Boardroom gender diversity and performance of listed companies in Italy

G.S.F. Bruno, A. Ciavarella, N. Linciano

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Gender diversity e *performance* delle società quotate in Italia

G.S.F. Bruno*, A. Ciavarella**, N. Linciano**

Sintesi del lavoro

Negli ultimi anni in molti paesi sono state adottate diverse iniziative legislative e di autoregolamentazione volte a favorire una maggiore partecipazione delle donne alla vita delle società quotate, anche partendo dall'ipotesi che una maggiore presenza femminile possa avere effetti positivi sulle performance societarie. In Italia, nel 2011 è stata adottata la legge 120, che impone alle società quotate che il riparto degli amministratori da eleggere sia effettuato in base a un criterio che assicuri l'equilibrio tra i generi, dovendo il genere meno rappresentato ottenere almeno un terzo degli amministratori eletti. Nel luglio 2018 la diversità di genere è inoltre stata oggetto di espresse raccomandazioni nel Codice di autodisciplina delle società quotate italiane. In questo studio si analizza l'efficacia della legge del 2011 sotto due distinti profili. Da una parte, si valuta l'impatto della legge sulla diversità di genere e su alcune caratteristiche dei *board*, quali il livello medio di istruzione, l'età, il profilo professionale, la presenza di amministratori *interlockers*. In secondo luogo, lo studio analizza l'impatto della legge sulle performance delle imprese italiane quotate, utilizzando diverse misure di performance, quali il ROE, il ROS, il ROIC e il ROA. Il dataset utilizzato comprende tutte le società italiane quotate nel periodo 2008-2016.

L'analisi conferma come la legge abbia avuto un effetto positivo e significativo sulla percentuale di donne, aumentata in media di 17 punti percentuali subito dopo l'entrata in vigore della legge (cosiddetto *instant reform effect*) e di 11 punti percentuali successivamente (cosiddetto *follow-up effect*). Inoltre, l'ingresso delle nuove amministratrici ha anche contribuito a modificare altre caratteristiche dei board, riducendo l'età media, aumentando la diversità in termini di età e background professionale, il livello medio di istruzione e la presenza di donne *interlockers*.

Con riguardo all'effetto sulle performance, non emergono risultati significativi se si utilizzano modelli econometrici statici. Utilizzando invece modelli dinamici, lo studio evidenzia come sia determinante la presenza di una massa critica di donne perché queste riescano ad impattare positivamente sui risultati d'impresa, supportando la validità della cosiddetta *critical mass theory*. In particolare, quando la percentuale di donne supera un determinato *threshold*, che varia tra il 17% e il 20% del *board*, le stime evidenziano un effetto positivo e significativo su tutte le misure di performance utilizzate.

Boardroom gender diversity and performance of listed companies in Italy

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Abstract

The proportion of women in boardroom has traditionally been low around the world. Over the last decades, several jurisdictions have adopted legislative actions in order to trigger a tangible progress in female representation, also moving from the assumption that gender balanced boards result in improved corporate governance and performance. The investigation of the relationship between female boardroom representation and firm value is therefore key on policy grounds. The empirical evidence gathered so far is however inconclusive, given that potential reverse causality may bias results. In Italy, the Law 120/2011 envisaged mandatory quotas for the three board appointments subsequent August 2012, by setting out a minimum objective of one-third of the corporate board seats for members of the under-represented gender, lowered to one-fifth for the first term. The Italian law has introduced an exogenous shock in board composition, which may enable to overcome the endogeneity problem potentially impairing the analysis of boardroom diversity. This paper contributes to the literature by analyzing both the effectiveness of the Law in terms of its impact on boardroom gender diversity and on other board attributes, and by analyzing the impact of gender quotas on the profitability of listed Italian firms over the period 2008-2016. The analysis confirms a positive impact of the reform: we estimate an instant reform effect on the percentage of female directors of 17 percentage points and a follow-up effect of 11 percentage points. The entry of new women pursuant to the law has also contributed to affect other board characteristics, lowering the average age, increasing the diversity in terms of age and professional background, increasing the level of education and the percentage of female interlockers.

As for the impact on firms performance, results are not significant when static models are used. Differently, when a dynamic model is considered, female representation is estimated to yield a positive effect on different measures of performance when it exceeds a certain threshold, ranging between about 17% and 20% of the board members, roughly equivalent to at least two seats held by women, given that the average board size over the sample period is around ten members. This evidence supports the idea underpinning the critical mass theory, i.e., the hypothesis that women may influence board decisions and consequently firm performance when a minimum weight is achieved.

Contents

1 Introduction

The proportion of women in boardroom has traditionally been low around the world (Credit Suisse, 2016). Over the last decades, several jurisdictions opted for active intervention, which triggered a tangible progress in female representation (Ferreira and Kirchmaier, 2013). In Europe, many countries have implemented boardroom diversity policies in the form of legal quotas for listed or state-owned firms, governance code amendments, and disclosure requirements since 2008. Norway was the first, by mandating 40% representation of both men and women on the boards of listed firms, followed by Italy, France, and Belgium envisaging similar provisions. Most recently, Germany passed a law requiring listed firms to have 30% of women on supervisory boards as of 2016. Other countries such as United Kingdom and Finland spurred a rise in the boardroom positions held by women through self-regulatory initiatives (see Davies, 2015, for the UK and Finncham, 2016, for the Finnish case).[1]

Since 2010, the European Commission has devoted special attention to gender diversity too, as the issue was high on the political agenda sketched by the Strategy for Equality between Women and Men.[2] In 2011, the Commission called for credible self-regulation by companies to ensure better gender balance in companies' boards. One year later, in November 2012, the Commission proposed legislation mandating a 40% quota of the under-represented sex in non-executive board-member positions of listed firms, with the aim to accelerate progress towards gender balance in boardrooms.

Policy actions rest, among other things, on the assumption that gender balanced boards result in improved corporate governance and performance. The investigation of the relationship between female boardroom representation and firm value is therefore key on policy grounds. The evidence gathered so far, however, has not produced conclusive results also because of data and methodological limitations. Indeed, empirical studies on the impact of voluntary female board representation had to tackle with endogeneity, due to either differences in unobservable characteristics across firms that may affect their gender policies and governance choices, or potential reverse causality. A second stream of investigation, currently under way, benefits from the recently enacted gender policies, which introduce an exogenous shock in board composition and may enable to overcome reverse causality.

The estimated impact of boardroom diversity remains mixed also because analyses still miss many features that might be relevant. As posited by Adams (2016), further research is needed in order to better understand the roots of women un-

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1   Indeed, mandatory quotas have solicited a lively debate. On one hand, opponents highlight that they may be inefficient in promoting women leadership and may be met with difficulties if the director candidate pool of experienced women remains insufficient (Adams, 2015; Choudhury, 2015). On the other hand, supporters recall that based on the experience of a number of countries quotas are the only method of advancing women into boardrooms in large numbers (Velkova, 2015) as well as spurring confidence and engagement in women with beneficial effects on corporate decision making process (Elstad and Ladegard, 2010).

2   See European Commission (2010), Corporate governance in financial institutions and remuneration policies, Green Paper; European Commission (2011), The EU corporate governance framework, Green Paper; European Commission (2012), Action Plan: European company law and corporate governance - a modern legal framework for more engaged shareholders and sustainable companies.

derrepresentation. A few studies tackle gender diversity by jointly taking into account the pipeline of the executives as well as of senior managers, both affecting directors' pool and directors' participation. Francoeur et al. (2008) show that high percentages of women officers lead to positive and significant abnormal returns for a sample of Canadian firms, whereas no significant impact is detected when boardroom female participation is accounted for either on its own or in combination with the proportion of women in the management system.

Moreover, the impact of female representation on firm governance and performance may be conditional on the achievement of a minimal threshold of gender-balance (Shrader et al., 1997, and Rosener, 1995). As posited by the theory of tokenism (Kanter, 1977) and by the related critical mass theory, women minorities in groups are subjective to discriminating behavior, and hence are not able to influence group decisions. Two or more women may be needed to catalyze female effective activeness. Until recently, few companies exhibited such a critical mass and this might have biased the empirical evidence gathered by previous studies. To this respect, legislative quotas provide a unique opportunity, as they ensure the degree of gender diversity that might potentially generate an appreciable effect of the female presence in boardroom positions (see, among the others, Konrad, 2008; Torchia et al. 2008).

Finally, increased over-boarding rates of female directors may not necessarily imply that the broader objectives set by the legislative initiatives are met and, therefore, that the impact of women on boards may be effectively detected. Indeed, several surveys show that companies may achieve quotas and targets numerically by cutting the number of directors or replacing existing directors rather than by recruiting additional female directors (Credit Suisse, 2016).

