delving into the data-analysis set-up and rationale. Part 5 and 6 will focus on my findings and subsequent discussion.

2. Literature Review

2.1. Female Board Representation and Public Firm Performance

Board characteristics and their implications for firm performance have been researched extensively (Denis and McConnell, 2003). These board characteristics include but are not limited to: CEO duality (e.g. García-Ramos and García-Olalla, 2011), director independence (e.g. de Andres, Azofra, and Lopez, 2005), boardsize (e.g. García-Ramos and García-Olalla, 2011; O'Connell and Cramer, 2010), and gender diversity (e.g. Miller and Del Carmen Triana, 2009; Campbell and Mínguez-Vera, 2007; Joecks, Pull, and Vetter, 2012; Lückerath-Rovers, 2011). Despite extensive coverage of the topic, findings regarding the relationship between gender diversity in boards and financial performance in public firms remain mostly inconclusive (Joecks, Pull, and Vetter, 2012; Byron and Post, 2015; Bianco, et al., 2015), with a slight tendency towards a positive relationship (e.g. Campbell and Mínguez-Vera, 2007; Carter, Simkins, and Simpson, 2003; Lückerath-Rovers, 2011; Singh and Vinnicombe, 2004).

For instance, Lückerath-Rovers (2011) examined 99 listed Dutch firms between 2005-2007, finding a positive link between the ratio of women directors and firm performance, as measured by return on equity. This study, however, is limited to a relatively short time frame of three years, restricting generalisability of findings to other time periods where economic conditions and CG practices might differ.

Similarly, Ahern and Dittmar (2012) investigated 248 listed Norwegian firms between 2001-2009, reporting a negative relationship between women's ratio on the board and firm performance, measured by Tobin's Q. While the authors investigate a larger sample and a more

extended period, findings may be affected by a downward bias due to the substantial changes in economic conditions, especially in the years of the financial crisis from 2007 to 2008.

Additionally, Rose (2007) analysed more than 100 listed Danish firms between 1998-2001, finding no evidence of a statistically significant relationship between women's ratio and firm performance as measured by Tobin's Q. The study's timeframe, coinciding with the Dot-com bubble, and its limited duration could affect the relevance and applicability of the findings, considering shifts in societal attitudes towards gender equality and the evolution in CG practices over the past decades.

Furthermore, the mixed results of these studies may also be attributed to broader factors. First, data originates from a variety of countries with differing governance and regulatory systems, over a range of different time frames (Miller and Del Carmen Triana, 2009). Second, the usage of varying measures for both gender diversity and firm performance, as well as a wide range of estimation methods being employed by scholars (Campbell and Mínguez-Vera, 2007) further complicate comparability between findings.

Third, the consideration of non-linearity in the relationship between the variables of interest is crucial as Joecks et al (2012) posit. In particular, studies biassed towards samples with either low or high female representation might yield negative or positive findings, respectively, while those with mixed samples may report an insignificant relationship (Joecks et al., 2012).

2.2. Differences Between Public and Private Firms

Understanding the distinctions between public and private firms is crucial to uncover the challenges and opportunities that women directors face in these differing environments. In particular, public firms face rigorous regulatory requirements and significant external scrutiny from investors and other stakeholders, which necessitates formal governance structures,

resulting in the need for the BoDs monitoring functions (Fama and Jensen, 1983; Jensen and Meckling, 1976).

In contrast, the majority of firms worldwide are privately held businesses (La Porta, et al., 1999), where the boards often engage in less formal advisory and service tasks, such as building reputation for the organisation, setting an organisational strategy, and networking (Van den Heuvel, 2006).

Furthermore, private firms are characterised by their reliance on relational governance. Specifically, unlike public firms which use formal contracts, incentives, as well as monitoring systems, private firms – particularly if owned by a single individual or family – rely on informal social controls which are based upon a shared vision, commitment among owners and management, and mutual trust (Huse, 1993; Mustakallio, Autio, & Zahra, 2002). This special type of governance, which is embedded in social relationships between management and owners, is often referred to as "relational governance" (Huse, 1993; Mustakallio, et al., 2002).

However, Filatotchev and Wright (2005) also discuss how, as private firms evolve throughout their life cycle, the role of boards and specific governance mechanisms may shift from the informal controls to a more formal, structured governance approach.

2.3. Female Board Representation and Private Firm Performance

The literature on the relationship between FBR and FFP has predominantly considered public companies, leaving a significant gap in extant research in terms of the dynamics which are at play in private firms (Maghin, 2022).

Addressing the need to investigate private firms, Maghin (2022) researches the FBR-FFP relationship in the context of private French firms, which were subjected to gender quotas. The author's results indicate that the gender quota increased profitability by 7% due to increased board diversity in gender, age, and nationality.

To ensure robustness, Maghin (2022) employs a quasi-experimental design, using the quota as an exogenous shock, which addresses potential endogeneity concerns. However, due to the nature of the quota, only private firms above a certain size threshold were affected. In particular, firm must have maintained a net revenue exceeding 50 million euro and a workforce of at least 500 employees over the last three years to be required to comply with the quota.

This size cut-off raises questions about the generalisability of findings for private firms of different size classifications and its reliability due to potential selection bias resulting from the highly selective quota. Therefore, while findings underline the benefits of greater gender diversity in larger, private firms, further research is needed to understand the relationship in the context of private firms as a whole.

3. Theory and Hypotheses

3.1. Agency Theory

Agency Theory (AT) navigates the intricacies of the relationship between principals and agents. Often, frictions between these two groups arise, causing so-called "agency costs" (Fama and Jensen, 1983; Jensen and Meckling, 1976). AT's focus lies in elucidating both the origin of these frictions and remedies to mitigate them.

First, it is important to have a clear understanding of these terms in a firm-level context. The shareholders (or owners) of a firm represent the principals, while the managers of the firm (e.g. the CEO and executives) act as agents. The managers are hired to take on a firm's day-to-day operations, expected to act in the business' best interest (Jensen and Meckling, 1976; Jermias and Gani, 2014), which increases the separation between ownership and control. Consequently, there is a greater possibility for the misalignment of goals and interests, resulting in Principal-Agent frictions (Jermias and Gani, 2014; Fama and Jensen, 1983). In particular, a self-interested manager might benefit from pursuing goals which differ to those of the owners

(Fama and Jensen, 1983; Jensen and Meckling, 1976; Jermias and Gani, 2014). Specifically, while shareholders expect long-term returns on their investment, a CEO might prefer a "high-risk high-reward approach" to grow their prestige amongst colleagues where the uncertainty is borne primarily by shareholders of the firm. This is considered an agency-cost, which refers to the costs related to, in this case, excessive risk-taking and the prevention and mitigation of principal-agent issues (Jensen and Meckling, 1976).

To mitigate these misalignments and subsequent agency costs, managers must be monitored (Jensen and Meckling, 1976; Fama and Jensen, 1983). Therefore, a board of directors is implemented as an intermediary, located between principals and agents, to monitor managers and evaluate performance to prevent frictions (Jermias and Gani, 2014; Westphal and Zajac, 1995; Williamson, 1988). Thus, boards' monitoring functions play a pivotal role in the success of firms.

Following Agency Theory, women directors are capable of mitigating agency-costs by bringing enhanced monitoring capabilities to the boardroom (Byron and Post, 2015; Kirsch, 2018). These capabilities come in several forms. Adams and Ferreira (2009) find that women are more likely to join monitoring-committees and have better attendance at board meetings. This has crucial implications on the effectiveness of monitoring capabilities. Specifically, the authors state that these meetings are the main source for directors to acquire essential information to fulfil their monitoring responsibilities. Additionally, Adams and Ferreira (2009) find that board members who are also present on important committees have a greater effect on overall governance, amplifying the impact of women directors.

Therefore, as a baseline for this paper, I hypothesise, in line with extant literature, that the FBR-FFP relationship is positive in public firms:

H0a: Female Board Representation in public firms positively affects Firm Financial Performance

3.2. Critical Mass Theory

Moreover, Critical Mass Theory (CMT) posits that the influence which minorities have within a group (e.g. women directors in boardrooms) only becomes significant once a certain threshold representation of the minority is reached (Kanter, 1977a, b). This threshold is commonly referred to as the *critical mass*. This theory, which originates from Kanter's (1977a, b) research on women in corporations, posits that women, as a minority, do not influence firm outcomes significantly. Instead, the critical mass, commonly quantified by scholars in the field as three women directors, or a 30% female representation (e.g. Konrad, Kramer, and Erkut, 2008; Joecks, Pull, and Vetter, 2012; Torchia, Calabrò, and Huse, 2011), is required to see women's influence fully materialise, affecting board dynamics and firm performance (Torchia, et al., 2011).

Additionally, CMT elucidates the concept of tokenism, which takes place in so-called *skewed groups* where female representation is below 20% (Kanter, 1977a, b). Tokenism states that as a minority, women directors, instead of being viewed based on their professional credentials, are often reduced to their gender, resulting in stereotyping and marginalisation (Joecks et al., 2012), inhibiting open dialogue as women are less likely to speak up (Konrad, et al., 2008). Therefore, women's unique perspectives and skills are often underutilised in male-dominated boardrooms (Kanter, 1977a, b). However, as the relative size of female representation approaches the critical mass, women directors become collectively more influential, helping overcome tokenism.

Ultimately, this allows women directors to contribute to board discussions more effectively, fostering a more diverse and inclusive boardroom environment (Torchia, el al., 2011). As a result, the decision-making capabilities of the board benefit from a broader range of perspectives (Lückerath-Rovers, 2011) while the firm signals its compliance with societal

requirements such as greater inclusivity (Lückerath-Rovers, 2011) to stakeholders, improving firm performance and reputation (Joecks, et al., 2012; Lückerath-Rovers, 2011).

Following Kanter's CMT (1977a, b), the FBR-FFP relationship likely follows a non-linear relationship in the form of a U-shape. Initially, the first few women directors will have a negative impact on firm outcomes, as they are unable to openly discuss topics and bring their unique perspectives and skills to the table, inhibiting the boards' ability to operate more effectively (Konrad, et al., 2008).

However, as the number (or proportion) of female directors approaches the critical mass threshold, this effect is decreasingly negative until the critical mass is met. Here, women are no longer significantly underrepresented, having moved away from the skewed group to a more balanced composition (Kanter, 1977a, b). From this point onwards, women directors can start contributing to board discussions and critical decisions, leading to improved board outcomes, enhancing firm performance, stakeholder engagement, and other firm outcomes such as innovation (Kanter, 1977a, b; Konrad et al., 2008; Joecks, et al., 2012; Torchia, et al., 2011).

Additionally, as the number (or ratio) of women directors reaches a significant share of the board, benefits start to diminish. This is reflected in a decreasingly positive relationship between FBR and FFP, from the critical mass threshold onwards. Consequently, I hypothesise as follows:

H0b: The FBR-FFP relationship in public firms is non-linear and follows a U-shape.

3.3. Resource Dependence Theory

Resource Dependence Theory (RDT) extends beyond the monitoring role, which is emphasised in AT, to highlight the advisory functions of boards, which are particularly relevant in the context of private firms. RDT posits that board members act as crucial links between a firm and its environment by facilitating a connection to external resources which are important for firm performance. These external resources include access to information, communication

channels, support commitments, and organisational legitimacy (Pfeffer and Salancik, 1978). Greater board gender diversity through increased female representation amplifies this linkage mechanism through more diverse perspectives and backgrounds, improving boards' monitoring (Adams and Ferreira, 2009; Adams and Funk, 2010), and advisory functions (Anderson et al., 2011; Ferreira, 2010).

