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**Gender quota on corporate boards in Italy:
spillover effects and financial performance**

Barbara Pistoresi*, Erica Poma, Alberto Rinaldi***

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* University of Modena and Reggio Emilia and RECent

E-mail: barbara.pistoresi@unimore.it

E-mail: alberto.rinaldi@unimore.it

** University of Modena and Reggio Emilia

E-mail: erica.poma@unimore.it

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GENDER QUOTA ON CORPORATE BOARDS IN ITALY: SPILLOVER
EFFECTS AND FINANCIAL PERFORMANCE

Barbara Pistoresi

(University of Modena and Reggio Emilia and RECent)

Erica Poma *

(University of Modena and Reggio Emilia)

Alberto Rinaldi

(University of Modena and Reggio Emilia and RECent)

ABSTRACT

This paper analyzes the impact of the introduction of mandatory gender quotas for the boards of directors of listed firms and state-participated companies (LP) in Italy. It investigates its effects on firms directly targeted by the new regulation as well as its indirect effects on firms that are not. To this aim, we use difference-in-difference and panel fixed-effects estimations. Our main results are that quotas directly increased female presence on boards of LP companies and produced some “positive spillover effects”, i.e., a higher proportion of women in top executive positions in LP firms and a higher share of women on boards of non-listed firms and non-participated firms (NLNP), even if the latter were not targeted by the law. We also find evidence for a positive impact of higher board gender diversity on firm performance in specific conditions, such as boards of small size and NLNP companies.

KEYWORDS: Gender quotas, firm performance, panel data, women directors, spillover effects, female executives

JEL Codes C10, G38, J16

*Corresponding author: 214803@studenti.unimore.it

INTRODUCTION

Over the past decades, several countries have adopted actions and policies for improving women's representation on corporate boards and top management positions, which has become a hotly debated issue across the world. Even though women's educational levels and their labor market participation have recently shown a clear improvement in western countries, gender gaps are still persistent and women remain underrepresented in top positions (Sachs et al. 2020). The "glass ceiling" persists and women face great difficulties for accessing specific job positions and industries, which are characterized by gender stereotypes and barriers (Yu & Madison 2021, Comi et al. 2021, Adams et al. 2016).

Gender equality is a priority for the European Union (EU), as it represents one of the key principles of the European Pillars of Social Rights and, since 2010, various forms of political pressures and legislative actions have been taken. For instance, the United Nations' sustainable development goals identify as their fifth goal the improvement of gender equality and state that organizations and national governments should "*ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life*" (United Nations 2020). Nonetheless, the majority of the National Recovery and Resilience Plans implemented by EU countries in response to the coronavirus pandemic considers the gender issue as an horizontal objective to be pursued in all recovery measures adopted. Thus, these plans include various horizontal interventions that address the gender topic in various perspectives, i.e., employment policies, social and territorial cohesion, and investment in social institutions and health systems (Sapala 2021). Moreover, the European Gender Equality strategy prioritizes women's participation in top managerial positions and recognize women's access to board and decision-making roles as one of the most important targets to pursue overall gender equality. To this regard, the European Commission promotes the exchange of best practices among countries which adopt

legislative measures that improved gender balance in boardrooms, as in the case of Italy which is one of the first EU nations that introduced mandatory gender quotas for corporate boards. This occurred through the enactment of Law 120/2011, known as the “Golfo-Mosca” Law, by the name of its two main parliamentary proponents, Lella Golfo and Alessia Mosca (henceforth GML).

Italy is a country historically characterized by low levels of female participation in the labor market, politics, and strategic decision-making positions. Thus, quotas were partially introduced also in politics for the election of regional councils with scarce results in terms of increased female representation, as the average percentage of women turned from 13.8 percent in 1995 to 12.5 percent in 2010 (Bonomi et al. 2013). Societal, cultural and religious structures do not enhance female empowerment and social programs, as well as flexible work and work-life policies, should be strengthened for creating greater work opportunities and female empowerment (Bozzano 2017). Nonetheless, it is noteworthy that a nation with a predominant patriarchal culture has been one of the first countries to introduce a law which provides mandatory gender quotas on boards of listed companies and state-participated enterprises becoming a benchmark for the other European countries (Golfo 2013).

Since gender quotas start to spread across several countries, scholars and policymakers decided to investigate the potential effects of these legislative interventions on boards’ gender representation and on other boards’ characteristics such as age, level of education, professional background and culture. Moreover, a wide strand of research aims to investigate the impact of increased female presence in corporate boards on firms’ economic, financial and social performance. Nonetheless, findings are mixed and controversial and often they do not consider the role of organizational contextual factors that may influence the impact of board gender diversity on firm performance, such as board size, directors’ age or chief executives’ duality (Yu & Madison 2021, Post & Byron 2015, Pletzer et al. 2015, Triana & Miller 2009). Moreover, there is scant evidence on the effects produced by women executives, who have a more influential role in the decision-making processes (Rubino et

al. 2021, Liu et al. 2014). Another significant gap in the literature is represented by the small number of studies on the spillover effects of gender quotas on firms that are not required to comply with this regulation. In fact, providing legitimacy and triggering imitative behaviors is one of the major goals of this normative action. Furthermore, an increased presence of women in board positions can produce an increase in female presence across the whole firm organization, in both companies that are and that are not mandated to gender quotas (Boutchkova et al. 2021, Bertrand et al. 2019, Prete et al. 2019, Maggian et al. 2017).

This paper analyzes the impact of the GML on the top of the Italian corporate system, proxied by Italy's 250 largest firms by value of their total assets in two benchmark years: 2010 and 2017¹. Specifically, we investigate the effects of the GML on firms directly targeted by the introduction of mandatory gender quotas as well as its indirect influence on board composition of firms that are not required to comply with the new regulation. Moreover, we analyze the impact of female representation on boards on firm performance, proxied by the return on assets (ROA) and the return on equity (ROE). We address this topic in different contexts: we choose the adoption of a small board as variable that may affect the impact of female presence on boards on firm performance. In fact, some empirical studies found that small sized boards can influence positively communication and inclusion in decision-making, leading to better performance (Jansens 2021, Dale-Olsen et al. 2013, Bøhren & Strøm 2007, Eisenberg 1998, Yermack 1996, Jensen 1993). We carry out this exercise with regard to firms both required and not required to comply with mandatory gender quotas. Finally, we also conduct specific analysis relating the effect of women directors who have an executive position, such as president of the board or CEO, as they have a greater influence on board decision and policies, with a greater effect on firms' financial and economic performance.

¹ We adopt this threshold to identify the top of the Italian corporate system for comparative purposes with the upcoming special issue *Women in corporate networks* of the journal "Business History".

Our data comprise a panel data of 232 firms-year observations, taken from R&S Mediobanca, the studies office of Mediobanca, Italy's largest investment bank. We analyze the benchmark years 2010 and 2017. Our dataset includes both listed companies and state-participated enterprises (LP), which were targeted by the GML, and unlisted and non-state-participated companies (NLNP) which were not affected by the new regulation.

This article is structured as follow: In Section 1 a literature review on the impact of gender quotas on firm performance is presented. Section 2 draws the context in which the GML was enacted and came into force in Italy. Section 3 looks at the sources and data and the econometric methodology adopted for the empirical analysis. In Section 4 the main results of the econometric analysis are outlined and in Section 5 discussed. Finally, Section 6 concludes.

1. LITERATURE REVIEW

Theoretical contributions on gender diversity and firm performance

Boards of directors have two main functions which impact on firm performance. Firstly, boards have the important role of monitoring managers' activities and, secondly, they are charged of providing social, human and economic resources to the firm. One of the main theories which support the positive effects of gender diversity on firm results is the resource dependence theory, which sees directors as providers of key resources for the firms, as they give advice and make strategic decisions. Women are considered democratic in decision-making, more future-oriented and more likely to exchange their personal interests for achieving higher performance. In this context, greater female representation on boards provides major resources in terms of human capital, enhancing different perspectives, managerial skills and fostering better corporate decisions which increase firm's value and profits (Eagly et al. 2003, Eagly & Carli 2003, Pfeffer & Salancik 1978).

With regard to the boards' monitoring function, the agency theory suggests that insider managers prefer to appoint directors who maximize their private interests instead of pursuing firms' objectives.