In Italy, evidence on boardroom gender diversity has long highlighted women underrepresentation (Gamba and Goldstein, 2009). In 2008, only 44% of Italian listed companies had a woman on their board, while women held less than 6% of the board positions. In 2011, a law was passed envisaging mandatory quotas. In details, the Law 120/2011 required gender quotas for the three board appointments subsequent August 2012, by setting out a minimum objective of one-third of the corporate board seats for members of the under-represented gender, lowered to one-fifth for the first term. The Italian gender quota law has created a natural experiment where one can study board gender diversity overcoming potential endogeneity problems.

The present paper has two objectives. First, it evaluates the effectiveness of the law, namely its impact on boardroom gender diversity. In particular, we wish to evaluate whether Italian listed firms have applied the law going beyond the minimum threshold set forth by the law or they have strictly followed the minimum standards imposed. Moreover, we evaluate whether the entry of new female directors pursuant to the law has also modified other board characteristics, such as the level of education, the average board age, the diversity in terms of age and professional background, the presence of interlocker directors. Secondly, it studies the impact of women representation on corporate performance, as proxied by various variables,

such as the return on equity (ROE), return on assets (ROA), return on invested capital (ROIC) and return on sales (ROS) of Italian listed companies.

The study refers to the Italian firms listed on the Italian Stock Exchange over the period 2008-2016. It relies on two different database, both drawn from CONSOB, recording respectively directors' characteristics and companies' characteristics. Over the time-period considered, information on directors' attributes is hand-collected from their curriculum vitae, while information on the governance of firms is hand-collected from individual companies' Corporate Governance Reports.

This paper is related to the recent stream of literature investigating the relationship between female directors and performance in the context of gender quotas.

Most part of the studies relate to Norway and bring forward conflicting evidence, as some of them document a negative impact on corporate performance (Ahern and Dittmar, 2012; Bøhren and Staubo, 2016), while others highlight either a neutral effect or an improvement of the observable characteristics of newly appointed female board members (Matsa and Miller, 2013; Nygaard, 2011). As for France, Ferreira et al. (2017) highlights an improvement in the stability of director-firm matches and a consequent reduction in the female directors' turnover, due to the change in the directors' selection process triggered by the quota.

As for Italy, two papers have investigated the issue so far. Ferrari et al. (2016), focusing on Italian listed companies over 2007-2014, show that the share of women on board is negatively related with the variability of stock market prices and positively related with stock market returns at the date of board's election. Gordini and Rancati (2017) document a positive impact of boardroom female representation and Tobin's Q, while the presence of one or more women on the board per se does not deliver any significant effect over 2011-2014. The results of both these papers, however, may not be conclusive given that the shortness of the time-period subsequent to the enactment of the law does not allow for a proper evaluation of the effects of female representation on firm performance. Indeed, at the end of 2014 only about 57% of the listed companies had undergone the first of the three board appointments subject to mandatory quota, around 2% were at the second term and the remaining 41% had not applied the law yet.

We enrich the existing literature in different ways. First, the time period considered is long enough to assess the impact of the law at least for those firms already implementing the legislative provisions. Indeed, at the end of 2016 board appointment subsequent to the law has been experienced once by more than half of listed firms, twice by 32% of the companies and three times by almost 5% of the sample, while only 6.4% of the market (mainly new listed firms) has not undergone the first appointment yet. This circumstance allows us to evaluate the distribution of the reform effect on gender diversity, as well as other board characteristics, over two post-reform board appointments. In particular, we are able to evaluate the effect on both the first and the second board appointments subject to the reform, which we may refer to as the instant effect and the follow-up reform effect, respectively.

Second, given the large time span in our data, we can explicitly test for slow adjustments of corporate performance to economic and institutional changes and, specifically, to enhanced gender diversity. To this purpose, for the first time in the literature, we specify the structural equations for corporate performance as dynamic panel data models. The foregoing extensions make a richer set of instrumental variables available, including lags and indicators for board elections.

The main findings of this research can be summarized as follows.

First, the analysis confirms that the impact of the reform is significantly positive. We find that, following the entry into force of the law, the presence of women directors increased on average by 17 percentage points at the first board appointment (instant reform effect) and by 11 percentage points at the second appointment (follow-up effect). Indeed, since 2012 gender diversity has been steadily advancing. By the end of June 2017, nearly all listed companies have gender diverse boards, while women directors represent over one-third of all boards members (33.6%), marking the highest figure ever recorded and reaching the mandatory gender quota.

The first part of the analysis shows also that the law has affected some other boards attributes. In particular, we find an increase in the presence of graduated directors, a marginal decrease in the average age after the first post-reform election and a significant positive instant effect in the diversity of age. The reform seems also to have reduced the percentage of managers in the board in favor of consultants/professionals. Finally, the reform seems to have significantly reduced both the average number of directorships for director and the average number of interlockers in the boardroom. However, the percentage of women interlockers has increased steadily after the law with instant and follow-up effects that are significantly positive and equal, respectively, to 16-17 percentage points and 20 percentage points.

As for the impact of the enhanced gender diversity on firm performance, findings differ depending on the specification and the measure of performance. When a static model is estimated, as in Ferrari et al. (2016), gender diversity does not seem to exert a significant effect on any measure of corporate performance. However, when the model is extended in order to incorporate the past records of firm performances, gender diversity turns out to play a role in shaping corporate profitability. More in depth, we find a significant U-shaped impact of gender-diversity on corporate variables such as ROA, ROE, ROIC and ROS, with marginal effects being positive when the woman share in the boardroom goes beyond 17%-20%.

Given these results, we can state that, where relevant, female representation yields a positive impact when it exceeds a threshold ranging between about 17% and 20% of the board members, depending on the specification. Given the average board size, i.e. around ten members over the time period considered, this would imply that a significant effect of gender diversity on corporate performance starts to emerge when at least two women hold a board seat. This evidence supports the idea underpinning the critical mass theory, i.e., the hypothesis that women may influence

board decisions and consequently firm performance when a minimum weight is achieved.

The paper is organized as follows. The next section provides a survey of the empirical literature on the relationship between gender diversity and firms' outcomes. Section 3 provides details on the Italian framework as for corporate governance of listed firms and the legislation on female representation in the boardroom. Section 4 describes the data. Section 5 reports the econometric strategy and the estimation results. Section 6 concludes.

2 Literature review

As the debate on boardroom diversity spread out several countries, academic research about the impact of gender diversity on firm performance proliferated. From a theoretical perspective, the link between women representation and shareholder value draws from the influence that board composition might have on the way the board addresses its monitoring and advising functions, which in turn affect performance.[3] Indeed, meta-analyses posit that boards with more female directors tend to be more engaged in monitoring and strategic involvement and that this relationship is stronger in countries with a higher level of shareholders' protection (Post and Byron, 2015). Given their unique attributes, women can also contribute to organizational innovation, which in turn is one of the most important predictor of firm performance, provided that a minimum threshold of female board members is achieved (Elstad and Ladegard, 2010; Torchia et al., 2011).

On empirical grounds, we can distinguish two streams of investigation. A first stream deals with voluntary female board representation, i.e., representation that is not driven by mandatory gender quotas. In this framework, researchers have to tackle with an endogeneity issue, due to either differences in unobservable characteristics across firms that may affect their gender policies and governance choices, or potential reverse causality (Adams et al., 2010; Adams, 2016). A second stream of investigation draws from the mandatory gender policies recently implemented across the world and benefit from novel data set and more sophisticated methodology. Overall, the empirical evidence on the impact of boardroom diversity is mixed, while differences in samples, time periods and methods make difficult to deduce policy implications.

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3   See Carter et al. (2010), for a synthetic review of alternative theoretical strands that may help explaining how female board representation may contribute to firm financial performance. See Post and Byron (2015) for a review of the empirical studies analysing how gender diversity may affect board monitoring and board strategy involvement and, through this way, corporate profitability. To this respect, a large body of literature claims for fundamental differences in preferences of men and women (Marini, 1990; Croson and Gneezy, 2009), which define managers' personal styles in firm management (Bertrand and Schoar, 2003; Graham and Narsimhan, 2004; Bloom and Van Reenen, 2010; Malmendier, Tate and Yan, 2011, Liersch, 2013). See also Huang and Kisgen (2013), Adams and Ragunathan (2014), Levi, Li and Zhang (2014), and Faccio, Marchica and Mura (2016) bringing indirect evidence on female directors' self-confidence and risk taking attitude. Finally, refer to both experimental evidence (Silverman, 2003; Andreoni and Vesterlund, 2001) and survey evidence (Adams and Funk, 2012) documenting sex differences in corporate directors' preferences and values.

Some studies do not detect any statistically significant impact of female representation on firm profitability and/or market value. The interest reader is referred, among the others, to Randøy et al. (2006), focusing on the largest 500 companies from Denmark, Norway and Sweden in 2005; Rose (2007), focusing on a sample of listed Danish firms during the period of 1998–2001; Rose et al. (2013), analyzing a sample of the largest listed firms in the Nordic countries as well as Germany in 2010; Marinova et al. (2010), using 2007 data on 186 Dutch and Danish listed firms; Gregory-Smith et al. (2014), using UK data. Other studies find a negative relation between the percentage of women on boards and the corporate performance (see Shrader et al., 1997, for a sample of Fortune 500 firms in 1993).