The presence of women directors additionally serves as a legitimacy-enhancing mechanism for organisations in the eyes of stakeholders (e.g. employees) by following social expectations for improved gender equality and by signalling openness to diverse perspectives (Brammer, Millington, and Pavelin, 2007; Hillman, Shropshire, and Cannella, 2007; Singh and Vinnicombe 2004). Hillman et al. (2007) further discuss that conforming with these societal expectations is a critical aspect of firm survival as it improves stakeholder relations, such as reputation (Lückerath-Rovers, 2011) and firm performance (Brammer et al., 2007; Singh, 2007). Furthermore, women directors may also contribute to improved group performance (Kang, Cheng, and Gray, 2007), as more diverse teams exhibit a wider range of perspectives, leading to better decision-making (Lückerath-Rovers, 2011). These enhanced decision-making capabilities result in improved firm performance (Burgess and Tharenou 2002; Singh and Vinnicombe 2004; Carter, et al., 2003).

Thus, I hypothesise that women directors play a crucial role in improving boardrooms' advisory roles, leading to improved firm financial performance in private firms, where the monitoring roles of the board are less important due to less separation between ownership and control.

H1a: Female Board Representation in private firms positively affects Firm Financial Performance.

Moreover, building on RDT as discussed in the context of private firms, the unique governance structures of private firms - characterised by relational governance - may create an environment with fewer barriers to women directors, influencing the relationship between FBR and FFP. In particular, private firms rely on informal social controls (Huse, 1993, Mustakallio, et al., 2002). Relational governance contrasts with the formal contracts, monitoring systems and incentives of public firms (e.g. Fama and Jensen, 1983; Jensen and Meckling, 1976). Specifically, boards of private firms are more focused on advisory and service tasks (Van den Heuvel, 2006), providing women directors with opportunities to influence the firm and enhance performance, driven by their beneficial traits as discussed in the previous section.

Furthermore, it is possible that the less formal and more flexible governance structures - which characterise private firms - may allow for greater inclusivity, reducing the barriers women directors face. In particular, women must not overcome barriers such as gender-based stereotypes and marginalisation, which are present in public firms (Joecks et al., 2012). Rather than inhibiting open dialogue (Konrad et al., 2008), this allows female directors to directly contribute to board discussions, while this is only possible once the critical mass threshold is overcome in public firms (Joecks et al., 2012; Konrad et al., 2008; Torchia et al., 2011).

However, more diverse perspectives can also lead to longer decision-making processes and conflict (Lückerath-Rovers, 2011), potentially counteracting the benefits and adversely affecting firm financial performance (Dwyer, Richard, and Chadwick, 2003) once a certain threshold of female representation is attained.

Given these dynamics I hypothesise that the relationship between FBR and FFP in private firms follows an inverse U-shape. In other words, women directors initially positively influence firm performance. However, there is a limit to these benefits, at which point the adverse effects, as described by Lückerath-Rovers (2011) and Dwyer, et al. (2003) outweigh the beneficial effects of greater female representation, harming firm financial performance.

H1b: The FBR-FFP relationship in private firms has a limit but faces fewer obstacles.

3.4. Agency Theory: Firm Size as a Moderator

Jensen and Meckling (1976) as well as Fama and Jensen (1983) discuss that following AT, larger entities tend to have more dispersed ownership, which complicates the monitoring function of the Board of Directors (BoD), increasing the possibility of managerial opportunism, resulting in higher agency costs. Private firms, on the other hand, are characterised by significantly less separation between ownership and control (Benischke et al., 2023), which according to AT, is the main cause for principal-agent issues and subsequent agency costs.

Therefore, board monitoring capabilities, and thus one of the primary contributions of women directors, are of less importance to the success of private businesses, reducing the need for improving the BoD's monitoring function (AT) and increasing the importance of the advisory functions of board members (RDT).

Hence, I expect a negative moderating effect of firm size on the relationship between FBR and FFP in public firms, while firm size does not moderate the relationship in a private firm context. This would support the notion that AT is indeed not an appropriate framework for these businesses, resulting in the following hypothesis:

H2: Firm Size negatively moderates the FBR-FFP relationship in public firms but not in private firms.

4. Methodology

In this section, I outline the data collection process, variable definitions, and the empirical approach used to investigate the relationship between FBR and FFP.

4.1. Data

The initial sample was retrieved from Orbis[3] and comprises 20,242 private, and 8,532 public Belgian firms in manufacturing sectors[4] from 2014-2021. The unbalanced panel data set contains firm-financial information, such as Return on Equity and Total Assets. Due to data availability limitations regarding board composition, I will manually collect the information on the board of directors for both public and private firms. To ensure feasibility, this manual data-collection component requires a significantly smaller, final sample size. Therefore, I want to ensure that those firms which are included contain sufficient information for all included years, and all key measures (e.g. Return on Equity and Total Assets). Thus, I excluded all firms with less than two non-consecutive observations throughout the investigated time-period.

This led to an additional 5,139 private and 665 public firms to be excluded from the sample due to missing observations, resulting in 11,459 private, and 7,876 public firms. Finally, I took a random sample of 150 private and 150 public firms to keep data collection feasible. I used Excel's "rand()" function to assign random values between 0 and 1 to each firm. These values are independently distributed, meaning that one does not affect the other (Corporate Finance Institute, n.d.). I then sorted the firms from largest to smallest rand value and included the top 150 private and 150 public firms after sorting, ultimately resulting in a total combined sample of 300 private and public firms.

The directors' names[5] are collected from the firms' annual reports which I retrieved from the Belgian National Bank's archive (Belgian National Bank, n.d.). Since the annual

[3] Orbis is one of the largest databases on private firms (Bureau van Dijk, n.d.)

[4] See Appendix A, Table A1 for an overview of all included sub-sectors.

[5] Auditors were excluded from this as their primary focus is financial oversight and compliance rather than participation in the governance and strategic decision making of the firm.

reports do not contain information on the gender of directors, I will employ three name-gender lists[6]. These lists are used to infer a director's gender based on their first name[7].

In case of gender-neutral names[8], I assign male gender due to the prevalence of men in boardrooms, which implies that the likelihood of a director to be male, rather than female, is significantly higher[9].

4.2. Variables

Table 1 provides an overview of key variables used throughout this analysis. The use of dependent variables in the field, especially concerning a firm's performance, varies significantly in extant literature but can be categorised into two main strands.

First, accounting-based firm performance measures (e.g. Ahern and Dittmar, 2012; Rose, 2007; Campbell and Mínguez-Vera, 2007) and second, market-based firm performance measures (e.g. Lückerath-Rovers, 2011; Adams and Ferreira, 2009). The most used measures for each camp are "*Return on Equity*" (*RoE*), or *"Return on Assets"* (*RoA*) and *Tobin's Q*. While Tobin's Q is one of the most used outcome variables, it is a market-based performance measure which is not applicable to private firms due to the lack of a market valuation of assets. Therefore, to ensure comparability with other papers in this field, I employed the most used accounting-based firm-performance measure in the field, RoE[10] (e.g. Lückerath-Rovers, 2011), which is defined as net income divided by shareholder's equity.

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[6] The lists comprise of 95,035, 121,558, and 19,730 name-gender combinations, respectively.

[7] The gender-name lists classify names by likelihood of being either male or female. If a name's gender is not clear, but it still shows a tendency towards either male or female, gender will be assigned accordingly.

[8] of which there are 143, 131, and 0 across the three lists respectively,

[9] However, out of the 274 gender neutral names which I assumed to be male, none were used for the cross-referencing process.

[10] The RoE data was retrieved from Orbis (Bureau van Dijk, n.d.).

Similarly, the independent variables, or gender diversity measures, can vary significantly. However, most papers use the women ratio (e.g. Ahern and Dittmar, 2012; Lückerath-Rovers, 2011) or the Blau Index (e.g. Miller and Del Carmen Triana, 2009; He and Huang, 2011). As my focus is on the impact of women directors, I will use the women ratio as my main independent variable. The women ratio (WR) is defined as the number of women directors (WD) divided by the board size. To improve interpretability, I multiplied WR by a factor of 100 to obtain a percentage, resulting in a new FBR measure called *female representation* (FR).

Additionally, I employed control variables in accordance with extant literature, given that I could obtain the necessary data. First, firm size (*FSIZE)* proxied by a firm's total assets[11] (e.g. Ahern and Dittmar, 2012. Second, board size (*BSIZE*) (e.g. Adams and Ferreira, 2009; Joecks et al., 2012), which I manually computed and lastly, time fixed effects are included to control for temporal trends (e.g. Adams and Ferreira, 2009; Ahern and Dittmar, 2012; Joecks et al., 2012).

Table 1: Variable Overview

	Full Name	Variable Name	Definition/Measure	Source
Dependent Variable	Firm Performance (Return on Equity)	ROE	$\frac{net\ income}{shareholder\ equity}$	Orbis
Independent Variables	FBR (Representation, %)	FR	$\frac{number\ women\ directors}{0.01\ x\ board\ size}$	Manual, NBB
	Firm Type	PUBLIC	= 1 if public, =0 if private	Computed
Control Variables	Total Assets	FSIZE	The total assets of a firm	Orbis
	Log of Total Assets	ln_FSIZE	Natural logarithm of TA	Computed
	Board Size	BSIZE	The total number of directors on the board	Computed
	Year Dummies	year	Year	Computed

[11] The Firm Size measure was retrieved from Orbis (Bureau van Dijk, n.d.).

4.3. Empirical Approach

To investigate the FBR-FFP relationship, I will employ different estimation methods, as well as models and variables to ensure robustness of my findings. Specifically, for each hypothesis, I will run three separate models, (1) through (3), which are all slight variations of the same model to allow for comparison between findings to ensure reliability. First, in model (1), I will employ Ordinary Least Squares (OLS). This is an estimation method that investigates the relationship between one or more explanatory variables and the dependent variable by minimising the sum of squares between the observed and predicted values of the dependent variable (Wooldridge, 2010).

Additionally, in models (2) and (3), I will use additional estimation methods, which are more robust, allowing me to compare the estimated coefficients from model (1). Specifically, I will employ Fixed and Random Effects estimation. On the one hand, fixed effects (FE) estimation removes any variation between firms, only looking at the within variation in firms to estimate the relationship in question (Wooldridge, 2010). FE estimators are valid if the explanatory variable(s) are correlated with the unobservable firm-specific effects. On the other hand, random effects (RE) estimation utilises both within and between variations. It does, however, require the assumption of strict exogeneity. Specifically, the explanatory variable(s) are uncorrelated with the unobserved firm-specific effects in *all* periods (Wooldridge, 2010).

The decision between random, and fixed effects is made using the Hausmann test, which compares the quality of coefficients of both estimators and determines which is approach more efficient; If the H0 (e.g. no significant difference between RE and FE) is rejected (i.e. there is a significant difference), then FE is preferred (Wooldridge, 2010). It is, however, important to keep in mind the limitations of both approaches. While RE is based on stronger assumptions, which are difficult to substantiate, FE only looks at the within variation in firms. This becomes problematic, when there is (too) little variation of my female representation

measure within firms, potentially leading to inaccurate estimates. Model (2) will always be the fixed effects model, while (3) will always be the random effects model. Below the outputs, "Hausman Preference" will indicate which estimator is theoretically preferred, using an "X".