Nonetheless, a higher female presence should improve the monitoring function of boards, as they push managers to appoint female directors who tend to be more independent and exercise a greater control over managers' activities (Bøhren & Staubo, 2016, Adams & Ferreira 2009, Zahra & Perce, 1889, Fama & Jensen, 1983, Fama, 1980, Jensen & Meckling 1976). Adams & Ferreira (2009) hold that women's different attitudes and experiences lead to better monitoring and management of board activity, with positive results for firm performance. Other studies show that a greater presence of women directors determines higher levels of controls, transparency, fairness and diligence which are beneficial for boards' monitoring activities and results (Magnanelli et al. 2020, Mazzotta & Ferraro 2020, Jurkus et al. 2011, Bøhren & Staubo 2016, Adams & Ferreira 2009, Gul et al. 2010).

Another important positive effect linked to higher gender diversity is that it pushes companies to appoint more outside directors as potential inside women directors are not enough to reach the quota required. Thus, more outside women directors reduce the risk of conflicts of interest in monitoring internal managers. In this regard, a higher proportion of female directors reduces agency problems and leads to more objective and efficient strategic decisions (Comi et al. 2020, Adams & Ferreira 2009).

A growing body of research also supports the existence of a non-linear effect linked to gender representation on boards, as claimed by Kanter's theory of critical mass, according to which women can impact on firms' decision making processes and exercise greater influence on boards when there are, at least, three female directors (Kanter 1977). This theory is supported by several empirical works, which provide evidence that a critical mass of women on board enhances firm performance thanks to changes in typical male communication styles and the opening to different perspectives and points of views (Bruno et al. 2018 , Schwartz-Ziv 2017, Amore et al 2014, Konrad et al. 2008).

Another theory which relates female appointment on boards is the glass cliff theory, which maintains that women tend to be appointed with more frequency in leadership roles during periods of crisis or downturn, when the probability of failure is higher (Sabharwal 2013, Ryan & Haslam 2007). This

theory is adopted by different studies on gender quotas' impact in the banking sector, which was particularly affected by the recent financial crisis (Mazzotta & Ferraro 2020, De Vita & Magliocco 2018, Prete et al. 2019).

Female board representation and effects on firm performance: empirical evidence

A growing body of empirical research analyzed the impact of greater female board participation on various dimensions of firm performance. Economic and financial performance is analyzed more frequently. ROE or ROA are usually adopted as accounting indicators (Ferrari et al. 2021, Carbonero et al. 2021, Comi et al. 2020, Mazzotta et al. 2020, Prete et al. 2019, Yang et al. 2019, Slama et al. 2019, Bruno et al. 2018, Dale-Olsen & Verner 2013, Martín-Ugedo & Minguéz-Vera 2014, Bøhren & Staubo, 2016), and the Tobin-Q as market-based indicator (Manganelli et al. 2020, Mazzotta et al. 2020, Ferrari et al. 2021, Yang et al. 2019, Slama et al. 2019). Some studies consider other dimension linked with firms' economic performance, such as labor productivity, the ratio of operating profits to assets and firm revenues (Carbonero et al. 2021, Ferrari et al. 2021, Comi et al. 2020).

Moreover, the impact of gender diversity on firms' social performance and corporate social responsibility is an emergent topic that appears in various empirical works, in response to women's supposed higher attention toward ethical issues and social engagement, i.e. firms' sustainable development, environmental issues, workers' well-being, human rights and greater attention for external stakeholders (Beji et al. 2021, Gangi et al. 2021, Grossmass et al. 2019, Amore et al., 2018, Glass et al. 2015).

We also find works that analyze other outcomes, such as the improved quality of board composition in terms of age, education and culture, as well as other dimensions linked with firm performance as innovation, competitiveness and a greater export orientation (Baltrunaite et al. 2021, Ferrari et al. 2021, Bennouri et al. 2020, Prete et al. 2019, De Vita et al. 2018, Bruno et al. 2018).

Some of the studies we surveyed find that a higher female presence on board has a positive impact on firms' economic performance (Ferrari et al. 2021, Magnanelli et al. 2020, Mazzotta et al. 2020, Comi et al. 2020, Martín-Ugedo & Minguéz-Vera 2014), whereas others find a negative (Greene et al. 2020, Comi et al. 2020, Mazzotta 2020, Slama et al. 2019, Bohren & Staubo, 2016 , Matsa & Miller 2013, Ahern & Dittmar, 2012) or a non-significant correlation (Carbonero et al. 2021, Eckbo et al. 2021, Prete et al. 2019, Yang et al. 2019, Dale-Olsen et al. 2013).

Moreover, a sizeable part of these studies provides mixed results (Ferrari et al. 2021, Comi et al. 2020, Mazzotta et al. 2020, Bruno et al. 2018, Del Prete et al. 2018, Yang et al. 2019). Heterogeneity of results is determined by different dimensions, i.e., the national context, as outlined by Comi et al. (2020) who find positive effects of gender quotas on firm productivity for Italy and negative or non-significant effects for France and Spain. Differences and inconsistencies of results may depend on the performance indicator adopted, as shown by Mazzotta et al. (2020) who report positive effects on accounting measures and negative effects for Tobin's Q. Similarly, Ferrari et al. (2021) find positive results of gender quotas on stock market returns and non-significant results for firm performance. Relationship between female presence and firm performance can be non-linear, as supported by critical mass theory (Kanter, 1977) and shown by Bruno et al. (2018) who find a non-linear relationship between increasing share of women on corporate boards and firms' financial performance, measured through ROA. Given the heterogeneity of results concerning the gender quotas effects on firm performance, we provide a short synthesis on the more recent European and non-European studies on this issue in Table A.1 (Appendix A).

The gaps identified and hypothesis

Inconsistencies and mixed results can also be attributed to contextual and organizational factors which the majority of the empirical works do not consider in their analysis of the relationship between female presence on boards and firm performance. Board size is an important contextual factor in this respect (Yu & Madison 2021, Post & Byron 2015, Pletzer et al. 2015, Triana & Miller 2009). Larger

boards may limit the influence of individual directors, making females less considered in the decision-making processes and less influential for companies' financial performance (Post & Byron 2015, Tuggle et al. 2010, Judge & Zeithaml 1992). Instead, a positive impact of small boards on firm performance can be the result of clearer communication, improved access to information, inclusion in decision-making processes (Bøhren, & Strøm 2007, Eisenberg 1998, Yermack 1996, Jensen 1993). Moreover, in small boards it is easier to reach consensus, take decisions and there are less agency problems and free rider behaviors (Jansen 2021, Bøhren, & Strøm 2007, Milton & Raviv 2008, Fama 1980). Thus, there is a sizeable bulk of empirical evidence that supports the idea that both small boards and board gender diversity increase firm performance, but these factors are usually analyzed separately, whereas their interaction should be considered as well (Muller & Watkins-Fassler 2021, Plantenga & Remery 2020, García et al. 2018, Nguyen & Faff 2007). Nonetheless, despite the growing request for further analysis of the role of organizational contextual factors, such as board size, there are no studies which investigate this moderating effect (Yu & Madison 2021; Post & Byron 2015).

In addition, empirical works do not pay particular attention to the spillover effects that gender quotas can produce on companies which are not targeted by the law, although one of the main aims of this action is to trigger a cultural change on firms and prompt a greater presence of women across a multiplicity of job positions and companies, including those which are not mandated by the law to comply with the new regulation (Boutchkova et al. 2021, Prete et al. 2019, Bertrand et al. 2019, Maggian et al. 2017).

In response to these gaps, we firstly investigate the effects of the introduction of gender quotas in Italy on both listed firms and state-participated enterprises (mandated to comply with the new regulation) and non-listed firms and non-state-participated enterprises (not mandated) in terms of gender representation on boards and rise of women to top executive positions. Secondly, we investigate the impact of higher presence of women on boards on firms' financial performance,

proxied by ROE and ROA. We also consider the casual relationship between board gender diversity and firm performance as moderated by the presence of small sized boards, as suggested in the literature (Yu & Madison 2021, Post & Byron 2015).

Secondly, we provide a distinct analysis of the impact board gender diversity on performance of companies targeted by the quota law and of those that are not. In the latter group, the voluntary choice to increase gender diversity on boards could reflect the adoption of new cultural and organizational models, that might have an impact on firms' economic and financial results.