These analyses support the idea that enhanced board diversity may be best designed around the moral value of diversity, rather than with reference to the 'business case' argument. Some arguments, however, may mitigate this conclusion. As pointed out by Rose (2007) and Rose et al. (2013), board members with unconventional background (such as women, younger and foreign board members) might unconsciously follow behavior and norms of the majority of conventional board members, thus preventing potential performance effects from materializing.

Moreover, women on board may engage in monitoring more actively than men do and this in turn may be counterproductive in already well-governed firms while being beneficial in companies with weak governance. This is claimed in Adams and Ferreira (2009), that delves into the relation between gender diversity and governance, on one hand, and on governance and performance, on the other hand, for Standard&Poor's (S&P) 500, S&P Mid Cap and S&P Small Cap firms over 1996-2003.[4] de Cabo et al. (2009) investigates the presence of women on boards of the EU banks over 1998-2004 and finds that female representations is higher where there is some evidence that monitoring plays a major role. Chen et al. (2015) focuses on a sample of US firms over 1996-2006 and finds that on average gender diversity improve performance of companies active in innovation-intensive industries, in industries where product market competition is lower and managers are more entrenched, i.e., when monitoring is needed the most. This evidence is in line with contingency theory, arguing that some board characteristics might be desirable in some organizations and not others, and under different circumstances and time (see Carter et al., 2010, for references).

Other studies highlight a positive relationship between performance and women on boards, by referring to the benefits of having more than one women on board (more on this in the following) and/or of a rigorous selection process. With regard to Spain, Campbell and Minguez-Vera (2008) show that firm value is positively affected by the ratio of women to men and by the degree of diversity in general (as measured by the Blau and Shannon indices) rather than by the presence of one or more women on the board per se. Farrel and Hersch (2005) find that higher women ratio leads to better financial performance in Fortune 500 firms over 1990-1999,

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4 The authors show that female directors record higher attendance rates, positively influence male directors' attendance, more frequently sit in monitoring-related committees, and are associated with greater equity-based compensation for directors and greater sensitivity of CEO turnover to stock performance.

although the announcement of a woman added to the board does not generate significant abnormal returns. The same positive result is detected by Erhardt et al. (2003) for 127 large US companies over the time-period 1993-1998. Also Adams and Ragunathan (2014) show that diversity is positively associated with performance for US listed bank holding companies and commercial banks over 2006-2009. This positive effect is probably driven by the high quality of female directors, on average slightly better educated than male directors are and subject to a harder selection process in the finance industry than elsewhere. Schwartz-Ziv (2013) uses the one-year minutes of the board and board-committee meetings of eleven Israeli government business companies between 2007 and 2009 in order to evaluate the extent to which gender diversity (and in particular the existence of a critical mass of female directors affects) board's actions and financial performance. The authors document that boards are most active when they are relatively gender-balanced (i.e., they include at least three male and three female directors), in line with the so-called critical mass argument (for references to a selected bibliography on tokenism and critical mass, see Konrad et al., 2008). Moreover, ROE and net profit margins are found to be significantly larger in companies with at least three directors of each gender. Owen and Temesvary (2017) brings forward additional evidence of non-linearities between board diversity and firm performance for 90 U.S. bank holding companies over the 1999-2016 period. Indeed, the authors find that adding women to the board enhances overall profitability if there is already at least one woman on the board, while no positive effect is associated to the first woman on board. This positive effect is only observed in better capitalized banks, thus suggesting again that the extent to which the institution is well-managed makes the difference. Evidence of a positive impact of gender diversity on firm performance are also found in Schmid and Urban (2016), who analyze both short and long term market reactions to exogenous retirements of female board members, due to death or illness, for 35,000 listed firms across 53 countries over 1998-2010. As argued by Adams and Ragunathan (2014), the authors claim that the more rigorous selection process undergone on average by women leads to an extraordinarily high quality of female board members, which then enhances firm valuation. To this respect, any interference with the selection process may be counterproductive, as it is the case for women entering the boardroom due to family connections or gender quotas.

In recent years, after the leading example of Norway[5], many countries have taken legislative actions in order to increase female representation at board level (Spain in 2007; Italy, Belgium, Netherlands and France in 2011; Germany in 2016). These actions led to the introduction of quotas, which changed the board member selection process. As a result, direct effects on the boards' actions may be expected, due to changes in the average competence in the pool of eligible candidates, the number of newly appointed board members, or increase in the total number of board seats. On methodological grounds, legislative initiatives are a natural experiment as they prompt an unprecedented exogenous change to corporate boards. Consequently,

5   The first legislative initiative in 2003 was based on voluntary compliance, since all public-limited firms were recommended to have at least 40% representation of women on their boards of directors. After voluntary compliance failed, the law came compulsory in 2006.

by referring to mandatory quotas researchers may best handle endogeneity issues when exploring the relationship between boardroom gender diversity and firm performance. Moreover, quotas allows more women sit in the board of directors and hence take companies beyond tokenism. The theory of tokenism (Kanter, 1977) suggests that women minorities in groups are not able to influence group decisions since they are subjective to discriminating behavior. Discrimination should be alleviated when the percentage of women goes beyond the token limit, i.e., 15% or two-three women according to the related critical mass theory. This in turn enables to test whether there is a critical mass of female directors to reach to have a bearing on corporate management and performance. On the other hand, recent research posits that women can influence decisions and hence must be regarded as influencers even when they are a minority or sole on a board (Konrad et al., 2008; McInerney-Lacombe et al., 2008; Elstad and Ladegard, 2010; Torchia et al., 2011).

The critical mass argument does not seem to be confirmed by the earlier investigations regarding Norway. Ahern and Dittmar (2012) finds a large negative impact of the quota for a panel of 248 listed Norwegian firms over 2001-2009 in terms of both stock price reaction to the initial announcement of the law and impact on profitability. Moreover, gender quota is found to have increased the probability of delisting by firms exposed to the obligation. The authors claim that the firm value loss is due to a deterioration in the capabilities of the board triggered by substantial differences among new female directors and retained male directors. Bøhren and Staubo (2016) confirms the negative impact of the Norwegian legislation by using an unbalanced panel from 2003 to 2008 of all Norwegian firms exposed to gender balance legislation. The mandated quota strongly enhanced the proportion of independent directors on board (as women are more frequently independent), which in turn might have interfered with the optimal tradeoff between the value of monitoring provided by independent (outside) directors and the value of advice provided by dependent (inside) directors, and penalized those firms that needed monitoring by independent directors the least. Matsa and Miller (2013) mitigates the conclusions in Ahern and Dittmar (2012) by analyzing how corporate decisions were affected by the gender quota for a panel of Nordic companies over 2003-2009. The authors highlight that the legislative initiative did not lead to less-profitable business decisions overall but only to changes in employment policies. Specifically, firms affected by the quota undertook fewer employee layoffs, causing an increase in relative labor costs, which in turn reduced short-run operating profits. The reduced layoffs cannot be attributed to board dysfunction, but are rather linked to gender differences in leadership style and, specifically, in corporate directors' preferences towards labor hoarding. Nygaard (2011) find no statistically significant effects of gender quota in those firms where information asymmetries among inside directors and newly appointed directors are high and outsiders cannot effectively develop their monitoring function. With less information asymmetry, vice versa, it is easier for an outsider or female director to apply her general expertise to a specific firm and become an effective director, thus enhancing its performance. Moreover, some firms benefit from having more women on board and therefore more monitoring as they had sub-optimal governance structure before the introduction of the quota. Eckbo et al. (2016) claim that the findings

of the earlier studies on the Norwegian case are questionable since they are driven either by the methodology used (as for Ahern and Dittmar, 2012) or by the time period considered (too short to capture the confounding effect of the financial crisis; Matsa and Miller, 2013). Indeed, they find that the introduction of the quota was neutral in terms of both short run market reaction and long run performance.[6]

International studies enable to capture also the role of the legal and economic environment. Terjesen et al. (2016) analyze the role of more gender-balanced boards for 47 countries in 2010 and find that the effect of independent directors on reducing agency costs is magnified by board gender diversity. Comi et al. (2017) study the effect of gender quotas on firm performance in seven European countries (including Italy), over 2004-2013. Consistently with Matsa and Miller (2013), they find that mandated gender representation has positive effects on employment, with subsequent negative effects on firm productivity and profitability, although such effects are not always significant. However, the effects are heterogeneous across regions, being positive and larger in those countries (such as Italy) characterized by lower initial levels of firm performance and greater gender imbalances. Adams and Kirchmaeir (2015) show that the relationship between diversity and corporate performance varies depending on several conditions relating to female labor force participation and, ultimately, to barriers to boardrooms. Where barriers are significant, women may not be able to raise their competencies and qualifications to the extent needed to access board directorship. Unless mitigating the factors underpinning female underrepresentation, gender diversity policies may hence miss the target as they may neither enlarge the pool of female directors, thus spurring female interlocking (i.e., raising the number of women holding multiple directorships), nor benefit firms' performance. This reasoning is well grounded in the authors' results, showing that the relationship between female board representation and corporate performance is positive when the full-time female labor force participation is above the median of the 22 sampled countries.