Moreover, the full-sample analysis of **H2** will not include a FE regression since the time invariant *public* variable is automatically omitted using FE. Therefore, this model would not accurately reflect differences of the moderation effect of firm size for each governance type separately. Overall, due to the limitations of both FE and RE estimations, I will rely on the OLS model (1) if findings are inconsistent across models.

Moreover, if the summary statistics provide evidence for the presence of significant outliers in the data, I will run additional regressions, which aim to account for these outliers. Specifically, the ROE variable would be transformed using arcsine transformation[12]. Ultimately, the resulting *as_ROE* variable will allow me to investigate the relationship again with data now being less sensitive to extreme values.

Furthermore, depending on the hypothesis, and therefore the respective model, I will employ different variations of variables. First, for all regressions, *FSIZE*, will undergo a natural logarithmic transformation (*ln_FSIZE)* due to its magnitude. This will allow for a better regression-fit between these variables and those of significantly smaller magnitude such as *FR*. Moreover, this approach can help normalise the distribution, which is a required assumption for my statistical estimation methods. This transformation also helps stabilise the variance, and mitigates the effect of outlier values, which might otherwise have skewed the relationship (Wooldridge, 2010). Additionally, for **H0b** and **H1b**, I will employ quadratic FBR-measures

[12] The results of this are like a natural logarithmic transformation, except that arcsine transformation can handle negative values, whereas an ln-transformation could not compute these values, which would likely affect outcomes (Adams and Ferreira, 2009).

to allow for a non-linear relationship between gender diversity and firm financial performance (e.g. Joecks et al, 2012).

Moreover, I will include lagged variables in my models to mitigate omitted variable bias (OVB), which occurs when one or more variables which affect both FFP and FBR, are omitted from the regression. In this case, the effects of changes in FBR are unlikely to show immediately since the impact of women directors needs time to materialise (Liu, Wei, & Xie, 2014). Thus, I will include a lagged-FBR measure to mitigate potential endogeneity issues (Liu, Wei, & Xie, 2014).[13]

Lastly, to ensure reliable regression estimates, I address some robustness concerns before the analysis. First, I test for multicollinearity[14] using a correlation matrix[15], which did not provide evidence in favour of considerable multicollinearity, indicating that it should not pose issues to the analysis. Second, to mitigate the adverse effects of potential heteroscedasticity[16] and autocorrelation[17], I cluster all regressions by firms.[18]

5. Results

This section presents the findings from the summary statistics of the variables as well as the results from the regression analyses.

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[13] See Appendix B for an overview of the regression models for each hypothesis.

[14] Multicollinearity refers to the correlation between explanatory variables (Wooldridge, 2010)

[15] Consult Appendix C, Table C1

[16] Heteroscedasticity occurs when the variance of error terms varies across observations, violating the assumption of constant variance.

[17] Autocorrelation, on the other hand, arises when error terms are correlated across time periods

[18] For a more detailed section on these concerns, please refer to Appendix C.

5.1. Summary Statistics

To provide a comprehensive overview of the representation of women in the boardrooms of manufacturing firms in Belgium, I present the summary statistics for both public and private firms combined, and then separately for public and private firms. Finally, I will compare firms with at least one women director with those without any female representation to determine whether they differ in characteristics[19].

Table 2 represents the summary statistics for the entire dataset, which includes both public and private firms, as well as a detailed summary for public and private firms separately. The average *ROE* across all firms is 17.2% with a standard deviation of 77.5, which indicates substantial variability in firm profitability across the dataset. The minimum value of *ROE* is -961.7% and the maximum is 776%, and while these values are extreme, the mean of 17.2% implies that these values are merely outliers. To ensure that these outliers do not significantly alter outcomes, I will run a robustness-check where they are controlled for, using the arcsine transformed *ROE* measure *as_ROE*.

Moreover, when comparing public and private firms, public firms have an average *ROE* of 11.3%, which is lower than the overall average, and a standard deviation of 61.8. In contrast, private firms present a significantly higher *ROE* of 23.8%, with a standard deviation of 91.3, suggesting higher profitability but also considerably more variability compared to public firms.

[19] All summaries include the key variables of interest: Return on Equity (*ROE*), Female Representation (*FR*), Board Size (*BSIZE*), as well as Firm Size (*FSIZE*) and present the number of observations, mean, standard deviation, along with the variables' respective minima and maxima values.

The female representation (*FR*) in the overall dataset averages 23.1%, with a standard deviation of 31.1. Public firms have a higher average of 26.1% female representation, while private firms have a lower average of 19.8%.

Board size (*BSIZE*) shows an overall mean board size of about 2.3 board members. Public firms, on average, have a larger boardsize with about 3.1 board members and minimum board size of one board member to a maximum value of 14 members. On average, private firms have a significantly smaller board size of about 1.4 members with a minimum of 1 board member and a maximum of 4 board members.

Finally, public firms are significantly larger in size, as measured by total assets, compared to private firms. Specifically, public firms exhibit an average of 39 million Euro in total assets, while private firms have an average of only 782 thousand Euro in total assets.

Overall, private firms exhibit a significantly higher mean Return on Equity compared to public firms, while public firms, on average, present slightly higher female representation in boardrooms and considerably larger firm sizes, supporting the inclusion of a firm size control.

Table 2: *Summary Statistics*

	N	Mean	Std. Dev.	min	max
Public and Private Firms					
Return on Equity	2157	17.22	77.45	-961.65	775.96
Female Representation	2267	23.07	31.11	0	100
Board Size	2267	2.3	1.55	1	14
Firm Size (thousands)	2270	20547.43	107670.21	0.21	1925422
Public Firms					
Return on Equity	1135	11.31	61.83	-961.65	775.96
Female Representation	1169	26.11	28.09	0	100
Board Size	1169	3.12	1.70	1	14
Firm Size (thousands)	1171	39096.68	147545.46	35.76	1925422
Private Firms					
Return on Equity	1022	23.79	91.32	-937.13	714.14
Female Representation	1098	19.84	33.74	0	100
Board Size	1098	1.42	0.62	1	4
Firm Size (thousands)	1099	782.94	1170.58	.21	12650.41

5.2. Are firms with female representation different?

To further delve into the impact that women directors have on firm characteristics, I also compare firms with at least one female director to those without any female representation, drawing on information from Table 3. Due to the nature of this comparison, all gender diversity related measures are omitted as they do not apply to firms without any women on the board.

In the full sample of both public and private firms, those with female representation present a mean RoE of 15%, while those without perform slightly better with an average RoE of about 19%. The detailed samples for public and private firms separately, however, indicate that this effect originates from public firms, which exhibit an average RoE of 14% in firms without female representation compared to 9% in those with at least one woman on the board, indicating a 55% higher average RoE in public firms without women directors. In private firms, on the other hand, this effect is reversed, as firms with female representation present an average RoE of 27%, while those without only have an average RoE of 22%. This indicates that the effect which women directors have on firm performance might differ across differing governance types.

Moreover, firms with at least one woman on the board tend to be larger and have bigger boards compared to those without female representation. Specifically, firms with female representation on their boards present significantly larger firm sizes. However, upon closer inspection, table 4 shows that this is only true for public firms, where those firms with female representation exhibit an average firm size which is about 61% larger than those firms without (47 million Euro compared to 29 million Euro). In private firms, the difference is significantly smaller and in the opposite direction, such that firms without female representation are, on average, 13% larger (812 thousand Euro compared to 715). Additionally, board size is, on average, larger in firms with female representation in boardrooms, which is consistent across both public and private firms combined as well as independently.

Table 3*: Summary Statistics – Are firms with women different?*

	at least one woman					no women				
	N	Mean	Std. Dev.	min	max	N	Mean	Std. Dev.	min	max
Public and Private Firms										
Return on Equity	944	15.02	71.20	-961.65	573.7	1213	18.94	81.97	-937.13	775.96
Female Representation	978	53.48	24.83	10	100					
Board Size	978	2.87	1.69	1	14	1289	1.87	1.27	1	10
Firm Size (thousands)	992	31416.98	149260.92	0.25	1925422	1278	12110.34	56091.31	.21	630895.83
Public Firms										
Return on Equity	638	9.16	59.63	-961.65	354.35	497	14.07	64.49	-371.45	775.96
Female Representation	654	46.66	21.23	10	100					
Board Size	654	3.4	1.79	1	14	515	2.77	1.52	1	10
Firm Size (thousands)	660	46861.01	181074.69	35.76	1925422	511	29068.38	86000.54	174.38	630895.83
Private Firms										
Return on Equity	306	27.23	89.59	-614.38	573.7	716	22.32	92.07	-937.13	714.14
Female Representation	324	67.23	25.88	33.33	100					
Board Size	324	1.78	0.67	1	3	774	1.27	0.54	1	4
Firm Size (thousands)	332	714.99	1369.93	.25	12650.41	767	812.34	1072.53	.21	6636.81

Overall, it appears that private firms with women perform better than those without, while public firms with women perform worse than public firms without. This indicates differing effects depending on the governance type, which supports my argument that there may exist differences between these firm types.

5.3. Regression Findings

According to Hünermund & Louw (2023), the role of control variables in regression analyses should be considered with caution. Specifically, the authors argue that, while control variables are crucial for identifying causal effects of the key variables of interest, their coefficients should not be given a causal interpretation themselves. This is because control variables often represent a combination of various mechanisms and may be endogenous, making their effects difficult to interpret theoretically.

Thus, Hünermund & Louw (2023) advise researchers to not over-interpret control variables to prevent wrongful conclusions. Instead, the clear focus should be set on key variables. This will not only ensure more accurate and reliable interpretation but also prevents misguidance which might otherwise arise. Consequently, my focus will be on the key variables of interest.

Additionally, to be able to interpret the coefficients of **H2**, which includes complex three-way interactions, I follow the approach outlined by (Mitchell, 2021). Specifically, I will create graphs to visualise the relationships by calculating the predictive margins. This enables me to comment on the specific relationships more accurately.

Lastly, for all models which include interactions, such as the non-linearity of the FBR-FFP relationship in **H0b** and **H1b**, or all **H2** regressions, I will report the Prob > chi2 value of the respective tests for join statistical significance (F-test)[20].

5.3.1. H0: FBR and FFP in Public Firm. The results from the regression analyses of **H0a** for public firms are presented in Table 4. They indicate that the coefficient of female representation (FR) is positive across all models (1a) through (3a) but not statistically significant. This suggests that while there might be a positive direction of the relationship between FBR and FFP, the evidence does not support hypothesis **H0a**, rejecting the notion of a statistically significant relationship between FBR and FFP.

Furthermore, as part of **H0b**, models (1b) through (3b) report a statistically insignificant female representation variable, which is now negative across all models. Additionally, the quadratic term of female representation is positive across all three models and statistically insignificant for (1b), while it is significant at the 10% level in models (2b) and (3b), indicating some non-linear effect, following a U-Shape as posited.

This is further supported by the margins plot for all three models (see Appendix D, Graphs D1). The test for joint significance in model (1b) indicates no jointly significant effect of the FR and quadratic FR terms while models (2b) and (3b), suggest that FR and its quadratic term are jointly significant at the 10% level. However, since the main model (1b) does not provide evidence for a non-linear relationship in the FBR-FFP relationship in public firms, **H0b** is also rejected.