Finally, we investigate the impact of women in top executive positions on firm performance, as their specific role is more influential on firms' decision-making (Rubino et al. 2021, Flabbi et al. 2019, Liu et al. 2014, Post & Byron 2015)

2. THE INTRODUCTION OF MANDATORY GENDER QUOTAS IN ITALY

Italian society and labor market are historically characterized by low levels of gender equality (Bettio 1988, Mancini 2018). Women voted for the first time at the election of the Constituent Assembly in 1946. Two years after, the new democratic Constitution stated gender equality as one of the fundamental principles of the Italian Republic. In the 1960s and 1970s, feminist and civil rights movements prompted important cultural changes, such as the reform of the family law (1975) and the repeal of the law on crimes of honor (1981). Nonetheless, women remained underrepresented in the labor market, as only 37% of women participated in it in 1977, a percentage that rose slightly to 44% in 1997². Gender inequalities had their basis in a deeply rooted patriarchal culture and were present in virtually all spheres of society: not just access to labor market, but also level of work retributions, poverty and lower standard of life, psychological, physical or sexual violence, access to decision-making positions in business and politics (Sachs et al. 2020, Bonomi et al. 2013). To tackle these

² By way of comparison, in that year the corresponding figure was 74.5% in Sweden, 67.5% in the UK, 60% in France, and 47.1% in Spain (OECD 2002).

problems, gender quotas were adopted for the first time in politics with the electoral reforms in 1993, but women are still strongly underrepresented in elective assemblies (Donà 2018, Golfo 2013, Bonomi et al. 2013). The introduction of gender quotas in the corporate sector, in Italy and across Europe, started later but produced significant changes. Norway was the first country to introduce binding gender quotas for the boards of publicly listed companies in 2003, followed by France and Italy in 2011 and, in more recent years, also by Belgium, the Netherlands, Germany and Portugal. Other nations, such as Spain and the UK, introduced voluntary gender quotas. In Italy, the GML came into force in 2011 and established the compulsory achievement of one third of the least represented gender on the boards of directors for listed firms and state-participated enterprises. As the implementation of the new regulation was gradual, these firms had the possibility to reach the required share into three directors' appointments³.

The introduction of quotas faced various difficulties, including political opposition and obstructions by right-wing parties, Confindustria i.e. the major organizations of employers, and other major entrepreneurial associations. Nonetheless, the opposition the bill faced during its passage through parliament was overcome as result of a strong alliance between women in parliament, feminist movements and women managers in industry (Donà 2018, Golfo 2013).

The public support of gender quotas was decisive for its approval in parliament, in which women were less than 20% (Golfo 2013). The women proponents of the bill were able to invoke a paradigm driven by economic efficiency and utility to build a new discourse on gender quotas that rallied support in many segments of Italian society that spanned across the whole political spectrum. It was also accompanied by lively public and academic debate promoting the increasing presence of the so-called "woman factor" (*Fattore Donna*) in the economy as a driver of economic growth. This argument eventually overshadowed traditional feminist themes such as gender equality and social

³ Within the first renewal of boards of directors firms must attributed to the least represented gender at least one fifth of the seats of the boards' directors. Then, by the third mandate, companies had to reach the compulsory share of one third of the board's directors.

justice, but proved effective in neutralizing resistance to the bill in the context of a severe economic downturn (Casarico & Profeta 2010, Ferrera 2006).

3. SOURCES, DATA AND ECONOMETRIC STRATEGY

The source we used in this article for the benchmark years 2010 and 2017 is *Le principali società italiane*, an annual report on balance sheets of the major Italian companies edited by R&S Mediobanca, the studies office of Mediobanca, Italy's largest investment bank. For the present study, we selected, for each benchmark year, the top 250 companies (50 financials and 200 non financials) by total assets.

From this universe, we focused on 116 companies which are present in both 2010 and 2017. We chose these two benchmark years because 2010 represents the year immediately preceding the enactment of the GML and 2017 is the year in which the GML had been fully implemented. Our dataset includes both listed firms and state-participated companies (LP), that are mandated to comply to the GML (49% of the total), and non-listed firms and non-state-participated companies (NLNP), that are not (51%). To identify these groups in the empirical analysis, we used the *dummy NLPL* equal to 1 for the NLNP companies which were not targeted by the GLM and to 0 otherwise. From the balance-sheet information provided by R&S Mediobanca, we also considered the total assets to proxy the size of the company. The variable named *firms' size* is the natural logarithm transformation of these total assets.

Balance sheet data are drawn from AIDA, the databank of Italian joint-stock companies of Bureau Van Dijck. Specifically, we considered the following variables: *ROE*, i.e., net income divided by stockholders' equity; *ROA*, i.e., net income divided by total assets; *women on board (%)*, constructed as the ratio of female directors to total directors; *women in top positions (%)*, defined as the ratio of

women holding a top executive position (president or CEO) in the board to total directors⁴; *board size*, identified by the total number of directors in the board. From the total number of board directors we also created the dichotomous variable *small board size* equal to 1 when the company has a board with less than 6 directors and equal to 0 when the corresponding figure is equal or greater than 6. This threshold was decided taking into consideration the average number of board directors per firm in our universe, which is close to 9 (see Table 1), and to be coherent with the thresholds for small boards in other empirical works (Dale-Olsen et al. 2013, Bøhren & Strøm 2007, Carter & Lorsch 2004).

Finally, in the empirical analysis we use the dichotomous variable *Law*, equal to 1 for the year 2017, when the GML was fully implemented, and to 0 for 2010, the year preceding the enactment of the GML.

The following tables provide descriptive statistics and T-tests relating the entity and significance of the variation of our variables of interests from 2010 to 2017. Table 1 reports statistical and inference analysis for LP companies while Table 2 reports analysis carried on the NLNP group.

Table 1 supports the existence of both direct and indirect effects of the GML on female representation on LP boards. Specifically, it shows that the LP group registered a significant increase in women on boards from 2010 to 2017, which turned from an average of 5% (0.083) in 2010 to an average of 33% (0.156) of women in 2017. Standard deviations are reported in parenthesis. Thus, the GML directly affected the share of female on boards, carried it up to one third of board seats, as identified by its mandatory requirements. Interestingly, Table 1 shows also a significant increase in the share of women in top executive positions which in 2010 was close to zero (0.018), and in 2017 turned to 3% (0.054). Although this value is still low, it seems that the law produced the indirect effect of increasing the presence of female also in the higher and more influential positions, even if companies were not

⁴ *Women in top positions (%)* is a variable equal to 0 when there are no women appointed as top executives. Thus, it works similarly to a dichotomous variable. However, we prefer to adopt this variable because it reduces the collinearity with the entity fixed effects in panel estimations.

mandated to increase the number of women in these roles. With respect to firm performance, LP companies registered a significant increase in ROA, which turned from 0.8% (0.074) in 2010 to 3% (0.028) in 2017, and a non-significant increase in ROE, which grew from 5% (0.322) to 8% (0.167).

Table 1

Descriptive statistics and t-test on listed and state-participated companies (LP)

| | Women on boards (%) | Women in top positions (%) | Board size | ROA | ROE |
|-------------------------|---------------------|----------------------------|------------|-------|-------|
| Average 2010 | 0.05 | 0.002 | 9.73 | 0.008 | 0.05 |
| Standard deviation 2010 | 0.083 | 0.018 | 6.282 | 0.074 | 0.322 |
| Average 2017 | 0.33 | 0.03 | 9.86 | 0.03 | 0.08 |
| Standard deviation 2017 | 0.103 | 0.054 | 4.339 | 0.028 | 0.167 |
| Δ (2017-2010) | 0.28 | 0.02 | 0.12 | 0.02 | 0.03 |
| T-test | 20.96 | 3.084 | 0.163 | 2.360 | 0.883 |

Table 2 reports the same variables of interests in the NLNP group in which the average number of women on boards more than doubled from 2010 to 2017, turning from 6% (0.100) to 14% (0.156). It is noteworthy that this group of companies, even if not mandated by the law, significantly rose their female representation on boards. There is not a causal relationship between the quota law and the increased presence of women on boards of NLNP companies, nonetheless, it is possible that the rise of women in the LP group prompted an external pressure also toward the firms not target by the law, influencing their behaviors and decisions.

External influences exercised by companies, stakeholders and public debates on gender quotas triggered a positive spillover effect increasing the presence of women on boards of all other companies which were not directly targeted by the quotas. Moreover, NLNP companies show a significant reduction in the average board size which turned from 9.69 (7.612) in 2010 to 7.93 (6.374) in 2017, while both performance indicators have an increase, even if not statistically significant, as reported in Table 2.