Finally, a few studies specifically focus on the Italian case. Bianco et al. (2015) sheds some light on female representation before the introduction of a gender quota legislation in 2012 and on the relevance of family connections. The authors find that in the majority of diverse Italian boards at least one of the women has a family connection with the controlling shareholder. Moreover, the number of board meetings appears to be negatively correlated with both the presence of family members and that of women on boards, whereas women show lower attendance to board meetings than male directors. Ferrari et al. (2016), focusing on Italian listed companies over 2007-2014, documents that the enforcement of gender quota might have led to an improved selection process, as along with the increase in the representa-

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6   For additional discussion on the impact of mandated quotas in Norway also on sociological grounds, see Dhir (2015) and Sjåfjell (2015). Additional investigations highlight how the gender quota affected the directors' search technology and the attributes of the directors. Ferreira et al. (2017) analyzes the impact of board gender quotas in France on the labor market for corporate directors and finds that the change in the directors' selection process triggered by the quota has improved the stability of director-firm matches, thus reducing female directors' turnover. Bertrand et al. (2014) shows that the introduction of the quota in Norway improved the observable characteristics of newly appointed female board members.

tiveness of women, education levels of all board members rose and age declined. Moreover, the authors find a positive impact of gender law, as the relation between the share of women on board and the variability of stock market prices is estimated to be negative and a positive effect on stock market returns at the date of board's election. As acknowledged by the authors, however, these results may not be conclusive given that they rely on a too short time period (two years) following the introduction of gender quotas. Finally, Gordini and Rancati (2017) analyses the relation between gender quota and firm financial performance over 2011-2014. The authors find that gender diversity, as measured by the percentage of women on a board and the Blau and the Shannon indices, positively and significantly impact on Tobin's Q, while the presence of one or more women on the board per se does not deliver any significant effect.

3 Main characteristics of Italian listed companies: ownership structure and board of directors

At the end of 2016, 230 Italian firms are listed on the main market. Since 2008, when they were 288, the number of listed firms has continuously decreased. In 2016 their average capitalization is equal to 1,963 millions of euro, while it was 1,267 millions of euro in 2008 (Table 1).

Listed firms' ownership has typically been characterized by a high level of concentration. In line with medium-term evidence, at the end of 2016 almost nine companies out of ten are controlled either by a single shareholder or by a shareholders' agreement (coalitions however have been losing importance since 2010). Non-controlled firms include both cooperative companies and widely held companies. Consistently with the limited contestability of control in the Italian market, the average stake held by the largest shareholder at the end of 2016 is 47%, substantially stable with respect to its 2008 value (46.7%). Along with the stability of these structural features, some changes have been detected in the last few years. In details, the use of control enhancing mechanisms such as pyramidal groups and non-voting shares, allowing separation between voting rights and cash flow rights, has been experiencing a reduction. From 2008 to 2016 the indicators of the degree of separation between ownership and control have declined, with the wedge (i.e., the difference between voting rights and cash flow rights) passing from 4.1 to 3.1% and the average leverage (i.e., the ratio between voting rights and cash flow rights) passing from 1.2 to 1.1.

Table 1 reports also data on selected features of Italian firms' corporate boards over 2008-2016.

The Italian legislation allows for three types of board structure since the 2003 company law reform. First, firms can adopt the "traditional" model, with a board of directors and a board of statutory auditors (collegio sindacale), both appointed by the shareholders' meeting. Secondly, the law envisages a "two-tier" model (dualistico) with a supervisory board appointed by the shareholders' meeting and a

management board appointed by the supervisory board, unless the bylaws provides for appointment by the shareholders' meeting. Finally, in the "one-tier" model (monistico) there is a board of directors, appointed by the shareholders' meeting, and a management control committee made up of non-executive independent members of the board.

As shown by the data in Table 1, the traditional model has always been the most prevalent governance system in the Italian market. In particular, at the end of 2016 only 5 firms out of 230 have opted for the two-tier or the one-tier model (respectively, 3 and 2 firms).

The average number of board members has remained around ten over the entire period, while the size of the management boards in firms adopting the two-tier system has decreased from 7.7 to 4.3. Finally, at the end of 2016 supervisory boards are composed on average by 13 members (12.4 in 2008).

Over the entire period the number of board meetings held during the year has increased from 9.9 to 11.2.

The Law 120/2011

Before the Law 120/2011, Italian boards of directors were composed mainly by men. As shown in Table 2, at the end of 2010 female boardroom representation was slightly lower than 7% and only in one firm out of two a female director was present. Also in light of the limited female representation in corporate boards, Law 120/2011 has mandated gender quotas for Italian listed companies. The Law requires gender quotas for the three board appointments subsequent August 2012, by setting out a minimum objective of one-third of the corporate board seats for members of the under-represented gender, lowered to one-fifth for the first term. [7] Directors mandates are generally for a three-year period, though companies' bylaws or general meetings may provide or allow for shorter (e.g. one-year) or different terms (e.g. staggered boards). Hence, a firm should be subject to the provisions set forth by the Law for a period of 6 years starting from the first board appointment subsequent to August 2012.

If a firm does not comply, Consob warns the company, which has four months to comply. In case of non-compliance, Consob can impose a fine ranging from a minimum of 100,000 euro to a maximum of 1,000,000 euro. If the company does not comply to the second warning within the following three months, the appointment of every elected director will be invalidated.

Data on the number of firms that have appointed a new board in each year in the period 2008-2016 are provided in Table 1. All appointments form 2008 to 2011 are pre-law. In 2012 we have both pre-law (before August) and post-law (after August) elections. All board elections made from 2013 to 2016 are post-law.

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7   For firms adopting the two tier system the provisions apply to the composition of the supervisory board.

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After 2012 the presence of women is continuously increased, reaching a value of 33.6% at the end of 2017. Moreover, nowadays almost all firms can be defined diverse board companies (Table 2). Provided that as recalled above the average board size has remained constant at around ten members, the compliance with the mandated gender quota was achieved through the replacement of existing directors rather than at the expense of the number of directors.

Interestingly, at the end of 2016 women held almost three board positions also in newly-listed companies, which will be subject to mandatory quotas only in the three board appointments subsequent to listing. Moreover, the breakdown of Italian companies according to the term of application of gender quotas shows that most companies have already enacted the one-third gender quota. Indeed, the percentage of board seats held by women in the companies that have undergone the second and third appointment under the new Law largely exceeds the mandated one-third quota (37.2% and 39.6% of total board size, respectively). Also companies that have undergone only the first board appointment record a female representation largely exceeding the one-fifth quota applying to the first term (27.7; Table 3).

Overall, the raising gender diversity has also affected other characteristics of Italian boards. Table 4 contains data on some directors' attributes in the period under analysis, which reflect these effects.

Over the entire period, the percentage of family directors (directors connected to the controlling shareholder, being the controlling shareholder themselves or their parents) has remained quite stable around 16%, mirroring the balance between the declining trend recorded for female directors (passed from 50% in 2008 to 25.8% in 2012 to11.8% in 2016) and the two point rise recorded for male directors (from 15.6% in 2008 to 17.4% in 2016).

From 2008 to 2016 the presence of independent directors is increased from 39.7% to 48.8%. At the end of 2016, 7 women out of 10 are independent, while in 2008 independent female accounted only for 18% of the total. As for men, the percentage of independent directors results quite stable in all the period, ranging from 43.9% in 2012 and 38.8% in 2016. As for the age, newly appointed women have contributed to stop the increase in the average age of directors started in 2008, when it was equal to 56.5. Indeed, from 2012 the average age is passed from 57.6 to 56.6, thanks to the increasing participation of women at boards, who are on average younger than men.

As for the level of education, over the entire period the proportion of graduated and post-graduated directors has risen (respectively from 76.3% to 86.7% and from 11.5% to 18.7%), mainly due to women, whose level of education has continuously increased. The percentage of graduated women has passed from 66% in 2008 to 90% in 2016, while post-graduated has increased from 12.5% to 26.1%. As for men, the presence of graduated directors has increased only by 8 percentage points and that of post-graduated by 4 percentage points.

As for the professional background, the appointment of the women pursuant to the law has contributed to reduce the proportion of directors with a manageri-

al professional background from 76.2 in 2012 to 70.2% in 2016. Indeed, new women have a more diversified professional background, being more often than men consultant/professionals or academics.

In spite of a marked reduction in the interlocking by Italian directors over the last years, the presence of women holding multiple directorships has largely increased. At the end of 2016, nearly 30% of women directors are interlockers, up from 21% in 2008 and 14% in 2012.

As for other boards characteristics, the presence of foreign members is increased from 5.4 to 7% and that of minorities from 4.3 to 8.3

Over the period under analysis, the average attendance rate at board meetings is increased from 88.1 to 92%. As for women, the participation rate is increased of almost 10 percentage points (from 83.3 to 92.2%) while for men it is increased of almost 4 percentage points.