[20] A Prob > chi2 value of 0.1 implies joint significance at the 10% level, a value below 0.05 implies 5%, and below 0.01 implies a 1% significance level.

Table 4: *H0: Board Gender Diversity and Firm Performance in Public Firms*

VARIABLES	(1a) RoE	(2a) RoE	(3a) RoE	(1b) RoE	(2b) RoE	(3b) RoE
Female Representation	0.100	0.125	0.141	-0.126	-0.295	-0.186
	(0.125)	(0.164)	(0.125)	(0.268)	(0.326)	(0.253)
Quadratic Female Representation				0.00319	0.00636*	0.00481*
				(0.00317)	(0.00363)	(0.00289)
Board Size	-5.641***	-0.729	-3.599***	-5.305***	0.195	-3.025**
	(1.455)	(1.874)	(1.238)	(1.515)	(1.965)	(1.236)
ln(Firm Size)	2.966**	16.47*	3.450**	3.086**	17.28*	3.666**
	(1.427)	(9.792)	(1.742)	(1.428)	(9.767)	(1.760)
Lagged Female Representation	-0.0596	-0.0643	-0.0795	-0.0689	-0.0746	-0.0982
	(0.135)	(0.141)	(0.119)	(0.137)	(0.139)	(0.122)
Constant	10.48	-117.0	-2.046	10.07	-124.4	-3.448
	(13.79)	(81.28)	(16.57)	(13.74)	(81.03)	(16.57)
Observations	983	983	983	983	983	983
R-squared	0.026	0.015		0.028	0.017	
Prob > chi2				0.41	0.095	0.086
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Sample	Public	Public	Public	Public	Public	Public
Estimation	OLS	FE	RE	OLS	FE	RE
Hausman Preference			X			X
Time FE	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Overall, the findings for **H0** do not support the notion of a statistically significant relationship between FBR and FFP in public firms, though there is some indication of a U-shape.

5.3.2. H1: FBR and FFP in Private Firms. The results from the regression analyses of H1 are presented in Table 5, which shows that the coefficient of FR is positive in models (1a) through (3a) but statistically insignificant across all these models. This suggests that while there might be a positive direction in the relationship between FBR and FFP in private firms, the analysis does not support hypothesis H1a, failing to provide evidence for a statistically significant impact of FBR on FFP in private firms.

For **H1b**, models (1b) through (3b) also show statistically insignificant female representation estimates, which are positive across all three models. The quadratic term of FR is negative across all three models and statistically insignificant. This supports the idea of an inversely U-shaped relationship in the FBR-FFP relationship in private firms, which is in line with the expected limit to the benefits of more female representation. This is further supported by the predictive margins graphs for all three models (see Appendix D, Graphs D2). However, models (1b) through (3b), do not provide sufficient evidence in favour of a non-linear relationship between FBR and FFP in private firms. Therefore, **H1b** is also rejected.

Overall, the findings of **H1** do not provide any evidence of a statistically significant relationship between FBR and FFP in private firms, though there is some indication of an inverse U-shape.

Table 5: *H1: Board Gender Diversity and Firm Performance in Private Firms*

VARIABLES	(1a) RoE	(2a) RoE	(3a) RoE	(1b) RoE	(2b) RoE	(3b) RoE
Female Representation	0.865	0.433	0.755	1.290	1.142	1.315
	(0.647)	(0.279)	(0.505)	(1.030)	(1.167)	(0.896)
Quadratic Female Representation				-0.00449	-0.00721	-0.00584
				(0.00796)	(0.0109)	(0.00708)
Board Size	8.041	-18.26*	3.308	4.309	-24.31**	-1.646
	(8.820)	(9.263)	(7.749)	(14.52)	(11.05)	(12.74)
ln(Firm Size)	5.954	10.52	4.301	5.883	11.56	4.320
	(4.160)	(10.91)	(4.495)	(4.183)	(11.55)	(4.486)
Lagged Female Representation	-0.876	-1.147	-0.852	-0.894	-1.165	-0.878*
	(0.587)	(0.724)	(0.526)	(0.588)	(0.721)	(0.531)
Constant	-21.64	4.687	-1.542	-17.06	4.375	3.676
	(27.49)	(73.81)	(29.00)	(31.44)	(73.33)	(31.33)
Observations	875	875	875	875	875	875
R-squared	0.021	0.025		0.023	0.025	
Prob > chi2				0.371	0.295	0.269
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Sample	Private	Private	Private	Private	Private	Private
Estimation	OLS	FE	RE	OLS	FE	RE
Hausman Preference		X			X	
Time FE	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.3.3. H2: Firm Size as a Moderator in Public Firms. The results from the regression analyses for **H2** are presented in Table 6. Models (1) and (2) include the full sample with the three-way interaction term between public, firm size, and female representation, while models (1a) through (3a) and (1b) through (3b) are for the split sample of public and private firms, respectively.

The test for joint significance of models (1) and (2) reports that there is a jointly significant effect of the interaction terms of firm size on the FBR-FFP relationship. To interpret these complex interactions, I use margins graphs as well as predictive margins, as outlined by Mitchell (2021).

First, the margins plots of models (1) and (2) indicate that for private firms (i.e. public=0), smaller firm size is associated with a more negative relationship between FBR and FFP and vice versa. For public firms, the effect on the FBR-FFP relationship is negative for larger firms and positive for smaller firms (see Appendix D, Graphs D3).

Moreover, the predictive margins[21] for model (1), returned statistically significant marginal effects of 27.3 for private and 10.0 for private firms[22]. Thus, these findings provide evidence of a statistically significant moderating effect of firm size on the FBR-FFP relationship for both public and private firms, while the effect is significantly more positive in private firms[23].

For model (2), the predictive margin for private firms remained almost identical[24]. However, the margin for public firms has decreased to 6.74 from 10.0 in model (1) and is now statistically insignificant. Therefore, the second model provides evidence for the moderating

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[21] The predictive margins for model (1) and (2) are calculated using the mean values of the female representation (23%) and logarithmic firm size (7) variables.

[22] Significant at the 1% significance level.

[23] Predictive margins of 27 for private firms compared to 10 for public firms.

[24] Predictive margins of 26 compared to 27.3 in the first model, now significant at the 1% significance level.

effect of firm size on the FBR-FFP relationship in private firms but rejects this relationship in public firms. Due to the strong assumptions of the random effects estimation (2), however, I prefer model (1), which partially supports **H2**. Specifically, while there is some evidence of a moderating effect of firm size in public firms, which is in line with the hypothesis, firm size also appears to act as a moderator in the FBR-FFP relationship for private firms, which suggests the rejection of **H2.**[25]

The split-sample analyses are reported in models (1a) through (3a) for public, and (1b) through (3b) for private firms. In the public firm sample, the interaction term of female representation and firm size is statistically insignificant across all three models, while the firm size variable is significant in all three models[26]. The F-tests provide evidence in favour of joint significance of the moderation of the FBR-FFP relationship by firm size in public firms across models (1a) and (3a)[27].

Due to the statistically significant interaction term, the first part of **H2** concerning the presence of a moderating effect of FSIZE on the FBR-FFP relationship in public firms is supported, in line with the findings of the full sample analysis of **H2**.

In the private firm sample, the interaction of FR and FSIZE is statistically significant in models (2b) and (3b)[28], while it is statistically insignificant in model (1b). The original FSIZE variable is statistically insignificant across all three models. The joint significance test indicates that only models (2b) and (3b) show joint significance[29], while the preferred model (1b) remains insignificant. This further supports **H2**, as the findings provide no evidence of a statistically significant moderation effect of firm size in private firms.

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[25] Consult Appendix D, Table D3 for a detailed table of the predictive margins.
[26] Significant at the 5%, 10%, and 5% levels respectively for models (1a) through (3a).
[27] Significance at the 10% level.
[28] Significance at the 10% level.
[29] Significance at the 10% level.

Table 6: *H2: Firm Size Moderation*

VARIABLES	(1) RoE	(2) RoE	(1a) RoE	(2a) RoE	(3a) RoE	(1b) RoE	(2b) RoE	(3b) RoE
Female Representation	-0.891	-1.408	0.592	0.663	0.616	-0.355	-3.265	-0.754
	(0.693)	(0.929)	(0.385)	(0.844)	(0.478)	(0.687)	(2.197)	(0.714)
public/private dummy = 1	-14.06	-48.72						
	(34.95)	(40.93)						
Public(1) * FR	1.707**	2.308**						
	(0.866)	(1.119)						
ln(Firm Size)	3.378	-0.0579	4.408**	18.32*	4.879**	2.919	5.308	0.466
	(5.104)	(5.968)	(1.942)	(10.54)	(2.284)	(4.939)	(11.12)	(5.489)
FR * ln(Firm Size)	0.219	0.288*	-0.0620	-0.0663	-0.0595	0.189	0.576*	0.239*
	(0.143)	(0.162)	(0.0458)	(0.0974)	(0.0555)	(0.139)	(0.335)	(0.140)
Public(1) * FR * ln(Firm Size)	-0.279*	-0.355**						
	(0.153)	(0.174)						
Board Size	-4.310**	-3.592**	-5.837***	-0.721	-3.694***	6.634	-20.40**	1.972
	(1.818)	(1.398)	(1.494)	(1.840)	(1.234)	(9.406)	(10.13)	(8.091)
Lagged Female Representation	-0.343	-0.377*	-0.0861	-0.0698	-0.0989	-0.742	-1.043*	-0.726
	(0.231)	(0.217)	(0.139)	(0.144)	(0.129)	(0.533)	(0.620)	(0.483)
Constant	12.52	36.61	-0.386	-132.7	-13.34	-1.252	45.02	23.57
	(30.74)	(36.50)	(16.29)	(88.20)	(20.28)	(34.35)	(77.95)	(36.70)
Observations	1,858	1,858	983	983	983	875	875	875
R-squared	0.027		0.028	0.016		0.029	0.039	
Prob > chi2	0.080	0.0541	0.076	0.224	0.094	0.127	0.065	0.092
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Sample	Full	Full	Public	Public	Public	Private	Private	Private
Estimation	OLS	RE	OLS	FE	RE	OLS	FE	RE
Hausman Preference		X			X		X	
Time FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Thus, the split sample analyses support **H2** such that the moderation is found in public but not private firms. However, since the full sample analysis benefits from a larger sample size, it is the preferred analysis, providing evidence of statistical significance of the moderation of firm size on the FBR-FFP relationship across both governance types.

5.3.4. Summary of Results. Overall, the regression analyses for **H0** indicate no statistically significant relationship between FBR and FFP in public manufacturing firms. Furthermore, as the quadratic term of the female representation variable shows mixed results but is insignificant in the main model (1b), the analysis also provides no evidence of a statistically significant non-linear FBR-FFP relationship. For **H1**, the results similarly show a statistically insignificant linear and non-linear relationship between FBR and FFP in private firms. Therefore, both **H0** and **H1** are rejected. The interaction analysis of **H2** provides mixed findings but generally suggests that there may be a moderating effect of firm size on the FBR-FFP relationship for public firms, which is also present in private firms, leading to the rejection of **H2**.[30]

6. Discussion

This section discusses the key findings from the analysis of Female Board Representation (FBR) on Firm Financial Performance (FFP) along with the study's contributions and limitations, finishing on the paper's conclusion.

[30] These findings are in line with the robustness test regressions (consult Appendix E for a detailed section on the robustness of the results).