Table 2

Descriptive statistics and t-test on non-listed and non-state-participated companies (NLNP)

| | Women on boards (%) | Women in top positions (%) | Boards' size | ROA | ROE |
|-------------------------|---------------------|----------------------------|--------------|-------|-------|
| Average 2010 | 0.06 | 0.01 | 9.69 | 0.02 | 0.007 |
| Standard deviation 2010 | 0.100 | 0.052 | 7.612 | 0.086 | 0.602 |
| Average 2017 | 0.14 | 0.01 | 7.93 | 0.03 | 0.31 |
| Standard deviation 2017 | 0.156 | 0.052 | 6.374 | 0.090 | 2.963 |
| Δ (2017-2010) | 0.08 | 0.00 | -1.76 | 0.01 | 0.30 |
| T-test | 5.468 | 0.264 | 2.177 | 1.435 | 1.225 |

The Empirical strategy

Tables 1 and 2 show that LP companies significantly increased the share of women on their boards. Moreover, we found positive spillover effects relating gender representation on executive positions and NLNP companies. We propose the following econometric methodology to develop our analysis beyond these preliminary results.

We firstly adopt the difference-in-difference methodology considering the introduction of the GML as a natural experiment in which we compare the treated group affected by mandatory gender quotas, which is represented by the LP companies, with the control group of NLNP, which was not exposed to it. This approach allows us to evaluate changes in our variables of interest, i.e., gender representation, female executives, ROE and ROA, as consequences of the GML. For each of these dependent variables, we estimate the following difference-in-difference model:

$$\pi_{it} = \alpha_2 Post_t + \alpha_3 Treated_i + \alpha_4 Post_t \times Treated_i + \theta_i + \varepsilon_{it}$$

Where π_{it} measures, respectively, *women on boards (%)*, *women in top positions (%)*, ROE and ROA which we analyze for the firm i at the period t . *Post* represents a variable, equal to 1 for the year 2017 and to 0 for 2010, while the variable *Treated* is a dichotomous variable which identifies LP companies, directly targeted by the quota law. The parameter of interest is the coefficient α_4 which expresses the interaction between the variables *Treated* and *Post*. The equation models also considers enterprises fixed-effects by θ_i and the time fixed-effects, identified by the variable *Post*, which capture the unobserved characteristics of the companies which are fixed across companies and change from 2010 to 2017.

Secondly, panel fixed-effects regressions were estimated to investigate more in depth the impact of board gender diversity on firm performance. The general equation is as follows:

$$y_{it} = \beta_0 + \beta_1 x_{it} + \beta_2 (x_{it} \times \gamma_{it}) + \beta_3 Law + Control\ Variables + \theta_i + \varepsilon_{it}$$

where y_{it} indicates the ROE and ROA considered in different specifications, while x_{it} identifies the regressors *women on boards (%)*, *women in top positions (%)*, adopted alternatively for comparing their different effects on firm performance. γ_{it} is identified by: *small board size*, *dummyNLNP* and *small board size* \times *dummyNLNP*; these variables are adopted in interaction with the variable *women on boards*. Every specification includes the control variables: *firm size*, *board size* and *Law*. Note that *Law* is a time fixed dummy capturing those effects caused by omitted variables that are equal across companies and change from 2010 to 2017. *Law* also identifies the post-reform period represented by the enactment of the GML. We also include entity fixed-effects identified by θ_i that capture omitted variables varying across companies and constant in the period 2010 2017.

Clustered standard errors for the NLNP group are used for an “experimental design reason” relating the assignment mechanism of quotas, as the dummy NLNP differentiates between firms assigned to the quotas and firms which were not affected by them (Abadie et al. 2017).

4. RESULTS

In Table 3 we use the difference-in-difference method for analyzing the impact of the GML on the dependent variables of our interest: *women on boards (%)*, *women in top positions (%)*, ROE and ROA. For each model, we report the interaction term *Treated* \times *Post* which expresses the difference-in-difference coefficients.

We find that gender quotas significantly increase gender representation on boards and on executive positions, without any significant impact on firm performance. Specifically, model 1 suggests that the GML produced a positive and significant impact on the percentage of *women on boards* in LP companies, i.e. the treated group, which registered an increase in the share of women in their board of 21% more from 2010 to 2017, with respect to the control group of NLNP firms.

Moreover, model 2 suggests that the GML significantly improved also the presence of *women in top positions* on the boards of the LP firms, which increased of 3%.

Thus, model 2 supports the presence of positive spillover effects in terms of higher presence of women in top and strategic roles, although these executive positions were not targeted by the GML, reflecting a cultural change more oriented toward a greater gender balance in boards of directors and top positions.

Models 3 and 4 show that there are no statistically significant effects of the GML on any indicator of performance. This result is coherent with previous research on gender quotas, which finds a non-significant impact on firm performance (Carbonero et al. 2021, Yang et al. 2019, Ferrari et al. 2018, Dale-Olsen et al. 2013).

In synthesis, our difference-in-difference results support the claim that the GML only produced positive effects on gender representation on boards and gender representation in top executive positions as both these variables show a significant increase over time in the LP companies with respect to the NLNP group, not targeted by the quotas requirements.

Table 3

The effect of gender quotas on gender representation and firm's performance

| | (1) | (2) | (3) | (4) |
|-----------------------|---------------------|----------------------------|-------------------|--------------------|
| | Women on boards (%) | Women in top positions (%) | ROE | ROA |
| Treated group | -0.033 (0.06) | -0.015 (0.03) | -0.116 (0.09) | -0.038** (0.02) |
| Time variable | 0.062*** (0.02) | -0.003 (0.008) | 0.023 (0.026) | 0.004 (0.007) |
| Treated×Post | 0.213*** (0.025) | 0.027** (0.011) | -0.035 (0.037) | -0.005 (0.007) |
| R-squared within | 0.690 | 0.028 | 0.002 | 0.004 |
| Number of observation | 232 | 232 | 232 | 232 |

Notes. Fixed effects are included in the models estimated. *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$. Standard errors are in parenthesis.

Tables 4 and 5 report the longitudinal analysis carried on the balance sample of 232 firm-years observations between 2010 and 2017, comprising both targeted and not targeted companies. We include fixed-effects which control the unobserved firm heterogeneity and clustered standard errors for NLNP companies. Moreover, we include board's and firm's level controls (*firm size, board size*) and time fixed-effects captured by the variable *Law* which identifies the period pre and post-reform.

Table 4 shows that only the percentage of *women on boards* does not have a significant impact on ROE, confirming the results found in our difference-in-difference analysis (Model 1).

Nonetheless, we find that *women in top positions*, as presidents or CEOs, significantly increase firm performance (Model 2). This different effect between the presence of *women on boards* and the presence of *women in top positions* suggests that the possibility for women to exercise a greater influence, as executives, on firms' decision-making processes leads to higher positive results on performance in terms of ROE. Model 2 also shows that *board size* has a negative and significant correlation with firm performance, as suggested by other studies relating the impact of this variable on firm performance.

This relationship has been investigated more in depth by analyzing the impact of female directors on boards of small size (Model 4). We find that women on small boards have a higher and significant impact on performance. This result is supported by previous literature, which finds that women directors have a stronger influence on decision-making when sitting on small boards. Women in these contexts face fewer barriers in terms of exclusion from strategic decisions and, as consequence, they have a greater impact on firm performance (Post & Byron 2015, Tuggle et al. 2010, Judge & Zeithaml 1992).

Table 4 also shows the impact of women on performance of NLNP companies. These firms present higher performance indexes than LP companies (Model 3). Moreover, higher gender diversity in NLNP boards has a greater positive and significant impact on performance in terms of ROE, than in

the LP group (Model 5). This finding may be due to the cultural and organizational models adopted by this group of companies, which may promote more women participation reducing gender barriers and exclusion episodes.

As models 4 and 5 support the existence of a positive and differentiated impact of women directors in the case of small boards and NLNP companies, we conduct an additional analysis of gender diversity's impact when female are on small boards of NLNP companies (Model 6). In this case the impact of women's presence is even stronger than in the previous models: women have a positive effect on ROE when they are in contexts that facilitate participation, transparency and communication.

Table 5 repeats this exercise adopting another performance indicator: ROA. Results confirm – and strengthen for interpretative purpose – those obtained by using ROE.

We deepen our analysis of women on performance in specific sectors, finding support for the glass ceiling theory, as we provide evidences that women directors are more likely to be appointed in those sectors which have lower levels of financial performance. Our sectorial analysis show that women have a greater positive and significant impact in specific sectorial contexts, such as the case of the public utility sector (see Appendix B).