4 Data

Our sample comprises Italian firms listed on the Italian Stock Exchange and the members of their board of directors over the period 2008-2016.

The study relies on two different database, both drawn from CONSOB, referring respectively to directors' characteristics and companies' characteristics. Information on the level of education and on the professional background of directors is hand-collected from their curriculum vitae. Information on internal governance characteristics is hand-collected from individual companies' Corporate Governance Reports for the years 2008-2016. Accounting and stock market data are cast from Datastream-Worldscope.

Our sample consists of an unbalanced panel of 22,003 director-level observations from 2,219 companies over the nine years considered. The number of companies varies from 278 in 2008 to 220 in 2016, while the number of unique firms is 313 in the sample overall.

Table 5 describes the variables used in the econometric analysis, while descriptive statistics are reported in Table 6. As for firm level financial variables, over the sample period the average ROA is quite low (0.4), while the average ROE and the average ROS are negative (-6.6 and -6.3 respectively).

Italian listed companies are mainly small or medium enterprises: the average firm has a market capitalization of EUR 1,674 million euros. The single largest company has a capitalization of about 71 million euros, while the smallest has a capitalization of slightly more than half a million euros.

As for board characteristics, board size ranges between two and 25 directors. The percentage of women on board varies between zero and 75% over the sample period. Family directors are on average 18% of the board over the whole

period, ranging between 0 and 100%. The average percentage of interlocker directors is 23% and concerns all directors in one case.

Independent directors are on average 43%; more than 8 directors out of 10 are graduated and 73.3% has a professional background as manager.

5 Econometric analysis

In order to estimate the impact of gender quotas for Italian listed companies on both board composition and board diversity, on one hand, and firm performance, on the other hand, we run two models.

The first model evaluates the impact of the Law 120/2011 on boardroom gender diversity and other board characteristics. Since enforceability does not seem to be an issue here, on average the sign of the effect of the law on gender diversity is expected to be positive. Nonetheless, both the size and the statistical significance of this effect remain open questions. Moreover, given the gradual compliance permitted by the law, the reform effect may be distributed over more than one board appointments, with instant and follow-up components that may differ in size, sign and statistical significance. Finally, the reform effects on board characteristics other than gender (age, education, professional background, interlocking) are also worth investigating.

The second model evaluates the impact of gender diversity on firm performance, as measured by the return on assets (ROA), return on equity (ROE), return on invested capital (ROIC) and return on sales (ROS). This analysis brings evidence on whether the law has been effective not only on equality grounds but also in benefiting Italian firm performance.

Results from both models are presented and discussed at the end of each subsection.

5.1 The reform average effect on gender diversity and other boardroom characteristics

Our identification strategy builds upon Ferrari et al. (2016), who partition listed companies into different groups depending on the date of the first board election and by using the fact that boards are renewed every three years. They identify three groups of companies, i.e. two sub-samples (group 1 and goup 2) with the last two election years straddling 2013 (the first year of the reform period), and the last subsample (group 3) straddling 2012, the phase-in year. Given this partition, in Ferrari et al. (2016), group 1 contains firms whose board elections were held in years 2007, 2010 and 2013; group 2 includes companies with elections in 2008, 2011 and 2014; group 3 contains firms with elections in 2009, 2012 and 2015. Ferrari et al. (2016) use data from groups 1 and 2 to evaluate the reform impact on board characteristics through what they refer to as an *adjusted-before-after-reform* estimator.

Letting y denote the board characteristic, Ferrari et. al. (2016) estimate the average effect of the reform on the first after-reform election (*instant effect* γ_1, henceforth) by the difference in mean differences:

$$\hat{\gamma}_1 = \left(\overline{y}_{t+3} - \overline{y}_t\right) - \left(\overline{y}_t - \overline{y}_{t-3}\right)$$.

Within this framework, the assumption of a constant trend over the time frame *(t-3,t+3)* is the identification assumption:

$$E\left(y \mid t-3\right) = \alpha$$
$$E\left(y \mid t\right) = \alpha + \delta$$
$$E\left(y \mid t+3\right) = \alpha + 2\delta + \gamma_1$$.

Given this hypothesis, the *adjusted-before-after-reform* estimator can be considered as a special *difference in difference* estimator (DD), using firms in *(t,t+3)* as the treatment group and the same firms in *(t-3,t)* as the control group.

Our analysis extends Ferrari et al. (2016) along two directions. First, since our dataset spans until 2016, we can use information on board elections in years 2010, 2013 and 2016 to evaluate the effect on the second post-reform round of board elections (follow-up effect γ_2, henceforth):

$$E\left(y \mid t-3\right) = \alpha$$
$$E\left(y \mid t\right) = \alpha + \delta + \gamma_1$$
$$E\left(y \mid t+3\right) = \alpha + 2\delta + \gamma_1 + \gamma_2$$.

with t=2013. The estimating equation identifying $\gamma_2 - \gamma_1$ is

$$y_{it} = \beta_{2010} \cdot \left(d_{2010,t} - d_{2016,t}\right) + \beta_{2013} \cdot \left(d_{2013,t} + 2d_{2016,t}\right) + \left(\gamma_2 - \gamma_1\right) d_{2016,t} + \varepsilon_{it}$$

where $d_{2010,t}$, $d_{2013,t}$ and $d_{2016,t}$ are year dummies, t=2010, 2013 and 2016 and *i* indicates all companies with elections in those years. We estimate the foregoing equation by using OLS with cluster-robust standard errors.

We can also separately identify γ_2 and γ_1 by pooling firms with appointments in *t=2008, 2010, 2011, 2013, 2014* and *2016*:

$$y_{it} = \sum_{s=2008,2010}\left[\beta_s \cdot \left(d_{s,t} - d_{s+6,t}\right) + \beta_{s+3} \cdot \left(d_{s+3,t} + 2d_{s+6,t}\right)\right] + \gamma_1 \cdot \left(d_{2014,t} - d_{2016,t}\right) + \gamma_2 \cdot d_{2016,t} + \varepsilon_{it}$$

Our second contribution is a test for the constant-trend assumption. We evaluate the trend restriction on the pooled sample of firms with board appointments in the pre-reform years: 2008, 2009, 2010 and 2011. The estimating equation for the constant-trend test is

$$y_{it} = \pi_0 + \pi_{trend} \cdot t + \pi_{2010} \cdot d_{2010,t} + \pi_{2011} \cdot d_{2011,t} + \varepsilon_{it}$$

where *t=2008, 2009, 2010*, $d_{2010,t}$ and $d_{2011,t}$ are the 2010 and 2011 dummies, respectively, and *2011* and *i* indicates all companies with elections in those years. The test is a cluster robust F-test for the null hypothesis that the coefficients of $d_{2010,t}$ and $d_{2011,t}$ are jointly zero.

Tables 7-11 report results for the average effects of the reform for a number of board characteristics, starting with the percentage of women in the boardroom. In each table Column (1) shows the estimates of γ_1 as estimated from the sample 2008-2011-2014. Column (2) reports the estimation results for

$$\hat{\gamma}_1 = \left(\overline{y}_{t+3} - \overline{y}_t\right) - \left(\overline{y}_t - \overline{y}_{t-3}\right)$$

in the phase-in group. This estimate can be informative on the extent to which the firms with board elections before August 2012 anticipated the incoming new legal framework in spite of not being subject to the gender quotas yet. Column (3) shows estimates of $\gamma_2 - \gamma_1$ as estimated from the sample 2010-2013-2016. Columns (4) shows separate estimates of γ_1 and γ_2 from the regression pooling the 2008-2011-2014 and 2010-2013-2016 subsamples. Hence, we have two estimation of γ_1, based on two different samples: one reported in column 1 and the other in column 4. Below each table, we report the F-test for the constant trend assumption.[8]

The instant effect on the percentage of female directors is around 16-17 percentage points, as shown in columns (1) and (4), and is statistically significant. The follow-up effect turns out to be smaller than the instant effect by a significant 6 percentage points (see column 3). The pooled regression shows, however, that the follow-up effect is significantly positive and as large as 11 percentage points (γ_2 in column 4). The F-test does not reject a constant trend at any conventional level of significance, supporting our causal interpretation of the coefficient estimates (Tab. 7).

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8   On methodological grounds, it would be better to estimate ($\gamma_2-\gamma_1$) and γ_1 from the same sample 2010-2013-2016, extended for elections in 2007 in order to separately estimate γ_1 and γ_2. Nonetheless, given the exogeneity of the timing of elections and the constant trend assumption, γ_1 is also accurately estimated from firms with elections in 2008-2011-2014.