6.1. Summary of Key Findings

This study examined the relationship between Female Board Representation and Firm Financial Performance in Belgian manufacturing firms, differentiating between public and private firms. These findings do not indicate any relationship between Female Board Representation and Firm Financial Performance in both public and private Belgian manufacturing firms. However, there was some indication of a U-shaped relationship in public firms, and an inverse U-shape in private firms, although these were not statistically significant. The moderation analysis provided mixed but generally supportive evidence that firm size moderates the FBR-FFP relationship in both public firms and private firms.

6.2. Interpretation of Results

6.2.1. Public Firms (H0). In my initial hypothesis, **H0**, I predicted a positive relationship between FBR and FFP in public firms based on Agency Theory (AT). AT posits that women directors can enhance monitoring and reduce agency costs, consequently improving firm performance. This suggests that women on boards can improve governance by bringing in different perspectives and by enhancing the board's monitoring capabilities, helping reduce managerial opportunism (Adams and Ferreira, 2009; Kirsch, 2018; Byron and Post, 2015).

However, my findings did not support hypothesis **H0a**, showing a statistically insignificant linear relationship between FBR and FFP in public firms. Similarly, the non-linear relationship was also found to be statistically insignificant. However, there was some indication that this relationship may be non-linearly U-shaped in public firms, as posited, but due to the statistical insignificance, the presence of a non-linear relationship between FBR and FFP is not confirmed, leading to the rejection of **H0b**. Thus, in line with other European studies (e.g. Rose,

2007; Marinova, Plantenga, & Remery, 2015), I reject the hypothesis **H0**, which posits a statistically significant relationship between FBR and FFP in public firms.

A possible explanation for this discrepancy between theory and findings could be that public firms in the Belgian manufacturing sector have not met the needed critical mass threshold to experience the influence of women directors on firm performance. This would align with the findings of Konrad, Kramer, and Erkut (2008), who suggested that the presence of a critical mass of female directors in boardrooms is required to leverage the benefits of diversity. Upon inspection, the summary statistics for public firms (see Table 2), present that the mean female representation rate in public firms is around 26%, which lies within the often cited 20% (e.g. Nguyen, Locke, & Reddy, 2015) to 30% critical mass threshold (e.g. Arvanitis, Varouchas, & Agiomirgianakis, 2022). Following CMT, this would indicate that the effect is only beginning to become positive but likely still mostly flat, which is confirmed by the predictive margins graphs for models (1b) through (3b), as they present a mostly flat slope around the 26% female representation level, which could be a possible reason for the insignificant findings. However, due to the insignificance of the coefficients, there exists uncertainty around the reliability of this argument, implying that it may not be valid.

Another potential reason for the insignificance of **H0** is my limited sample size of only 150 public firms. Smaller samples can lead to reduced statistical power, complicating the detection of significant relationships (Wooldridge, 2010). This is particularly important in the field of corporate governance, where there exists a range of variations in firm characteristics and external factors which can further complicate the detection of significant effects. This underlines the call of extant literature for larger sample sizes to more robust and accurate results.

Moreover, omitted variable bias (OVB) might be another reason for the insignificance of **H0**. OVB occurs when important variables that influence firm performance are not included

in the models, resulting in biassed estimates of the relationship (Wooldridge, 2010). Such factors may include other board characteristics such as director tenure, or age (Hillman, et al., 2007), highlighting the importance of considering a wide set of control variables to more accurately capture causal relationships. Therefore, the lack of a broader range of control variables may have skewed findings, potentially resulting in an insignificant relationship between FBR and FFP.

Lastly, according to Rose (2007), another reason may be that the only way for women to be taken seriously and considered for high-tier positions - such as being on the board of directors - is to adapt to the behaviour and norms of the "old boys clubs". This would lead to the benefits of women directors not materialising, resulting in an insignificant relationship between FBR and FFP. This argument is further underlined by the potential presence of context-specific challenges in the Belgian manufacturing sector, which may include more resilient "old boys clubs".

6.2.2. Private Firms (H1). I posited a positive relationship between FBR and FFP in a private firm context. Specifically, as there exists significantly less separation between ownership and control in private firms (Benischke et al. 2023), the importance of the monitoring role of board members (AT) becomes less critical, while the advisory role (RDT) becomes more crucial.

Contrary to this, the findings of **H1a** suggest that there is no statistically significant relationship between FBR and FFP in private firms. Moreover, the indication of an inversely U-shaped relationship, though it is not statistically significant, aligns my hypothesis. In particular, there may exist fewer obstacles for women directors, due to the unique governance mechanisms and characteristics in private firms. This results in an immediate positive impact of greater female representation through greater diversity, aligning with RDT, which posits that

diverse boards bring valuable resources and perspectives (Anderson et al., 2011; Ferreira, 2010; Pfeffer and Salancik, 1978).

Compared to public firms, the predictive margins plots of the private firm sample show that at the average female representation of 20%, the slope is very steep and positive but diminishing (1b), increasingly negative (2b) as well as positive but approaching the turning point (3b), while they are also statistically insignificant.

There are several possible reasons for this. First, as outlined by Arvanitis (2022), Social Psychology Theory (SPT) and Social Identity Theory (SIT) oppose RDT. Specifically, Arvanitis (2022) discuss that greater diversity does not necessarily result in improved board performance (Carter, Simkins, & Simpson, 2003), as it may lead to increased conflicts of interest on the board (Goodstein et al. 1994).

This would imply that the unique resources and advisory capabilities, which women directors bring to boardrooms, are undermined by other subsequent inefficiencies. Here, SPT suggests that improved diversity could negatively influence the boardrooms' effectiveness (Arvanitis, et al., 2022), which is supported by Campbell and Minguez-Vera (2007), who find that increased FBR adversely affects a board's decision-making processes.

Additionally, SIT theorises that increased board diversity adversely affects firm performance since people tend to group with others who have similar attributes, such as age or gender. This can lead to several conflicts between these groupings, such as sub-optimal cooperation or miscommunication (Arvanitis, et al., 2022; Tajfel, 1978). Thus, as gender diversity in the board increases, these conflicts grow, ultimately harming a board's decision-making process, resulting in worse firm performance. This may result in an insignificant FBR-FFP relationship if the adverse effects of SPT and SIT offset any beneficial effects of increased female board representation as proposed by RDT.

Uhlaner, Wright, and Huse (2007) discuss another possible reason which offers a significantly different perspective. The argument is based on Hessels and Hooge (2006), who found that only three percent of Dutch firms between 1 and 99 employees and 33% of larger firms (between 50 and 99 employees) have Boards of Directors (BoDs). Therefore, Uhlaner et al. (2007) argue that (smaller) private firms do not have any formal BoDs, and that even if they do, these boards contribute minimally. A lack of BoDs in private firms would therefore explain the insignificant results since the hypothesised mechanisms, which are based on a firm's directors, would not be applicable to firms without a formal board of directors.

Other possible reasons for these findings, like the explanations of **H0**, include the limited sample size of 150 private firms only, potential OVB due to a lack of control variables, as well as industry-specific contextual factors, which may skew findings, leading to the statistically insignificant relationship between FBR and FFP.

6.2.3. Moderation of Firm Size (H2). The moderation analysis of **H2** revealed that firm size moderates the FBR-FFP relationship in both public and private firms**.**

In the public firm context, this follows AT, which discusses issues related to the separation between ownership and control (Jensen and Meckling, 1976), suggesting that increased firm size should lead to greater principal agent frictions in public firms. This implies that firm size should be a moderator in the FBR-FFP relationship of public firms, which is confirmed by the results. In particular, larger public firms experience a more negative relationship between FBR and FFP, which can be explained by greater principal-agent frictions (Jensen and Meckling, 1976), while smaller public firms with less separation between ownership and control stand to gain more from enhanced FBR.

Contrary to public firms, I argued that private firms offer a unique context, which is characterised by significantly less separation between ownership and control (Benischke et al,

2023). Therefore, the moderation effect of firm size should not be significant in private firms, as AT's monitoring function is less crucial, while the advisory role of directors, as posited by RDT might be more applicable in this context. However, the analyses provided evidence that firm size also moderates the relationship between FBR and FFP in private firms, opposing **H2**.

Filatochev and Wright (2005) may offer an explanation for the findings concerning private firms. The authors discuss that throughout their life cycle, private firms evolve such that informal governance is progressively replaced by more formal governance mechanisms, such as BoDs. This is based on Hessels and Hooge's (2006) findings that larger firms are eleven times more likely to have a formal BoD. Therefore, only as firm size increases and firms implement formal BoDs, women directors can exert their beneficial influences on boards and subsequently firm performance, explaining the differing relationship for smaller and larger private firms.

Thus, my analyses suggest that for private firms, despite being characterised by less separation between ownership and control, there is evidence of a moderating effect of firm size on the FBR-FFP relationship. Thus, there is insufficient evidence to conclude that AT mechanisms do not apply to private firms.

6.3. Contributions

This study makes some significant contributions to the field of Corporate Governance, with a focus on Female Board Representation and Firm Financial Performance in a private firm context, within the Belgian manufacturing sector. By examining the differences between public and private firms, this research additionally provides novel insights into the complex dynamics of corporate governance, and its key underlying mechanisms in the unique governance context of private firms.

First, this research fills a gap in extant literature by focusing on private firms, which remain under investigated (Benischke et al., 2023) compared to public firms. By doing so, I provide valuable insights into the domain of private firms, addressing the call for research to include non-listed companies, as well as using more accounting-based performance measures (Marinova, Plantenga, & Remery, 2015).

There is also a need for more research on the underlying mechanisms in CG, especially concerning the FBR-FFP relationship (Marinova et al., 2015). Therefore, theoretical contributions of my paper are significant as this study critically evaluates the applicability of Agency Theory and Resource Dependence Theory in the context of private firms.

Despite my hypothesis that alternative theories to AT may be more relevant in private firms' unique governance context, my paper revealed that there is insufficient evidence to reject the applicability of AT in private firms. However, the analysis also provided no evidence of a relationship between FBR and FFP in both public and private firms, which may put into question the effectiveness of the AT mechanisms to predict firm performance (Uhlaner, et al. 2007). Therefore, with its important insights into this new frontier, my paper can act as a basis for future research in the domain.

Furthermore, the study's concentrated focus allows for targeted practical insights for business owners and policymakers as I provide evidence on the lack of a relationship between FBR and FFP in both public and private Belgian manufacturing firms. This implies that the inclusion of more women directors does not adversely affect firm financial performance, which means that businesses and policymakers can address the significant lack of women directors in boardrooms without fearing to harm firm or board performance.

6.4. Limitations

Despite these contributions, this study is subject to several limitations. First, the need for manual data collection due to a lack of data availability for private firms significantly restricted the scope of board composition to gender alone, excluding any other potentially relevant factors such as tenure or director age (Hillman, et al., 2007). For the same reasons, the sample size was also limited to 300 firms only, with half allotted to each firm type, potentially affecting and limiting the reliability and generalisability of findings.

Third, the study focus is very narrow due to tis focus on the manufacturing sector in Belgium, which limits the generalisability of findings across other contexts. Fourth, potential biases may arise from the use of name-gender inference, which may not always accurately capture the true gender diversity on boards. Additionally, the investigated time frame includes the COVD-19 period. As the unprecedented impact of the pandemic is not controlled for, it may have affected the findings of this paper.