Table 4

Fixed-effects panel on ROE

| | (1) | (2) | (3) | (4) | (5) | (6) |
|--|-------------------|---------------------|--------------------|--------------------|---------------------|--------------------|
| Women on boards (%) | -0.064 (0.015) | | -0.049 (0.010) | 0.165 (0.109) | -0.103 (0.047) | -0.146 (0.074) |
| Women in top position (%) | | 0.740*** (0.280) | | | | |
| Law | 0.003 (0.001) | -0.014 (0.020) | 0.005 (0.006) | 0.013 (0.004) | 0.005*** (0.000) | 0.018* (0.006) |
| Boards' size | -0.006 (0.003) | -0.006* (0.003) | -0.003 (0.004) | -0.004 (0.003) | -0.004 (0.002) | -0.004 (0.002) |
| Firms' size | 0.057* (0.005) | 0.044 (0.046) | 0.064 (0.012) | 0.051 (0.045) | 0.056* (0.005) | 0.059* (0.009) |
| DummyNLNP | | | 0.140** (0.008) | | | |
| Women on boards × small boards' size | | | | 0.356** (0.184) | | |
| Women on boards × dummyNLNP | | | | | 0.230** (0.019) | |
| Women on boards × dummyNLNP × small boards' size | | | | | | 0.791** (0.036) |
| R-squared within | 0.030 | 0.076 | 0.043 | 0.062 | 0.036 | 0.091 |

Notes. Fixed –effects and clustered standard errors for NLC are included in the models. *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$. Standard errors are in parenthesis.

Table 5

Fixed-effects panel estimation on ROA

| | (1) | (2) | (3) | (4) | (5) | (6) |
|--|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|
| Women on boards (%) | -0.007 (0.007) | | -0.003 (0.005) | -0.025* (0.003) | -0.015 (0.004) | -0.019 (0.006) |
| Women in top positions (%) | | 0.078 (0.036) | | | | |
| Law | 0.001 (0.002) | -0.001 (0.000) | 0.001** (0.000) | 0.002 (0.002) | 0.001 (0.001) | 0.003 (0.001) |
| Boards' size | -0.001 (0.000) | -0.001 (0.000) | -0.0002 (0.001) | -0.001 (0.000) | -0.001 (0.000) | -0.001 (0.000) |
| Firms' size | -0.001 (0.002) | -0.002 (0.004) | 0.001 (0.001) | -0.001 (0.000) | -0.001 (0.002) | -0.001 (0.002) |
| DummyNLNP | | | 0.039 (0.007) | | | |
| Women on boards × small boards' size | | | | 0.060 (0.035) | | |
| Women on boards × dummyNLNP | | | | | 0.046** (0.002) | |
| Women on boards × dummyNLNP × small boards' size | | | | | | 0.111** (0.003) |
| R-squared within | 0.011 | 0.023 | 0.044 | 0.034 | 0.020 | 0.041 |

Notes. Fixed-effects and clustered standard errors for NLC are included in the models. *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$. Standard errors are in parenthesis.

5. DISCUSSION AND POLICY IMPLICATIONS

Our analysis suggests that the GML produced various positive effects: firstly, it directly increased the average number of women on boards of LP companies. Secondly, the GML produced some “positive spillover effect”, represented by actions or policies in the environment that lead to an increase in one or more pro-environment behavior⁵. Specifically, the presence of women in top positions in the LP group increased, even if the GML does not force firms to appoint more women executives. Spillover effects occurred also in the NLNP group, where the share of women on boards significantly increased between 2010 and 2017, even if these firms were not targeted by the GML. This finding could be a result of institutional and informal pressures which induce NLNP to imitate the behavior of LP companies as well as of the existence of a larger pool of qualified women to hold a directorship’s position. These spillover effects support one of the main goals of the GML: the promotion of a cultural change and an increase in women’s representation not only on boards of LP companies, but across the whole corporate system and in different job positions and roles. As to performance, the GML did not produce a direct positive effect, thus, the general impact of the percentage of female on firm performance is non-significant. This result is coherent with previous empirical works (Carbonero et al. 2021, Ferrari et al. 2018, Dale-Olsen et al. 2013). Nonetheless, we find that women have a positive and significant effect on performance in specific conditions and contexts, such as firms that have small boards. Moreover, women directors have a greater positive impact on firm performance in NLNP than in LP companies and, in particular, in NLNP firms that have a small board.

Thus, our results allow us to address the issue put by Lépinard and Rubio-Marín (2018) according to which gender quotas can be either corrective measures – defined by Nancy Fraser (2003) as remedies which do not challenge the state of power relations among groups – or transformative measures,

⁵ Definition from the website of the “*Corporate Finance Institute*” :
<https://corporatefinanceinstitute.com/resources/knowledge/other/spillover-effect/#:~:text=A%20positive%20or%20a%20negative,occurring%20from%20an%20unrelated%20environment>

which aim to tackle the root of economic and political inequalities by changing economic, social, and political structures, i.e., the prevalent gender order. At a first glance, gender quotas may appear a paradigmatic example of corrective mechanisms: gender quotas acknowledge existing gender inequalities and how they are embedded in pervasive structures of power but do not address the root cause of the problem behind women's disempowerment, such as job market segregation, gendered citizenship, the gendered division of labour, and the public/private divide. However, the spillover effects detected in our analysis can suggest that, despite their corrective nature, gender quotas may also trigger a trajectory of social change and contribute to a more radical social transformation than their current political agenda reveals.

We believe that our results have also important policy implications. They should encourage the adoption of gender quotas and related measures in other countries for two main reasons. The first one relates to their transformative potential in so far as they can contribute to social change towards a new gender order based on equal representation among men and women in decision-making positions and in society as a whole.

The second reason is related to the "business case" for gender diversity, as our results show that gender quotas did not reduce mandated firms' performance and a higher female presence on boards has a positive impact on firm performance in specific contexts, i.e., firms with small boards and NLNP companies.

We thus propose to encourage the adoption of quotas and similar measures that promote gender equality in other job positions and industries which the glass ceiling phenomenon is still diffused, as well as in other countries that has not adopted similar measures yet. We also suggest the development of internal policies, for creating working environments in which women participation is fostered and gender stereotypes and barriers are discouraged. Firms should address more resources for enhancing cultural environments and organizational models that promote equal and fair participation among individuals and freedom of expressing personal opinions and perspectives.

6.CONCLUSION

This paper analyzed the impact of the introduction of mandatory gender quotas for the boards of directors of Italian LP companies on Italy's largest firms. It investigated the effects of the GML on firms directly targeted by the new regulation as well as its indirect effects on firms that are not.

The main results suggest that the GML produced various positive effects. Firstly, it directly increased the average number of women directors in LP companies. Secondly, the GML produced positive spillover effects increasing female representation on boards of NLNP firms, not subject to the law, and in top executive positions in LP companies. These findings suggest that the GML has been able to trigger a cultural change and increase women's representation across the whole corporate system in Italy.

We also find that the GML produced no direct positive effect on firm performance, thus, the general impact of higher board gender diversity is not significant for both indicators we used: ROE and ROA. Nonetheless, an increased women's presence on boards had a positive and significant effect on performance in specific conditions and contexts, such as firms that have small boards. Moreover, a higher share of women directors has a greater positive impact on firm performance in NLNP companies than in the LP group and, in particular, in NLPN companies that have a small board.

Lastly, we argue that gender quotas can represent an effective policy measure for promoting equality and representativeness of women and men in decision-making positions in the corporate economy. Nonetheless, we believe that the effectiveness of gender quotas is reinforced by internal policies which promote organizational and cultural models coherent with the rationale of higher gender equality.

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APPENDIX A

The articles selected for the gender quotas review

Table A.1 in this Appendix reports the studies we surveyed in our review on the impact of gender quotas on firm performance. It compares performance indicators, methodology and the relationship between gender quotas and performance estimated in each of the articles analyzed.