We also analyze instant and follow-up effects of the mandatory gender quotas with respect to some characteristics of board members, i.e. formal education, age, professional background and interlocking. As for education, we estimate the effects on the percentage of graduated directors both in the whole sample of board members and in the female subsample. As for the latter, instant and follow-up effects are both positive and around 33–38 percentage points, indicating a steady increase in the percentage of female directors with a degree led by the implementation of mandatory quotas (Tab. 8a). The picture is similar for the overall percentage of directors with a degree, although the increase records lower figures (Tab. 8b). The constant trend assumption pass the test only for the percentage of women with a degree and only at the 5% significance level. This evidence supports the assumption that the foregoing estimates could not be entirely due to the reform but also to a long-lasting increasing trend in the average level of education of the board members.[9]

Tables 9a–9c report the effect of the reform on the average age of the board members and on age diversity, as measured through the age gap between the oldest and the youngest director (namely, a dummy variable equal to one if the gap is higher or equal to 40 years) and the standard deviation of the board members' age. After the first post-reform round of elections, the average age of board members records a marginal, statistically significant decrease along with an insignificant follow-up effect. Both measures of age diversity (i.e., the beyond-40-years age gap dummy and the age standard deviation) show a significantly positive instant effect, although not always confirmed by the pooled regression. In all cases, the F-test does not reject the constant-trend assumption.

As for the board members' professional background, the reform seems to have significantly reduced the average percentage of managers, by around 8.5–10 percentage points after each post-reform election, with instant and follow-up effects not significantly different. The F-test does not reject the constant-trend assumption (Tab. 10b). We also find a positive follow-up effect on the average percentage of women managers, although the causal interpretation is not supported by the constant-trend F-test, which does not reject the null only at 1% (Tab. 10a). As for the proportion of consultants on board, the effects of mandatory quotas go in the opposite direction to those estimated for managers, with both instant and follow-up effects significantly positive at around 4.8–7.4 percentage points. However, no significant impact is detected on the average percentage of female consultants. In both cases, the constant-trend F-test supports the causal interpretation (Tab. 10c and 10d).[10]

Finally, the law seems to have significantly reduced both the average number of directorships per director and the average number of interlockers in the boardroom, with homogenous instant and follow-up effects. The constant-trend F-tests are mildly significant in both cases, though, suggesting some caution in the causal

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9   No significant reform effect, whatsoever, is found on the percentage of directors with a postdoctoral degree. The constant-trend assumption is not rejected here.

10   No reform effect is observed on the average percentage of academic directors, either in general or just focusing on women, with a dubious causal interpretation in the case of women due to a significant constant-trend F-test.

interpretation of the foregoing effects. The result is clear-cut, instead for the percentage of women interlockers, which has increased steadily after the law with instant and follow-up effects that are significantly positive, respectively about 17 and 20 percentage points. Notice that, although larger, the follow-up effect is not statistically significantly larger than the instant effect. The constant-trend F-tests is not significant, supporting the causal interpretation of our estimates (Tab. 11a- 11c).

We have also performed other regressions in order to assess the impact of the law on the percentage of independent directors, the presence of family directors and the average level of attendance. However, we did not detect any significant reform effect. Results remain insignificant also when restricting to women.

5.2 The effect of gender diversity on corporate performance

Let us turn to models of corporate performance, relative to the impact between boardroom gender diversity, as measured by the percentage of women on board (*percentage women* or *perc_w in the equations*), on corporate performance (*y*) as measured through ROE, ROA, ROIC and ROS.[11] Econometric results are presented in Tables 12-15. In all cases, we accommodate a non-linear impact of *perc_w* by including also its square value as a right-hand variable into the estimating equation. This specification may identify an impact that is either U-shaped or hump-shaped. As it will be confirmed later, the nonlinear coefficient *β2* is always significant in the general dynamic specifications, so rejecting the linear specifications nested into them. Accordingly, our baseline equation is the following:

$$y_{it} = \beta_1 \cdot perc\_w_{it} + \beta_2 \cdot perc\_w_{it}^2 + \alpha_i + \lambda_t + \varepsilon_{it} \qquad (1)$$

i=1,...N and *t=1,...,T*. The possibly correlated individual- and time-specific error components, *αi* and *γt* are accommodated by including full sets of individual dummies (fixed effects at companies level) and time dummies. If *β1<0 and β2>0*, the impact of *percentage women* is U-shaped, being zero at *perc_w*=-β1/2β2*. It is hump-shaped, otherwise.

We first estimate equation (1) by OLS with individual and time dummies (Column 1 of each Table). The second specification of equation (1) treats both *percentage women* and *percentage women squared* as endogenous variables and uses a two-stage-least-squares (TSLS) estimator with individual and time dummies (Column 2 of each Table). Given that the calendar of board elections is both predetermined and firm-specific, we use three election indicators as external instruments: *dpre=I(board elections before 2012)*, *d2012=I(board elections in 2012)* and

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11 We have also evaluated the effects of the presence of women on return on investment (ROI). Results are in line with those found for the other dependent variables. However, the Hansen test does not support the over-identifying restrictions.

d_{post}=I(board elections after 2012).[12] Our third specification is dynamic (Column 3 of each Table) and allows past performance, as captured by the first three lags of y, to play a role in explaining the current performance of the firm:

$$y_{it} = \sum_{j=1}^{3} \gamma_j y_{i,t-j} + \beta_1 \cdot perc\_w_{it} + \beta_2 \cdot perc\_w_{it}^2 + \alpha_i + \lambda_t + \varepsilon_{it} \qquad (2)$$

The second dynamic specification (Column 4 of each Table) extends equation (2) by including a number of additional controls to capture idiosyncratic heterogeneity across firms: log of capitalization, wedge, average age of directors, percentage of interlockers and percentage of independent directors. In addition to *percentage women* and *percentage women squared,* both (2) and its extended specification include an extra endogenous variable, i.e., the first lag of y. To estimate these specifications, we use the Arellano and Bond (1991) first-difference GMM estimator by relying on an instrument set comprising d_{pre}, d_{2012} and d_{post} and all the usable lags of y beyond the first. We implement the Arellano-Bond estimator through the Stata code xtabond2 by Roodman (2009). As robustness checks, we also estimate specifications with a reduced lag count in the instrument set and with the capitalization variable treated as endogenous (see the last dynamic specification in each Table).

Tables 12-15 show results for each performance variable (ROA, ROE, ROIC and ROS). In the static specifications, *percentage women* and *percentage women squared* are both statistically significant only in the OLS model for ROE, while in the remaining cases they are never jointly significant (Table 13, column 1). This finding is largely in line with Ferrari et al. (2016), where the proportion of women on board is never found to exert a significant impact on corporate performance, however measured.

The picture changes, however, when moving to the dynamic specifications, which overcome the potential limits of the static models due to a confounding dynamic effect (columns 3-5 of each Table). In this case, we find convincing evidence of a U-shaped effect in all specifications with ROA, ROE, ROIC and ROS strongly and significantly affected by the percentage of women on board. In details, the threshold beyond which the presence of women begins to positively and significantly affect firm performance is estimated to be close to 20% of board members in all cases.

In the dynamic specifications, the instruments set always comprises all lags of the performance variable more remote than the second one, along with the election indicators, d_{pre}, d_{2012} and d_{post}. Diagnostic tests for the dynamic specifications are generally supportive. More specifically, the Arellano-Bond test for zero AR(2) correlation in differenced errors never rejects the null. In addition, the robust Hansen test generally supports the over-identifying restrictions in all models. Finally, also the robustness check performed in the last dynamic regressions confirm the U-shaped

12   Ferrari et al (2016) do not consider *percentage women squared* and limit their choice of instruments to d_{pre}.

effect of gender diversity with a strongly significant, around 20%, gender-diversity threshold.

This result complements the analysis of Ferrari et al. (2016) and supports the critical mass theory, which underlines that women minorities in groups are subjective to discriminating behavior, and hence are not able to influence group decisions. Two or more women may be needed to catalyze female effective activeness. Until recently, few companies exhibited such a critical mass and this might have biased the empirical evidence gathered by previous studies.

Finally, Table 16 reports marginal effects evaluated at different levels of *percentage women* (i.e., 10%, 20%, 30%, 40%, 50% and 60%) for ROA, ROE and ROIC. The regularity of the pattern of the impact of gender diversity across performance measures is striking: the effect of female presence is always significantly negative when it accounts for 10% of the board size, insignificant at 20% and significantly positive for levels greater than 20%.

6 Conclusion

In recent years legislative actions have been enacted in order to increase female representation at board level in many jurisdictions. In Italy the Law 120/2011 envisaged mandatory quotas for the three board appointments subsequent August 2012. The Italian law has introduced an exogenous shock in board composition, which may enable to overcome the endogeneity problem potentially impairing the analysis of boardroom diversity.

In this paper we analyze the impact of the introduction of gender quota on Italian listed companies along several dimensions. First, we evaluate the impact of the law on gender diversity and on some board attributes other than gender diversity. Secondly, we investigate the impact of the presence of women directors on firm performance.