Moreover, there are endogeneity-related concerns, which arise when an explanatory variable is correlated with the error term in the regression model (Wooldridge, 2010). In this study's context, this could occur when there are unobserved factors that influence both female board representation and firm financial performance, such as a company's culture (Adams and Ferreira, 2009). Simultaneity may be another endogeneity-related concern which is present if there exists two-way causation between the explanatory and dependent variables such that the explanatory variable affects the dependent variable, but the dependent variable also affects the explanatory variable (Wooldridge, 2010). Overall, endogeneity can result in biassed and inconsistent estimates, making it difficult to establish a causal relationship between FBR and FFP (Wooldridge, 2010). In future research, this concern could be addressed by employing an

Instrumental Variable (IV) approach, as this can help isolate the exogenous variation in FBR that is not correlated with the error term (Wooldridge, 2010).[31]

These limitations underline the need to cautiously interpret the findings of this paper and highlight the importance of further research on private firms with more comprehensive data, potentially across different sectors and a new geographical focus, such as developing nations, which also remain under investigated (Benischke et al., 2023).

6.5. Conclusion

In conclusion, this study investigated the relationship between Female Board Representation (FBR) and Firm Financial Performance (FFP) in Belgian manufacturing firms, while distinguishing between private and public firms. The analysis addressed two primary concerns: whether FBR impacts FFP in private firms, and whether private firms differ from public firms concerning the mechanisms used to explain the FBR-FFP relationship. The findings indicate that FBR does not have a statistically significant impact on FFP in either firm type. However, the significant moderation effect of firm size on this relationship is found in both governance forms, suggesting that Agency Theory (AT) may be suitable for explaining the FBR-FFP relationship across different governance forms, contrary to my hypothesis.

Yet, these findings challenge the straightforward application of existing theories across differing governance types or industries, suggesting that the impact of gender diversity on firm financial outcomes is much more complex and context dependent. This study highlights the importance of considering industry and firm specific characteristics in corporate governance

[31] Here, it is crucial to choose the IV carefully, ensuring that it is both relevant (correlated with the endogenous explanatory variable) and exogenous (uncorrelated with the error term) (Adams and Ferreira, 2009; Wooldridge, 2010).

research and the critical questioning of relevant key mechanisms. By doing so, it ensures that boardroom diversity is understood in all its nuances, providing crucial practical and policymaking-related insights.

The validity and reliability of these findings are subject to several limitations. The manual data collection process constrained the scope to female representation, excluding other important board characteristics. Moreover, potential biases may arise from the name-gender inference, the COVID-19 pandemic, the limited sample size, and endogeneity-related issues. These limitations highlight the need for cautious interpretation of the results and the importance of further research with more comprehensive data, including a larger sample size and more control variables.

While the direct relationship between FBR and FFP remains statistically insignificant across both firm types, the moderation effect of firm size reveals the complexity of this relationship, warranting further exploration. Future research should consider an Instrumental Variable (IV) approach to address endogeneity concerns, while broadening the scope of the research to other geographical locations and industries. Furthermore, the findings emphasise the importance of careful and context-specific approaches to corporate governance to enhance female representation and its potential impact on firm performance.

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Appendices

Appendix A: Overview of Manufacturing Sub-Sectors

Table A1: *List of included manufacturing sub-sectors*

Orbis Sector Code	Description
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic, and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment
29	Manufacture of motor vehicles, trailers, and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing

Appendix B: Model Overview

My analyses will be conducted based on the following general regression models:

Model B1: Female Board Representation in public/private firms positively affects Firm Financial Performance (**H0a/H1a)**.

$$ROE_{i,t} = \beta_0 + \beta_1 * FR_{i,t} + \beta_2 * controls + \varepsilon_{i,t}$$

Model B2: The FBR-FFP relationship in public firms is non-linear and follows an inverse U-shape (**H0b/H1b**).

$$\mathrm{ROE_{i,t}} = \beta_0 + \beta_1 * \mathrm{FR_{i,t}} + \beta_2 * (\mathrm{FR_{i,t}} * \mathrm{FR_{i,t)}} + \beta_3 * \mathrm{controls} + \varepsilon_{\mathrm{i,t}}$$

Model B3: Firm Size moderates the FBR-FFP relationship in public firms but not in private firms (**H2**).

Full Sample Models:

$$ROE_{i,t} = \beta_0 + \beta_1 * FR_{i,t} + \beta_2 * ln(FSIZE)_{i,t} + \beta_3 * public_{i,t} + \beta_4 * ThreeWayInteractionTerms_{i,t} + \beta_5 * RemainingInteractionTerms_{i,t} + \beta_6 * controls + \varepsilon_{i,t}$$

Split Sample Models:

$$ROE_{i,t} = \beta_0 + \beta_1 * FR_{i,t} + \beta_2 * ln(FSIZE)_{i,t} + \beta_3 * (FR_{i,t} * ln(FSIZE)_{i,t} + \beta_4 * controls + \varepsilon_{i,t}$$

Appendix C: Pre-Analysis Robustness Concerns

Robustness concerns. To ensure reliable regression estimates, there are three core robustness concerns which must be addressed.

Multicollinearity. First, multicollinearity, which refers to the correlation between explanatory variables. While multicollinearity itself is not problematic, high and perfect multicollinearity pose significant challenges in regression analyses (Wooldridge, 2010). For instance, when variables are perfectly collinear, it becomes impossible to distinguish between the unique coefficient estimates of each variable, making the estimation of each individual coefficient unreliable, and leading to increased standard errors. The increased standard errors, in turn, will increase the variance of the estimates, making them less precise. Additionally, the coefficients may become unstable, meaning that a small change in the data could lead to large variations in estimations, also limiting the reliability of the regression model (Wooldridge, 2010). Therefore, to ensure that this does not affect my outcomes, I investigate the correlations between my variables.

As presented in Table C1, the correlation matrices indicate few noteworthy correlations amongst variables, where the highest reported correlation is between the original firm size and ln(*Firm Size*) variables. However, as ln(*Firm Size*) is the main control variable for firm size, both variables will not be used together, preventing potential multicollinearity concerns. Overall, the correlation matrices confirmed that multicollinearity is no concern regarding the reliability and accuracy of this analysis.

Heteroscedasticity and Autocorrelation. The two other key concerns are heteroscedasticity and autocorrelation, which may pose significant issues to my analysis. First,

heteroscedasticity occurs when the variance of error terms varies across observations, violating the assumption of constant variance. This may result in biassed standard errors, which affects the conclusions regarding the significance of variables (Wooldridge, 2010). Specifically, this means that hypothesis tests become unreliable.

Autocorrelation, on the other hand, arises when error terms are correlated across time periods. For instance, if the error term in period zero is correlated to the error term in the previous period, then the assumption of uncorrelated error terms is violated. This can result in underestimated standard errors, which inflates the t-statistics, increasing the possibility of incorrectly rejecting the null hypothesis (Type I error) (Wooldridge, 2010).

To address these issues, I cluster all my regression models by firms. This approach adjusts the standard errors to be robust to heteroscedasticity and autocorrelation within clusters of firms, making the models more reliable, enhancing the validity and accuracy of my statistical findings.

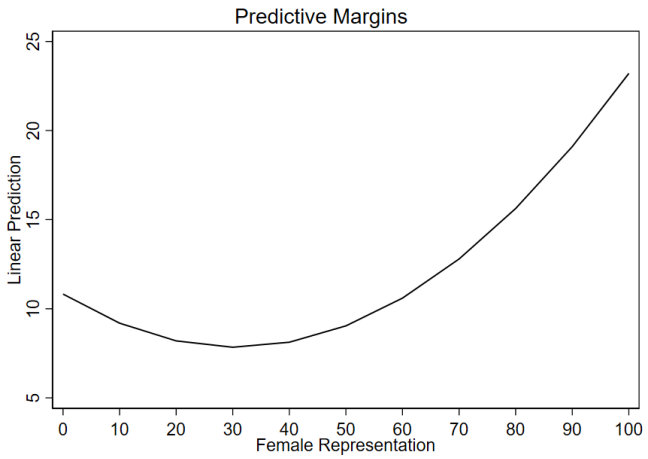
Table C1: *Correlation Matrices*

Variables	(1)	(2)	(3)	(4)	(5)
Public and Private Firms					
(1) Return on Equity	1.00				
(2) Female Representation	-0.00	1.00			
(3) Board Size	-0.09	0.05	1.00		
(4) Firm Size	-0.01	-0.03	0.40	1.00	
(5) ln(Firm Size)	-0.01	-0.07	0.55	0.51	1.00
Public Firms					
(1) Return on Equity	1.00				
(2) Female Representation	0.00	1.00			
(3) Board Size	-0.12	-0.06	1.00		
(4) Firm Size	0.01	-0.07	0.39	1.00	
(5) ln(Firm Size)	0.02	-0.24	0.42	0.59	1.00
Private Firms					
(1) Return on Equity	1.00				
(2) Female Representation	0.01	1.00			
(3) Board Size	0.05	0.13	1.00		
(4) Firm Size	0.03	-0.05	0.07	1.00	
(5) ln(Firm Size)	0.09	-0.07	0.10	0.77	1.00

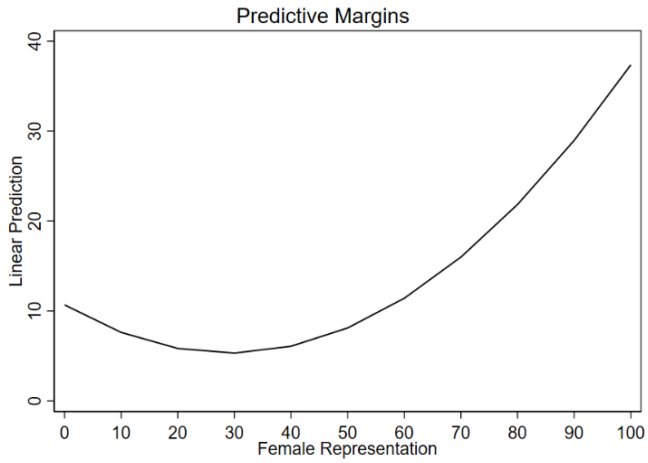
Appendix D: Margins Reports

Graphs D1: *H0b*

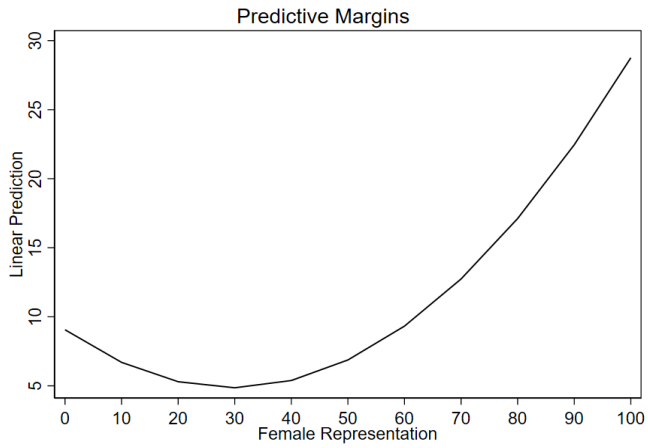
Graph D1.1 (1b)



Graph D1.2 (2b)