Table A.1

Synthesis of the literature review on gender quotas in European and non-European countries

| Number | Article | Performance Indicators | Methodology | Relationship with performance |
|--------|--|--|---|---|
| 1 | Comi, Simona, Mara Grasseni, Federica Origo, & Laura Pagani. 2020. «Where Women Make a Difference: Gender Quotas and Firms' Performance in Three European Countries». <i>ILR Review</i> 73 (3): 768–93 | ROA, an indicator of leverage and two indicators of productivity (labor productivity and total factor productivity). | Fixed Effects Difference-in-Difference | Negative or non-significant effects in France and Spain. Positive effects on productivity in Italy. |
| 2 | Magnanelli, Barbara Sveva, Luigi Nasta, & Elisa Raoli. 2020. «Do Female Directors on Corporate Boards Make a Difference in Family Owned Businesses?» <i>Journal of</i> | Tobin's Q (Market indicator of performance) | Panel Analysis with random effects –Italy | Positive effects on performance, especially for family-owned firms. |

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| | <i>International Accounting Research</i> 19 (1): 85–102 | | | |
| 3 | Bennouri, Moez, Chiara De Amicis, & Sonia Falconieri. 2020. «Welcome on Board: A Note on Gender Quotas Regulation in Europe». <i>Economics Letters</i> 190 (may): 109055. | Quality of the board (measured through several indicators: independence, size, qualifications, business) Compliance to the quota laws in countries with mandatory and non-mandatory regime. | Difference in difference analysis (through OLS regressions and probit models) Where the dependent variable is identified by the percentage of women in the OLS model and by the achievement of the target required by the law in the probit model. | The gender quota law produces an increase of female representation, according with the required target. Women representation is stronger in country with a mandatory regime. The increased in female representation increase some dimension of boards quality. These effects are stronger in countries with a mandatory regime. |
| 4 | Mazzotta, Romilda, & Olga Ferraro. 2020. «Does the Gender Quota Law Affect Bank Performances? Evidence from Italy». <i>Corporate Governance: The</i> | Accounting measures (ROE, ROA) Market Measures (Tobin's Q) | Panel estimations with fixed-effects | Gender quotas have a positive relationship with accounting measures and a negative effect with the Tobin's |

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| | <i>International Journal of Business in Society</i> 20 (6): 1135–58. | | | Q market measure. |
| 5 | Ferrari, Giulia, Valeria Ferraro, Paola Profeta, & Chiara Pronzato. 2018. «Do Board Gender Quotas Matter? Selection, Performance and Stock Market Effects». <i>SSRN Electronic Journal</i> . | Number of employee, ROA, Tobin's Q, assets, production, profits, short-term debts. | Difference in difference Instrumental estimation through IV regression. | Positive effects on boards quality (% female, age, education) . Non-significant effect for financial performance. Positive effect on stock market returns. |
| 6 | De Vita, Luisa, & Antonella Magliocco. 2018. «Effects of Gender Quotas in Italy: A First Impact Assessment in the Italian Banking Sector». <i>International Journal of Sociology and Social Policy</i> 38 (7–8): 673–94. | Female representation in Italian financial sector. | Descriptive statistics (frequency distribution) | Increasing representation of female on boards. Italy is the second country in Europe after France, showing the highest percentage of female directors on boards. Diversification of directorship in Italian listed companies in terms of age, education, and |

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| | | | | professional skills. Women tend to be represented in positions of non-independent or non-executive direction. |
| 7 | Beji, Rania, Ouidad Yousfi, Nadia Loukil, & Abdelwahed Omri. 2021. «Board Diversity and Corporate Social Responsibility: Empirical Evidence from France». <i>Journal of Business Ethics</i> 173 (1): 133–55. | Social performance indicators (a global index of corporate social responsibility and sub-index representing the human resource dimension, the environment, the business ethics, the community involvement, the corporate governance and human rights) | Regression models and change in change analysis | Boards' diversity is positively associated with firms' corporate social responsibility |
| 8 | Martín-Ugedo, Juan Francisco, & Antonio Minguéz-Vera. 2014. «Firm Performance and Women on the Board: Evidence from Spanish Small and Medium-Sized | ROA performance indicator | Panel Data methodology (Blundell & Bond, 1997) – the estimations are carried on a sample of small and medium | Positive effects on firms' performance |

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| | Enterprises». <i>Feminist Economics</i> 20 (3): 136–62 | | Spanish enterprises from 2003 to 2008 | |
| 9 | Bruno, Giovanni S. F., Angela Ciavarella, & Nadia Linciano. 2018. «Boardroom Gender Diversity and Performance of Listed Companies in Italy». <i>SSRN Electronic Journal</i> . | Analysis of boards characteristic (percentage of women, age, education levels, interlockers, professional roles) and analysis of financial performance (ROE, ROS, ROIC, ROA) | Static and dynamic panel estimations. | The authors found variation on board characteristics (increasing percentage of women on boards, a decrease in the medium age, increases in the variety and diversity of professional and educational background, an higher presence of women interlockers). The static panel estimations didn't find a significant effect of women on firms' performance, while the dynamic estimations show a non- |

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| | | | | linear effect as the presence of women become positive and significant once a threshold comprise between 17 and 20% of women is achieved, in accordance with the critical mass theory. |
| 10 | Carbonero, Francesco, Francesco Devicienti, Alessandro Manello, & Davide Vannoni. 2021. «Women on Board and Firm Export Attitudes: Evidence from Italy». <i>Journal of Economic Behavior & Organization</i> 192 (december): 159–75. | Indicators relating the propensity of exporting (value of export and number of products exported). ROA performance indicator, productivity, R&D expenditure. Analysis of women representation through the share of women on the board and the probability of having at least | Difference in difference and Propensity score matching | No significant results are found in terms of increased profitability, performance and productivity among the listed firms analyzed. The gender quota law increased the probability of exporting and the value of export |

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| | | one women leader. | | |
| 11 | Dale-Olsen, Harald, Pål Schøne, & Mette Verner. 2013. «Diversity among Norwegian Boards of Directors: Does a Quota for Women Improve Firm Performance?» <i>Feminist Economics</i> 19 (4): 110–35. | Financial performance (ROA) ,net asset ratio, log total assets, log operating costs, and log operating revenues. | Difference in difference estimator | No significant changes are depicted on firms' ROA, revenues and costs. Some different results is found in boards' size, distinguishing between large boards' size (greater than 8), medium (from 6 to 8) and small boards' size (from 3 to 5). |
| 12 | Paoloni, Mauro, Paola Paoloni, & Rosa Lombardi. 2019. «The Impact on the Governance of the Gender Quotas Legislation: The Italian Case». <i>Measuring Business Excellence</i> 23 (3): 317–34. | Literature review | | |
| 13 | Del Prete, Silvia, Giulio Papini, & Marco Tonello. 2018 «Gender Quotas, Board Diversity and Spillover Effects. | Analysis of the increased level of female in listed and unlisted banks. | Difference in difference | No significant result on performance (ROA) or negative |

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| | Evidence from Italian Banks», 38. | Analysis of possible spillover effects in terms of female increases. Analysis of performance outcomes (ROA, ROE) associated with the increasing representation of female. Analysis of the boards' composition after the introduction of the Italian gender quota law | | relationship (ROE) with the increasing presence of female directors. No spillover effects. Higher differentiation of boards' composition in terms of age, tenure, sex, nationality. |
| 14 | Yang, Philip, Jan Riepe, Katharina Moser, Kerstin Pull, & Siri Terjesen. 2019. «Women Directors, Firm Performance, and Firm Risk: A Causal Perspective». <i>The Leadership Quarterly</i> 30 (5): 101-297. | OI/A, ROA (accounting measures) MTBR, Tobin's Q (Market Measures) | Panel analysis on 662 companies in Norway (2001-2008) | Decrease in ROA and in OI/A. No significant changes in MTBR or Tobin's Q |
| 15 | Yu, Jeong Jin, & Guy Madison. 2021. «Gender Quotas and Company | Literature review on performance | | Mixed results |

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| | Financial Performance: A Systematic Review». <i>Economic Affairs</i> 41 (3): 377–90 | indicators (accounting and market based measures) | | |
| 16 | Ben Slama, Ramzi, Aymen Ajina, & Faten Lakhal. 2019. «Board Gender Diversity and Firm Financial Performance in France: Empirical Evidence Using Quantile Difference-in-Differences and Dose-Response Models». <i>A cura di David McMillan. Cogent Economics & Finance</i> 7 (1): 1626526. | ROA (Accounting measure) Tobin's Q (Market Measure) | Panel analysis on 89 French companies (2008-2011) | Decrease in Tobin's Q and ROA when the proportion of women increase |
| 17 | Bøhren, Øyvind, & Siv Staubo. 2016. «Mandatory Gender Balance and Board Independence: Mandatory Gender Balance and Board Independence». <i>European Financial Management</i> 22 (1): 3–30. | ROA | Panel analysis on 696 Norwegian companies (2003-2008) | Decrease of ROA, lower percentage of female directors exacerbated additional adverse effects |
| 18 | Greene, Daniel, Vincent J. Intintoli, & Kathleen M. Kahle. 2020. «Do Board | Abnormal Returns | Longitudinal analysis on 602 Californian | Negative impact of quotas on |