As for the first strand of the analysis, we find that the significantly positive impact of the Law 120/2011 on the woman share in boardrooms of Italian listed companies is distributed over board appointments, being around 17 percentage points in the first post-reform election, and 11 percentage points in the second post-reform election. Our identification strategy depends on the assumption of a constant trend over board elections. We tested this assumption using pre-reform data, and we could not rejected it in most cases. An interesting extension would consider a dynamic specification for the models of board characteristics, in order to accommodate heterogeneous patterns of gender diversity over time and across firms. We also find that, following the appointment of new women pursuant to the law, boards have become more diverse in terms of age and professional background. In addition, the average age of board members has declined, while the average degree of formal education has risen. Moreover, the law has affected the percentage of interlocker directors, as their overall presence has decreased while the opposite holds for the percentage of female interlockers.

As for the second strand of our investigation, all dynamic models of firms performance as measured by ROA, ROE, ROIC and ROS consistently predict a U-shaped impact of enhanced gender diversity in the boardroom. We find that the estimated impact starts to be positive when the woman share exceeds 17%-20% of board members. Indeed, the evidence supports the idea underpinning the critical mass theory, i.e., the hypothesis that women may influence board decisions and consequently firm performance only when a minimum weight is achieved.

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Table 1 – Selected features of corporate governance of Italian listed firms

	2008	2009	2010	2011	2012	2013	2014	2015	2016
N. firms	288	278	270	260	251	244	238	234	230
Average Market capitalization (millions of euro)	1,267	1,598	3,035	2,471	1,889	1,741	1,824	2,229	1,963
Controlled firms (%)	87.5	87.1	85.9	86.9	86.1	85.2	83.6	84.2	86.1
Average stake largest shareholder (%)	46.7	47.1	46.2	46.1	46.8	46.8	46.0	46.7	46.9
Average Cash Flow Rights (%)	45.1	45.6	44.4	44.2	44.2	43.8	43.5	44.7	44.9
Average Voting Rights (%)	49.2	49.5	48.4	48.3	48.8	47.9	47.2	47.7	48.0
Average Wedge (%)	4.1	3.9	4.0	4.1	4.4	4.1	3.7	3.0	3.1
Average Leverage	1.2	1.2	1.2	1.3	1.3	1.3	1.2	1.1	1.1
N. firms adopting the Traditional model	267	267	260	250	243	237	232	228	225
Average size of the board of directors	9.9	10.0	10.1	10.1	10.0	9.9	9.8	9.8	9.9
Average size of the management board	7.7	7.7	7.4	6.7	6.3	6.6	6.5	6.0	4.3
Average size of the supervisory board	12.4	13.3	13.1	14.3	14.2	17.4	17.3	17.0	13.0
Average Board meetings	9.9	10.3	10.2	10.1	10.8	10.2	10.0	10.7	11.2
Pre-law board appointments	96	71	93	82	82	0	0	0	0
Post-law board appointments	0	0	0	0	10	70	69	101	66

Source: Consob.

Table 2 – Female representation on corporate boards of Italian listed companies

	boards of directors			
	female directorship[1]		diverse-board companies[3]	
	number	weight[2]	number	weight[4]
2010	182	6.8	133	49.6
2011	193	7.4	135	51.7
2012	288	11.6	169	66.8
2013	421	17.8	202	83.5
2014	521	22.7	217	91.9
2015	622	27.6	230	98.3
2016	701	31.6	226	99.1
2017	760	33.6	226	98.7

Source: Consob (2017) and Report on Corporate Governance of Italian listed companies 2017. Data on corporate boards of Italian companies with ordinary shares listed on Borsa Italiana spa - Mta Stock Exchange. [1] Figures refer to the board seats held by women. [2] Weight on total number of directorships. [3] Diverse-board companies are firms where at least one female director sits on the board. [4] Weight on total number of companies.

Table 3 – Female representation on boards of directors of Italian listed companies by term of application of Law 120/2011

	% companies	% market cap[1]	average no. of female directors	average weight of female directors
2016				
first term	56.6	*58.8*	2.7	27.7
second term	32.0	*32.7*	3.7	37.2
third term	4.8	*1.9*	3.5	39.6
not applied yet	6.6	*6.6*	2.5	27.7
total	*100.0*	*100.0*	*3.0*	*31.3*
2015				
first term	84.7	*93.1*	2.6	26.8
second term	7.7	*2.7*	3.5	39.0
third term	0.4	*–*	3.0	42.9
not applied yet	7.2	*4.2*	2.1	24.2
total	*100.0*	*100.0*	*2.6*	*27.6*
2014				
first term	56.8	*71.4*	2.5	26.6
second term	2.5	*1.6*	3.8	39.0
not applied yet	40.7	*26.9*	1.5	15.2
total	*100.0*	*100.0*	*2.1*	*22.2*

Source: Consob (2017). Data on corporate boards of Italian companies with ordinary shares listed on Borsa Italiana spa - Mta Stock Exchange. For 2016 data refer to the end of December. For the years 2015 and 2014 data refer to the end of June. [1] Market value of ordinary shares of companies in each group in percentage of market value of ordinary shares of all companies..

Table 4 – Directors characteristics

		2008	2009	2010	2011	2012	2013	2014	2015	2016
N. directors	All	2,739	2,728	2,643	2,567	2,401	2,332	2,211	2,222	2,160
	Women	168	172	181	192	283	417	500	617	677
	% women	6.1	6.3	6.8	7.5	11.8	17.9	22.6	27.8	31.3
% interlockers	All	30.1	27.8	28.0	27.3	24.7	23.8	22.5	20.7	21.9
	Women	20.8	20.3	16.0	15.1	13.8	19.2	24.6	26.4	29.8
	Men	30.7	28.3	28.9	28.3	26.2	24.8	21.9	18.6	18.2
% Independent	All	39.7	39.9	40.3	42.2	45.0	43.7	47.2	47.7	48.8
	Women	17.9	23.3	28.2	37.5	53.7	56.6	64.6	68.2	70.6
	Men	41.1	41.0	41.2	42.6	43.9	40.9	42.1	39.9	38.8
% Minority	All	4.3	5.5	5.9	6.2	6.7	6.7	7.3	8.1	8.3
	Women	3.0	2.9	3.9	5.7	5.7	6.2	8.2	7.8	7.7
	Men	4.4	5.7	6.0	6.2	6.8	6.8	7.1	8.2	8.6
% Family	All	17.7	17.0	17.0	16.3	16.2	16.3	16.3	15.8	15.6
	Women	50.0	47.7	48.6	42.2	25.8	18.2	15.0	13.1	11.8
	Men	15.6	14.9	14.7	14.2	14.9	15.9	16.7	16.9	17.4
% Graduated	All	76.3	80.5	82.7	84.0	84.9	85.5	85.6	85.7	86.7
	Women	66.1	71.5	72.9	75.5	83.0	87.5	88.0	88.5	90.3
	Men	76.9	81.1	83.4	84.7	85.2	85.1	84.9	84.6	85.0
% Post-graduated	All	11.5	12.4	12.6	12.9	13.3	14.7	16.2	18.0	18.7
	Women	12.5	13.4	13.3	12.5	18.0	21.1	24.0	26.4	26.1
	Men	11.4	12.3	12.5	12.9	12.7	13.3	13.9	14.7	15.3
% Manager	All	70.9	74.2	73.9	75.0	76.2	74.5	73.0	70.8	70.2
	Women	72.6	77.3	76.8	71.9	68.2	62.4	59.6	55.3	55.4
	Men	70.8	74.0	73.6	75.2	77.3	77.2	77.0	76.8	77.0
% Consultant /professionall	All	15.1	15.8	16.4	16.2	15.1	16.5	18.3	20.3	20.9
	Women	13.1	15,1	15.5	17.2	17.7	23.7	29.0	31.8	31.6
	Men	15.2	15.8	16.5	16.1	14.7	14.9	15.2	16.0	16.0
% academics	All	7.3	7.4	7.9	7.6	8.2	8.3	8.1	8.3	8.2
	Women	6.0	5.2	5.5	8.3	13.4	13.2	11.0	12.5	12.4
	Men	7.4	7.6	8.1	7.6	7.5	7.3	7.3	6.7	6.3
% Foreign	All	5.4	5.3	5.3	5.1	5.2	5.8	6.2	7.4	7.0
	Women	2.4	2.9	3.3	3.1	5.3	7.0	6.6	7.9	7.1
	Men	5.6	5.4	5.4	5.3	5.1	5.5	6.1	7.2	7.0
Average age	All	56.5	56.8	57.2	57.5	57.6	57.3	57.1	56.7	56.6
	Women	48.0	48.1	48.5	49.7	50.5	50.2	50.7	50.9	51.6
	Men	57.1	57.4	57.9	58.1	58.5	58.9	58.9	58.9	58.9
Average board meetings attendance	All	88.1	88.6	8.6	89.5	91.2	91.2	91.0	91.4	92.0
	Women	83.3	86.1	85.9	89.1	89.7	91.0	91.0	90.5	92.2
	Men	88.4	88.8	88.8	89.5	91.4	91.2	91.0	91.8	91.9

Source: Consob (2017), Report on Corporate Governance of Italian listed companies 2017.