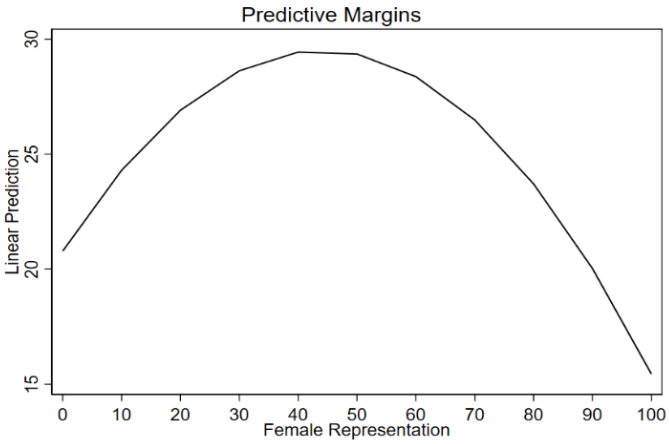


Graph D1.3 (3b)

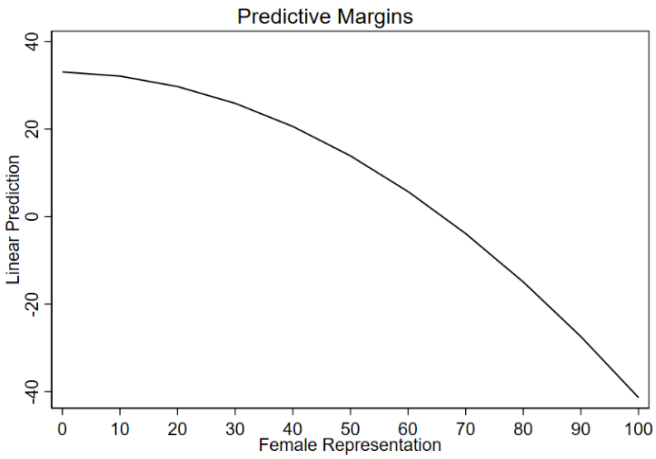


Graphs D2: *H1b*

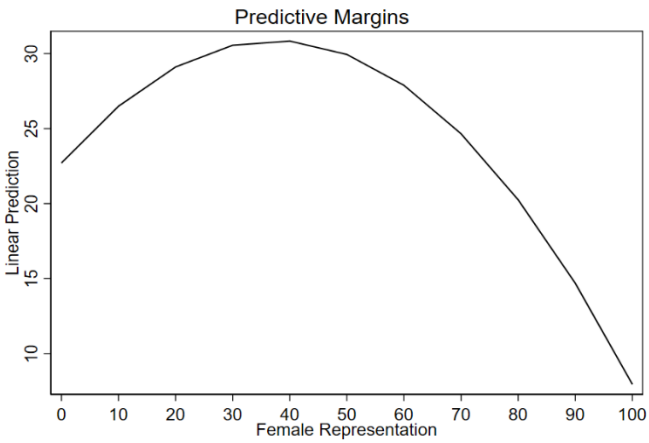
Graph D2.1 (1b)



Graph D2.2 (2b)

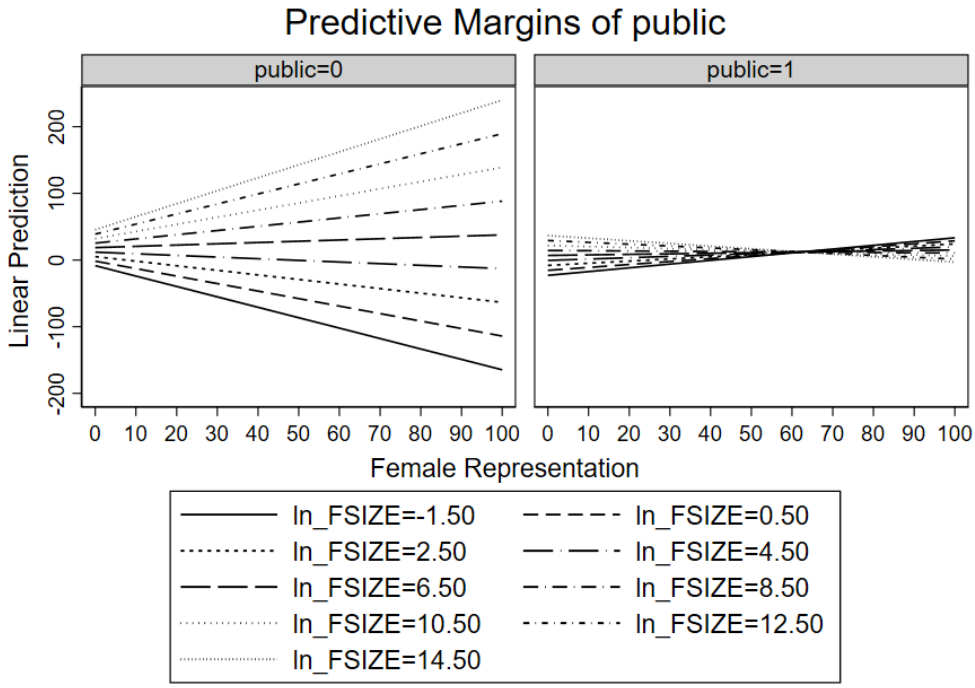


Graph D2.3 (3b)



Graphs D3: ***H2 Three-Way Plots***

Graph D3.1 (1)



Graph D3.2 (2)

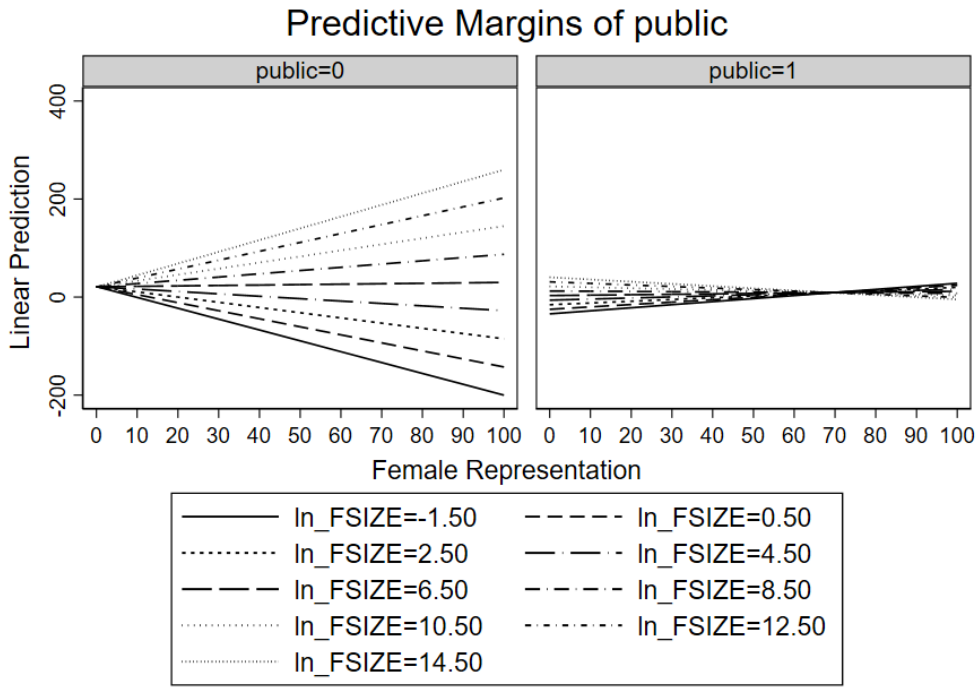


Table D3: *Predictive Margins*

Firm Type	Model	FR value	ln(FSIZE) value	Margin	t-statistic	P > t	95% Conf. Interval	
Private	(1)	23%	7	27.3***	3.41	0.001	11.59	43.07
				(8.016)				
Public	(1)	23%	7	10.02***	2.68	0.008	2.67	17.38
				(3.738)				
Private	(2)	23%	7	26.5***	3.27	0.001	10.59	42.36
				(8.102)				
Public	(2)	23%	7	6.7	1.46	0.143	-2.29	15.77
				(4.606)				

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix E: Robustness

Robustness Regressions. To test the reliability and robustness of my results, I conduct all regressions again with slight changes in the model or data. First, all analyses will be replicated without last year's female representation in the models. This test is advised since the inclusion of the lagged FR term limits observations, potentially affecting outcomes. Then, I will use the transformed RoE variable *as_ROE* as the dependent variable, as the transformation mitigates the effects of significant outliers present in my data (see Table 3) by adjusting the scale of the variables. Finally, I will replicate the original analyses in a balanced sample where all firms with incomplete information were omitted.

Robustness check: Transformation of RoE. For H0a, the RoE transformation to account for outliers has not affected outcomes (see Appendix E, Output E1). Specifically, this robustness test found that there may be a positive correlation between FBR and FFP, but that there is no evidence to support a statistically significant relationship in public firms, aligning with the main regression findings. Moreover, results for H0b remained robust as well, as the analyses provided no evidence of a statistically significant non-linear relationship between FBR and FFP in public firms.

The results of the robustness test of H1 are presented in Appendix E, Output E2. First, the findings of H1a were confirmed as the analyses provided no evidence in support of a statistically significant relationship between FBR and FFP in private firms. Furthermore, the robustness tests confirmed the original findings on H1b, as there is insufficient evidence to conclude that there is a statistically significant, non-linear relationship between FBR and FFP in private firms.

Furthermore, the results of H2 are supported by the robustness test, since the split sample analysis for private firms now also suggests a significant moderation of firm size on the

FBR-FFP relationship in contrast to the split sample of the main regression findings (see Appendix E, Output E3).

Overall, the robustness check of transformed outliers confirms the consistency of the findings of the original analyses for hypotheses **H0**, **H1**, while it consistently suggests that the moderation effect of firm size is present in both public and private firms **H2**.

Robustness check: Exclusion of last year's female representation. The results for the second robustness regression-set of H0a are presented in Appendix E.

The exclusion of last year's female representation as a control variable from the regression models has not affected the outcomes of H0a or H0b (see Appendix E, Output E4), confirming the robustness of the main analyses.

Similarly, the findings of H1a are confirmed (see Appendix E, Output E5), such that there is no statistically significant relationship between FBR and FFP in private firms, while this adjusted analysis also does not provide evidence in favour of a statistically significant, non-linear relationship of the FBR-FFP relationship in private firms (H1b).

Lastly, the robustness check confirmed the findings of the split sample analyses of H2 (see Appendix E, Output E6), while the three-way interaction analysis in model (1) now suggests insignificance of the moderating effect of firm size on the FBR-FFP relationship. The predictive margins, however, still provide evidence in favour of a moderation effect of firm size on both public and private firms, in line with the main regression findings.

Therefore, the analyses excluding last year's female representation confirm the consistency and robustness of the original analyses for all three hypotheses **H0**, **H1**, and **H2**.

Conclusion of robustness analysis. The robustness analysis concluded that my original findings are mostly in line with the adjusted models. The first robustness test revolving around

the transformation of outliers presents one exception in **H2**. Specifically, the main model (1b) for the split sample analysis on private firms now provides evidence in favour of a moderation effect in private firms. This does not pose any issues, however, as the notion of a moderation effect in private firms was also ultimately confirmed in the main analysis. Furthermore, model (1) of the full sample analysis of **H2** in the second robustness test, which excludes last year's female representation, seizes to support a significant moderation effect of firm size on the FBR-FFP relationship. The predictive margins for this model, however, provide evidence in favour of a moderation effect across both firm types (see Appendix E, Table E3), in line with the original findings. Therefore, I can conclude that my findings are robust across differing specifications.