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| | Gender Quotas Affect Firm Value? Evidence from California Senate Bill No. 826». <i>Journal of Corporate Finance</i> 60 (febbraio): 101526 | | companies (2018-2019) | abnormal returns |
| 19 | Ahern, Kenneth R. & Amy K. Dittmar. 2012. "The changing of the Boards: The impact on firm valuation of mandated female board representation." <i>The Quarterly Journal of Economics</i> 127(1):137-197. | ROA, Tobin's Q | Longitudinal analysis on 248 Norwegian companies 2001-2009 | Decrease of Tobin's Q, decrease of ROA |
| 20 | Matsa, David A, & Amalia R Miller. 2013. «A Female Style in Corporate Leadership? Evidence from Quotas». <i>American Economic Journal: Applied Economics</i> 5 (3): 136–69. | Operating profits (revenue/assets, labour costs/assets, other costs/assets) | Panel analysis on 4.620 Nordic companies from 2003 to 2009 | Decrease of operating profits and performance indicators |

APPENDIX B

The impact of female on firm performance: a sectorial analysis

According with the glass ceiling phenomenon, women face greater barriers for accessing specific sectors which result to be typically “male-dominated”. In this Appendix, we present an analysis of the impact of board gender diversity on firm performance in those sectors where men were historically overrepresented. Specifically, we identify five sectors: manufacturing, financial intermediaries, public utilities, services and a residual sector labelled “other”. The distribution of our enterprises among these sectors is fairly homogeneous, as 26% of firms are in manufacturing, 20% in financials, 27% in services, 20% in public utilities, and the remaining 9% in other industries.

NLNP enterprises present a non-homogeneous distribution among sectors ($\chi^2(4) = 10.221$; p-value ≤ 0.05): in 2010 chi-square reports a significant difference and a greater presence of NLNP companies in the manufacturing (19) and service (14) sectors, followed by the financial sector (11), the residual sector “others” (9), and the public utilities sector (6). This distribution is almost the same in 2017 ($\chi^2(4) = 14.209$; p-value ≤ 0.001), as public utilities result to be the sector with the lower number of NLNP firms (6), followed by “others” (8), financial (10), services (16), manufacturing (18).

We also analyze the presence of differences in terms of women directors, performance indicators and board size through one-way Anova comparing the average values of the mentioned variables across industries in 2010 and 2017. Our results show that, in 2010, the financial and public utilities sectors reported the lower share of women directors. This is confirmed by the post-hoc Turkey HSD test that identifies financials and public utilities as a homogeneous subset of enterprises characterized by a significant lower representation of women. Interestingly, the same sectors in 2017 registered the larger increase in women’s presence on boards, as financials turn from 3% in

2010 to 26% in 2017, while public utilities turn from 4% to 26%. Thus, the significant differences among sectors in terms of board gender diversity in 2010 (P-value=0.06; F-Test=2.311) is no more depicted in 2017 (p-value=0.23; F-Test=1.413).

Moreover, Anova tests find significant differences among industries with respect to financial performance: in 2010, ROA presented different average values across sectors (p-value=0.03, F-test=2.772), with the financial sector accounting for the lower value (ROA= 0.004, standard deviation =0.110). In 2017 both performance indicators show significant differences between sectors, as ROA was lower in the financial (ROA=0.003, standard deviation = 0.014), service (ROA=0.02, standard deviation =0.036) and manufacturing (ROA=0.02, standard deviation= 0.043) sectors. ROE has the lower values in the financial (ROE=0.01, standard deviation=0.169) and manufacturing (ROE=0.06, standard deviation=0.140) sectors. On the other hand, the public utilities sector registered the higher ROE (ROE= 0.14, standard deviation=0.130). The number of directors is statistically different among sectors in both years (P-value = 0.00; F-Test=5.401 in 2010; P-value=0.001; F-Test=5.405 in 2017). Post-Hoc Turkey HSD test confirm the existence, in 2010, of one homogeneous subset identified by the financial sector (P-value=0.08) which had an average board size statistically higher than the others sectors. In particular, the financial sector has an average of almost 15 directors per board in 2010 and 12 directors in 2017, while the corresponding value for the other sectors is significantly lower, as reported in Table 7.

Table B.1

Anova estimates and average values of women on boards, financial indicators and boards' size between sectors.

| | Financial | Public Utilities | Manufacturing | Services | Other | P-value |
|-------------------|------------------|------------------|-----------------|------------------|-----------------|---------|
| Anova 2010 | | | | | | |
| Women on boards | 0.03 (0.054) | 0.04 (0.097) | 0.06 (0.083) | 0.07 (0.098) | 0.12 (0.111) | 0-062 |
| ROE | 0.05 (0.046) | 0.04 (0.164) | 0.11 (0.191) | 0.07 (0.114) | 0.09 (0.117) | 0.355 |
| ROA | 0.004 (0.11) | 0.02 (0.040) | 0.03 (0.041) | 0.02 (0.029) | 0.04 (0.036) | 0.031 |
| Boards' size | 14.87 (6.476) | 7.58 (2.714) | 8.04 (3.766) | 7.58 (2.714) | 7.08 (2.937) | 0.001 |
| N | 23 | 28 | 23 | 34 | 12 | 116 |
| Anova 2017 | | | | | | |
| Women on boards | 0.26 (0.161) | 0.26 (0.151) | 0.18 (0.145) | 0.23 (0.162) | 0.19 (0.147) | 0.23 |
| ROE | 0.01 (0.169) | 0.14 (0.130) | 0.06 (0.140) | 0.10 (0.165) | 0.10 (0.074) | 0.05 |
| ROA | 0.003 (0.014) | 0.037 (0.032) | 0.02 (0.043) | 0.02 (0.036) | 0.05 (0.037) | 0.03 |
| Boards' size | 11.96 (3.960) | 6.52 (3.446) | 8.00 (2.906) | 12.04 (9.874) | 6.91 (3.048) | 0.001 |
| N | 23 | 27 | 28 | 27 | 11 | 116 |

Note. Standard errors are in parenthesis.

We develop more in detail our analysis estimating panel-fixed effects models on the financial and public utilities sectors, which result to be those with the lower female presence in 2010 and with the highest increase in 2017. We evaluate gender diversity's impact on the performance indicators (ROE and ROA) for both sectors.

Firstly, we present panel fixed-effects of gender diversity's impact on ROE in the financial sector. Model 1 shows that the dichotomous variable financial sector is negatively and significantly correlated with ROE ($\beta = -0.09$; $p\text{-value} \leq 0.01$, Model 1). This result confirms what we previously mentioned: the financial sector registered the lower levels of performance, possibly as result of the past financial crisis, that hit more this industry. The interaction term financial sector \times women on boards is negatively and significantly associated with firm performance ($\beta = -0.27$; $p\text{-value} \leq 0.1$, Model 2). Although the statistical significance is only at 10%, it seems that the increase in the share of women directors in this industry, gravely hit by the financial crisis, did not produce a positive effect on firm performance. Nonetheless, it is noteworthy that the impact of women directors in small boards is significantly positive on firm performance in the financial sector ($\beta = 0.13$; $p\text{-value} \leq 0.05$, Model 4). The presence of small boards promotes firm performance, as in various models higher number of directors are associated with significantly lower performance, as reported in Models 1, 2, 3 and 5. We also find that NLNP enterprises in the financial sector have a negative and significant correlation with firm performance ($\beta = -0.04$; $p\text{-value} \leq 0.1$, Model 5).

We also tested the same models on ROA, confirming the results obtained with ROE. Thus, we can support that women directors in small boards the financial sector have a significant positive effect on firm performance both using ROE and ROA. Moreover, larger boards and the presence of NLNP companies significantly reduce firm performance. With respect to the interaction term financial sector \times women on boards, we find a partial negative and significant relationship, supported only by ROE, while ROA lead to a negative but non-significant impact.