Output E1: *H0 – Transformed RoE*

VARIABLES	(1a) as_ROE	(2a) as_ROE	(3a) as_ROE	(1b) as_ROE	(2b) as_ROE	(3b) as_ROE
Female Representation	0.000371	0.00467	0.00361	-0.00924	-0.0233	-0.0143
	(0.0104)	(0.0101)	(0.00879)	(0.0156)	(0.0204)	(0.0157)
FR * FR				0.000136	0.000424*	0.000264
				(0.000172)	(0.000247)	(0.000170)
Board Size	-0.346***	-0.00781	-0.170**	-0.332***	0.0538	-0.137
	(0.114)	(0.0986)	(0.0838)	(0.115)	(0.105)	(0.0862)
ln(Firm Size)	0.298***	0.599	0.286***	0.303***	0.653*	0.299***
	(0.103)	(0.363)	(0.0994)	(0.103)	(0.350)	(0.0989)
Lagged Female Representation	0.00243	0.00644	0.00281	0.00203	0.00575	0.00186
	(0.0112)	(0.00938)	(0.00819)	(0.0113)	(0.00925)	(0.00822)
Constant	0.447	-3.297	-0.184	0.430	-3.795	-0.280
	(0.918)	(2.928)	(0.933)	(0.913)	(2.827)	(0.921)
Observations	983	983	983	983	983	983
R-squared	0.047	0.019		0.048	0.024	
Prob > chi2				0.733	0.177	0.228
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Sample	Public	Public	Public	Public	Public	Public
Estimation	OLS	FE	RE	OLS	FE	RE
Hausman Preference			X			X
Time FE	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Output E2: *H1 – Transformed RoE*

VARIABLES	(1a) as_ROE	(2a) as_ROE	(3a) as_ROE	(1b) as_ROE	(2b) as_ROE	(3b) as_ROE
Female Representation	0.00608	0.00719	0.00590	0.0164	0.0839*	0.0203
	(0.0160)	(0.0121)	(0.0144)	(0.0256)	(0.0489)	(0.0255)
FR * FR				-0.000109	-0.000781*	-0.000151
				(0.000204)	(0.000425)	(0.000203)
Board Size	0.0697	-0.854*	-0.0178	-0.0206	-1.508***	-0.147
	(0.217)	(0.510)	(0.226)	(0.278)	(0.535)	(0.284)
ln(Firm Size)	0.259**	1.188***	0.272**	0.257**	1.301***	0.271**
	(0.124)	(0.450)	(0.126)	(0.123)	(0.434)	(0.126)
Lagged Female Representation	-0.0112	-0.00666	-0.0112	-0.0117	-0.00857	-0.0119
	(0.0159)	(0.0209)	(0.0150)	(0.0160)	(0.0218)	(0.0152)
Constant	1.017	-3.032	1.154	1.128	-3.066	1.300
	(0.857)	(2.984)	(0.873)	(0.877)	(2.871)	(0.897)
Observations	875	875	875	875	875	875
R-squared	0.018	0.027		0.019	0.032	
Prob > chi2				0.814	0.169	0.720
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Sample	Private	Private	Private	Private	Private	Private
Estimation	OLS	FE	RE	OLS	FE	RE
Hausman Preference		X			X	
Time FE	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Output E3: *H2 – Transformed RoE*

VARIABLES	(1) as_ROE	(2) as_ROE	(1a) as_ROE	(2a) as_ROE	(3a) as_ROE	(1b) as_ROE	(2b) as_ROE	(3b) as_ROE
Female Representation	-0.0295	-0.0404	0.0222	0.0209	0.0166	-0.0194	-0.0661	-0.0252
	(0.0237)	(0.0318)	(0.0283)	(0.0431)	(0.0277)	(0.0256)	(0.0898)	(0.0264)
public/private dummy = 1	-1.943	-2.007						
	(1.376)	(1.483)						
Public(1) * FR	0.0538	0.0626						
	(0.0332)	(0.0397)						
ln(Firm Size)	0.209	0.246	0.362***	0.655*	0.325***	0.195	1.085**	0.193
	(0.142)	(0.170)	(0.131)	(0.390)	(0.121)	(0.140)	(0.480)	(0.144)
FR * ln(Firm Size)	0.00476	0.00666	-0.00276	-0.00200	-0.00162	0.00395	0.0114	0.00490
	(0.00379)	(0.00497)	(0.00326)	(0.00477)	(0.00315)	(0.00361)	(0.0132)	(0.00382)
Public(1) * ln(Firm Size)	0.130	0.0854						
	(0.191)	(0.207)						
Public(1) * FR * ln(Firm Size)	-0.00738	-0.00866						
	(0.00498)	(0.00580)						
Board Size	-0.305***	-0.232***	-0.355***	-0.00756	-0.172**	0.0403	-0.896*	-0.0505
	(0.107)	(0.0837)	(0.115)	(0.0979)	(0.0836)	(0.221)	(0.535)	(0.231)
Lagged Female Representation	-0.00204	-0.00244	0.00125	0.00627	0.00234	-0.00844	-0.00460	-0.00828
	(0.00912)	(0.00782)	(0.0114)	(0.00937)	(0.00835)	(0.0158)	(0.0184)	(0.0150)
Constant	1.881**	1.716	-0.0360	-3.773	-0.500	1.442	-2.233	1.675*
	(0.897)	(1.080)	(1.067)	(3.214)	(1.091)	(0.970)	(3.320)	(0.999)
Observations	1,858	1,858	983	983	983	875	875	875
R-squared	0.046		0.048	0.019		0.021	0.032	
Prob > chi2	0.065	0.034	0.013	0.243	0.012	0.058	0.007	0.037
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Sample	Full	Full	Public	Public	Public	Private	Private	Private
Estimation	OLS	RE	OLS	FE	RE	OLS	FE	RE
Hausman Preference					X		X	
Time FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Output E4: *H0 – Excluding last year's female representation*

VARIABLES	(1a) RoE	(2a) RoE	(3a) RoE	(1b) RoE	(2b) RoE	(3b) RoE
Female Representation	0.0272	0.140	0.0748	-0.239	-0.569*	-0.373
	(0.0979)	(0.162)	(0.0977)	(0.274)	(0.334)	(0.254)
FR * FR				0.00361	0.0106**	0.00629**
				(0.00301)	(0.00487)	(0.00307)
Board Size	-6.028***	-0.808	-4.067***	-5.646***	0.695	-3.325***
	(1.423)	(1.819)	(1.237)	(1.474)	(1.868)	(1.227)
ln(Firm Size)	3.054**	12.82	3.496**	3.196**	14.46*	3.804**
	(1.397)	(9.085)	(1.591)	(1.391)	(8.626)	(1.602)
Constant	11.90	-88.12	-0.653	11.44	-102.9	-2.700
	(15.70)	(73.47)	(15.79)	(15.60)	(69.49)	(15.66)
Observations	1,128	1,128	1,128	1,128	1,128	1,128
R-squared	0.028	0.014		0.030	0.020	
Prob > chi2				0.360	0.084	0.063
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Sample	Public	Public	Public	Public	Public	Public
Estimation	OLS	FE	RE	OLS	FE	RE
Hausman Preference		X				X
Time FE	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Output E5: *H1 – Excluding last year's female representation*

VARIABLES	(1a) RoE	(2a) RoE	(3a) RoE	(1b) RoE	(2b) RoE	(3b) RoE
Female Representation	0.0194	-0.162	-0.0186	0.235	-0.00230	0.257
	(0.151)	(0.361)	(0.160)	(0.820)	(1.117)	(0.699)
FR * FR				-0.00237	-0.00170	-0.00300
				(0.00817)	(0.00958)	(0.00672)
Board Size	6.483	-18.54*	-3.364	4.467	-20.03	-6.026
	(9.430)	(9.583)	(7.591)	(15.53)	(13.29)	(12.38)
ln(Firm Size)	5.828	-3.252	3.310	5.808	-3.061	3.357
	(4.107)	(10.51)	(4.076)	(4.128)	(10.96)	(4.062)
Constant	-11.72	82.94	21.16	-9.404	83.29	23.67
	(27.65)	(65.54)	(27.55)	(32.12)	(64.92)	(29.67)
Observations	1,012	1,012	1,012	1,012	1,012	1,012
R-squared	0.014	0.015		0.014	0.015	
Prob > chi2				0.9589	0.820	0.858
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Sample	Private	Private	Private	Private	Private	Private
Estimation	OLS	FE	RE	OLS	FE	RE
Hausman		X			X	
Time FE	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Output E6: *H2 – Excluding last year's female representation*

VARIABLES	(1) RoE	(2) RoE	(1a) RoE	(2a) RoE	(3a) RoE	(1b) RoE	(2b) RoE	(3b) RoE
Female Representation	-1.002	-1.732*	0.433	1.106	0.596	-0.924	-3.922*	-1.644*
	(0.709)	(0.945)	(0.338)	(0.928)	(0.434)	(0.710)	(2.086)	(0.912)
public/private dummy = 1	-13.87	-63.71*						
	(34.40)	(36.26)						
Public(1) * FR	1.391*	2.342**						
	(0.794)	(1.046)						
ln(Firm Size)	3.371	-1.452	4.335**	16.49*	5.168**	3.061	-9.741	-1.192
	(5.082)	(5.122)	(1.868)	(9.257)	(2.108)	(4.856)	(10.46)	(4.952)
FR * ln(Firm Size)	0.182	0.294*	-0.0540	-0.120	-0.0677	0.165	0.607**	0.280*
	(0.132)	(0.150)	(0.0430)	(0.106)	(0.0542)	(0.134)	(0.303)	(0.147)
Public(1) * ln(Firm Size)	0.250	6.739						
	(5.639)	(5.599)						
Public(1) * FR * ln(Firm Size)	-0.231	-0.362**						
	(0.140)	(0.161)						
Board Size	-4.680**	-4.116***	-6.193***	-0.767	-4.169***	5.437	-18.75*	-4.190
	(1.819)	(1.425)	(1.452)	(1.774)	(1.245)	(9.938)	(9.691)	(7.802)
Constant	17.83	49.94	2.283	-119.4	-13.90	6.854	128.7*	50.03
	(29.46)	(31.36)	(18.26)	(75.41)	(19.04)	(33.43)	(69.21)	(34.27)
Observations	2,140	2,140	1,128	1,128	1,128	1,012	1,012	1,012
R-squared	0.024		0.029	0.016		0.020	0.033	
Prob > chi2	0.128	0.085	0.065	0.165	0.045	0.158	0.137	0.090
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Sample	Full	Full	Public	Public	Public	Private	Private	Private
Estimation	OLS	RE	OLS	FE	RE	OLS	FE	RE
Hausman		X			X		X	
Time FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table E3: *Predictive Margins*

Firm Type	Model	FR value	ln(FSIZE) value	Margin	t-statistic	P > t	95% Conf. Interval	
Private	(1)	23%	7	28.48*** (8247)	3.41	0.001	12.25	44.71
Public	(1)	23%	7	11.19*** (3.927)	2.68	0.005	3.46	18.92
Private	(2)	23%	7	28.41*** (7.769)	3.66	0.001	13.18	43.64
Public	(2)	23%	7	7.42 (4.331)	1.71	0.087	-1.07	15.91

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1