Table B.2

Panel fixed-effects models on the ROE indicator of the financial sector

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|--|---------------------|--------------------|---------------------|-------------------|-----------------------|-------------------|
| Women on boards | -0.11 (0.088) | 0.011 (0.106) | -0.08 (0.089) | -0.07 (0.020) | -0.11*** (0.026) | -0.05 (0.049) |
| Law | 0.020 (0.026) | 0.002 (0.028) | 0.02 (0.026) | 0.004 (0.002) | 0.02*** (0.004) | 0.004 (0.001) |
| Boards' size | -0.002* (0.000) | -0.007* (0.004) | -0.002** (0.001) | -0.006 (0.003) | -0.002*** (0.0002) | -0.007 (0.005) |
| Firm size | 0.01 (0.009) | 0.04 (0.004) | -0.004 (0.006) | 0.057* (0.006) | -0.001 (0.009) | 0.05** (0.001) |
| Financial sector | -0.09*** (0.036) | | | | | |
| Financial sector × women on boards | -0.27* (0.148) | | | | | |
| Financial sector × boards of small size | -0.02 (0.040) | | | | | |
| Financial sector × women on boards × boards' of small size | 0.13** (0.007) | | | | | |
| Financial sector × NLNP | -0.04* (0.027) | | | | | |
| Financial sector × women on boards × NLNP | -0.37 (0.156) | | | | | |
| R-squared within | 0.01 | 0.004 | 0.04 | 0.03 | 0.006 | 0.03 |

Note. Models with interactions represented by two dummy variables (Financial × boards of small size, financial × NLNP companies) and the financial dummy variable have not the fixed effects. All the models have clustered standard errors for the variable NLNP.

Table B.3

Panel fixed-effects on the ROA indicator of financial sector.

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|--|--|-------------------|----------------------|-------------------|----------------------|-------------------|
| Women on boards | -0.009 (0.019) | -0.001 (0.014) | -0.004 (0.018) | -0.01 (0.008) | -0.01 (0.018) | -0.01 (0.011) |
| Law | 0.001 (0.003) | 0.001 (0.002) | 0.001 (0.002) | 0.001 (0.002) | 0.001 (0.003) | 0.001 (0.002) |
| Boards' size | -0.0005* (0.002) | -0.001 (0.009) | -0.001*** (0.000) | -0.001 (0.000) | -0.001*** (0.000) | -0.001 (0.001) |
| Firm size | -0.001 (0.0007) | -0.002 (0.003) | -0.004** (0.002) | -0.001 (0.002) | -0.003*** (0.000) | -0.002 (0.003) |
| Financial sector | -0.02*** (0.001) | | | | | |
| Financial sector × women on board | -0.02 (0.026) | | | | | |
| Financial sector × small boards' size | -0.01*** (0.002) | | | | | |
| Financial sector × women on boards × small boards' size | 0.02** (0.000) | | | | | |
| Financial sector × NLNP | -0.02*** (0.000) | | | | | |
| Financial sector × women on boards × NLNP | -0.03 (0.033) | | | | | |
| R-squared within | 0.01 0.01 0.01 0.01 0.01 | | | | | |

Note. Models with interactions represented by two dummy variables (Financial × boards of small size, financial × NLNP companies) and the financial dummy variable have not the fixed effects. All the models have clustered standard errors for the variable NLNP.

The second industry in which we analyze the impact of gender diversity is public utilities, in which, in 2010, only 4% of directors were women. Interestingly, the increased presence of women directors in this industry shows a positive and significant correlation with firm performance. Thus, women on

boards impact positively on this sector ($\beta=0.28$; $p\text{-value} \leq 0.05$). Women directors in public utilities present a positive impact also when we consider their effect on boards of small size, in which women produce a greater effect on ROE ($\beta=0.31$; $p\text{-value} \leq 0.1$). Moreover, the higher impact of women on firm performance is also detected when they are on boards of small size of NLNP companies ($\beta=1.85$; $p\text{-value} \leq 0.01$). In some models, women on boards are negatively and significantly correlated with firm performance, nonetheless, this effect is present only when we do not consider the variable women on boards in interaction with some subgroups of enterprises, which are identified by the dummy relating the public utilities sector, the NLNP group and the enterprises with boards of small size. The negative impact of women directors on ROE is significant only in models 1, 3, 5 and 6. We also find that the presence of an increased number of directors reduces significantly firm performance in models 1, 3 and 5.

The analysis on ROA confirms that women directors in public utilities have a positive impact on firm performance ($\beta=0.03$; $p\text{-value} \leq 0.05$), which is stronger when we consider women's presence in small boards ($\beta=0.04$; $p\text{-value} \leq 0.05$) and in NLNP in this industry ($\beta=0.20$; $p\text{-value} \leq 0.05$). The impact of women directors on NLNP companies is interesting, as the correlation of NLNP companies in public utilities with ROA is negative and significant ($\beta= -0.003$; $p\text{-value} \leq 0.01$) but if we consider the interaction of the percentage of women on boards in NLNP firms in public utilities, the impact becomes positive and significant ($\beta=0.20$; $p\text{-value} \leq 0.05$). As noticed in the previous models in Tables B.3, B.4 and B.5, a larger board size is negatively associated with performance, indicating that small boards are characterized by organizational and cultural models that facilitate participation and enhance firm performance.

Table B.4

Panel fixed-effects model on ROE of the public utilities sector

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---------------------------|-------------------|-----------------------|-------------------|-----------------------|--------------------|
| Women on boards | -0.10** (0.044) | -0.16 (0.056) | -0.10** (0.039) | -0.12 (0.103) | -0.09** (0.040) | -0.06** (0.001) |
| Law | -0.02*** (0.004) | 0.006 (0.008) | 0.017*** (0.004) | 0.005 (0.029) | 0.02*** (0.002) | -0.004 (0.004) |
| Boards' size | - 0.001*** (0.0001) | -0.005 (0.005) | -0.002*** (0.0001) | -0.005 (0.004) | -0.002*** (0.0002) | -0.006 (0.003) |
| Firm size | -0.004* (0.002) | 0.05 (0.020) | -0.004* (0.002) | 0.05 (0.046) | -0.004* (0.002) | 0.064* (0.009) |
| Public Utilities | 0.02 (0.013) | | | | | |
| Public Utilities × women on boards | | 0.28** (0.015) | | | | |
| Public Utilities × small boards' size | | | 0.004 (0.003) | | | |
| Public Utilities × small boards size × women on boards | | | | 0.31* (0.174) | | |
| Public Utilities × NLNP | | | | | 0.001 (0.004) | |
| Public Utilities × NLNP × women on boards | | | | | | 1.85*** (0.010) |
| R-squared within | 0.01 | 0.05 | 0.005 | 0.05 | 0.004 | 0.07 |

Note. Models with interactions represented by two dummy variables (Public utilities × boards of small size, Public utilities × NLNP companies) and the public utilities dummy variable have not the fixed effects. All the models have clustered standard errors for the variable NLNP.

Table B.5

Panel fixed-effects on ROA of the public utilities sector

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---------------------------------------|----------------------|-------------------|----------------------|-------------------|----------------------|--------------------|
| Women on boards | -0.01 (0.022) | -0.02 (0.012) | -0.01 (0.019) | -0.02 (0.011) | -0.01 (0.018) | -0.01 (0.005) |
| Law | 0.001 (0.003) | 0.001 (0.003) | 0.001 (0.006) | 0.001 (0.003) | 0.001 (0.003) | 0.0001 (0.002) |
| Boards' size | -0.0004 (0.000) | -0.001 (0.001) | -0.005 (0.003) | -0.001 (0.001) | -0.001*** (0.000) | -0.001 (0.005) |
| Firm size | -0.004*** (0.001) | -0.002 (0.001) | -0.004*** (0.001) | -0.002 (0.001) | -0.005*** (0.001) | -0.0002 (0.002) |
| Public utilities | 0.01 (0.009) | | | | | |
| Public utilities × women on boards | | 0.03** (0.000) | | | | |
| Public utilities × small boards' size | | | 0.005 (0.0006) | | | |
| Public utilities × small boards' size | | | | 0.04** (0.001) | | |

| | | | | | | |
|--|------|------|------|------|----------------------|-------------------|
| × women on boards | | | | | | |
| Public | | | | | | |
| utilities × NLNP companies | | | | | -0.003*** (0.001) | |
| Public | | | | | | |
| utilities × NLNP companies × women on boards | | | | | | 0.20** (0.007) |
| R-squared within | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 |

Note. Models with interactions represented by two dummy variables (Public utilities× boards of small size, public utilities× NLNP companies) and the public utilities dummy variable have not the fixed effects. All the models have clustered standard errors for the variable NLNP.