Table 5 – Description of the variables

Name	Description
ROA	Return on assets
ROE	Return on equity
ROS	Return on sales
ROIC	Return on invested capital
Lcapit	Natural logarithm of the capitalization of ordinary shares
Wedge	Difference between voting rights and cash flows rights
Percentage independent	Percentage of independent directors on board
Percentage interlockers	Percentage of interlocker directors on board
perc_w_interlockers	Percentage of female interlocker directors on board
Percentage women	Percentage of women on board
N. directorships	Number of other directorships in Italian listed firms held by a director
Perc_w_degree	Percentage of female graduated directors at the board on the total number of female directors
Perc_degree	Percentage of graduated directors at the board
Age	The average age of the board directors
Age gap>=40 years	Dummy variable equal to one if the difference between the age of the oldest director and that of the youngest is higher or equal to 40 years
Std dev age	Standard deviation of the age of the board
Perc_w manager	Percentage of female directors with a managerial background in the board
Perc manager	Percentage of directors with a managerial background in the board
Perc_w consultant	Percentage of female directors with a background as consultant in the board
Perc_consultant	Percentage of directors with a background as consultant in the board

Lagged variables (in t–i) are identified as (Li.)

Table 6 – Description of the sample

Name	Obs	Mean	St. deviation	Min	Max
Firm characteristics					
ROA	2137	0.4	13.6	–191.1	227.6
ROS	2158	–6.3	67.8	–935.8	75.2
ROE	2078	–6.6	62.0	–901.1	564.7
ROIC	2143	1.0	54.8	–534.1	1614.6
Market capitalization (millions of euro)	2218	1,674	5,819	0.6	71,338
Wedge	2219	3.8	10.8	0.0	66.3

Board characteristics
(for firms adopting the two-tier system the supervisory board is considered)

Name	Obs	Mean	St. deviation	Min	Max
Percentage women	2219	14.8	13.1	0	75
Percentage independent	2219	42.9	18	0	100.0
age	2219	56.3	5.1	37.2	71.0
Age gap>=40	2219	0.2	0.4	0	1
Std dev age	2219	9.9	3.0	0.5	20.4
Percentage interlockers	2219	23.0	21.6	0	100.0
perc_w_interlockers	1533	21.1	33.4	0	100.0
n. directorships	22003	1.43	0.88	1	7
Perc_w_degree	1533	83.3	32.2	0	100.0
Perc_degree	2219	84.4	16.7	12.5	100.0
Perc_w_manager	1533	65.4	38.9	0	100.0
Perc_manager	2219	73.3	18.1	0	100.0
Perc_w_consultant	1533	24	35.4	0	100.0
Perc_consultant	2219	17.7	16.1	0	100.0

Table 7 – Mandatory gender quotas and board characteristics: instant and follow up effects on the percentage of women

Variables	(1) 2008–2011–2014	(2) 2009–2012–2015	(3) 2010–2013–2016	(4) pooled
γ_1				17.65***
				(2.004)
γ_2				11.09***
				(2.584)
DD	16.91***	7.211***	–6.731***	
	(1.868)	(1.948)	(1.582)	
Observations	279	194	216	495
R–squared	0.410	0.730	0.742	0.695
Constant–trend test				
Observations		342		
F–test		1.020		
p–value		0.362		

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

DD in column (1) is an estimation of γ_1. DD in Column (2) is an estimation of $\hat{\gamma}_1 = \left(\overline{y}_{t+3} - \overline{y}_t\right) - \left(\overline{y}_t - \overline{y}_{t-3}\right)$.

DD in column (3) is an estimation of $\gamma_2 - \gamma_1$. as estimated from the sample 2010-2013-2016.

Table 8 – Mandatory gender quotas and board characteristics: instant and follow up effects on the percentage of graduated directors

A) WOMEN

Variables	(1) 2008–2011–2014	(2) 2009–2012–2015	(3) 2010–2013–2016	(4) pooled
γ_1				35.17***
				(11.87)
γ_2				32.75**
				(13.02)
DD	38.07***	0.894	−0.473	
	(12.19)	(5.877)	(6.346)	
Observations	182	152	168	350
R-squared	0.654	0.785	0.821	0.807
Constant–trend test				
Observations		168		
F–test		2.878*		
p–value		0.0597		

B) ALL DIRECTORS

Variables	(1) 2008–2011–2014	(2) 2009–2012–2015	(3) 2010–2013–2016	(4) pooled
γ_1				8.211**
				(3.175)
γ_2				7.311*
				(4.183)
DD	7.309**	−1.556	0.327	
	(3.156)	(1.664)	(2.487)	
Observations	279	194	216	495
R-squared	0.764	0.924	0.857	0.870
Constant–trend test				
Observations		342		
F–test		5.236***		
p–value		0.006		

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

DD in column (1) is an estimation of γ_1. DD in Column (2) is an estimation of $\hat{\gamma}_1 = \left(\bar{y}_{t+3} - \bar{y}_t \right) - \left(\bar{y}_t - \bar{y}_{t-3} \right)$.

DD in column (3) is an estimation of $\gamma_2 - \gamma_1$. as estimated from the sample 2010-2013-2016.

Table 9 – Mandatory gender quotas and board characteristics: instant and follow up effects on the board age

A) AVERAGE BOARD AGE

Variables	(1) 2008–2011–2014	(2) 2009–2012–2015	(3) 2010–2013–2016	(4) pooled
γ_1				-1.832* (1.032)
γ_2				-0.337 (1.404)
DD	-1.651 (0.999)	-1.155* (0.623)	1.246 (0.769)	
Observations	279	194	216	495
R–squared	0.788	0.960	0.899	0.900

	Constant–trend test			
Observations	342			
F–test	1.458			
p–value	0.235			

B) BOARD AGE GAP (>=40 YEARS)

Variables	(1) 2008–2011–2014	(2) 2009–2012–2015	(3) 2010–2013–2016	(4) pooled
γ1				0.150* (0.0786)
γ2				0.0543 (0.111)
DD	0.160* (0.0832)	0.0840 (0.0813)	-0.117 (0.0878)	
Observations	279	194	216	495
R–squared	0.172	0.218	0.155	0.160

	Constant–trend test			
Observations	342			
F–test	1.013			
p–value	0.364			

C) STANDARD DEVIATION OF THE BOARD AGE

Variables	(1) 2008–2011–2014	(2) 2009–2012–2015	(3) 2010–2013–2016	(4) pooled
γ_1				0.664 (0.491)
γ_2				-0.348 (0.735)
DD	0.990** (0.491)	0.279 (0.534)	-1.005* (0.574)	
Observations	279	194	216	495
R–squared	0.749	0.909	0.829	0.840

	Constant–trend test			
Observations	342			
F–test	2.175			
p–value	0.116			

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

DD in column (1) is an estimation of γ_1. DD in Column (2) is an estimation of $\hat{\gamma}_1 = \left(\overline{y}_{t+3} - \overline{y}_t\right) - \left(\overline{y}_t - \overline{y}_{t-3}\right)$.

DD in column (3) is an estimation of γ_2–γ_1. as estimated from the sample 2010-2013-2016.

Table 10 – Mandatory gender quotas and board characteristics: instant and follow up effects on the professional background of directors

A) WOMEN WITH A PROFESSIONAL BACKGROUND AS MANAGER

Variables	(1) 2008–2011–2014	(2) 2009–2012–2015	(3) 2010–2013–2016	(4) pooled
γ_1				−1.936
				(12.21)
γ_2				16.48
				(14.53)
DD	−5.157	6.342	23.39***	
	(12.35)	(10.97)	(8.533)	
Observations	182	152	168	350
R–squared	0.530	0.745	0.730	0.664
Constant–trend test				
Observations		168		
F–test		3.835***		
p–value		0.0240		

B) ALL DIRECTORS WITH A PROFESSIONAL BACKGROUND AS MANAGER

Variables	(1) 2008–2011–2014	(2) 2009–2012–2015	(3) 2010–2013–2016	(4) pooled
γ_1				−8.858**
				(3.623)
γ_2				−9.769**
				(4.847)
DD	−8.518**	−7.281***	1.648	
	(3.706)	(2.351)	(3.242)	
Observations	279	194	216	495
R–squared	0.740	0.934	0.869	0.853
Constant–trend test				
Observations		342		
F–test		2.279		
p–value		0.104		

C) WOMEN WITH A PROFESSIONAL BACKGROUND AS CONSULTANT

Variables	(1) 2008–2011–2014	(2) 2009–2012–2015	(3) 2010–2013–2016	(4) pooled
γ_1				8.957
				(11.14)
γ_2				-3.968
				(13.50)
DD	13.42	0.530	-17.98**	
	(10.79)	(10.00)	(7.747)	
Observations	182	152	168	350
R–squared	0.237	0.348	0.368	0.353
Constant–trend test				
Observations		168		
F–test		0.611		
p–value		0.544		

D) ALL DIRECTORS WITH A PROFESSIONAL BACKGROUND AS CONSULTANT

Variables	(1) 2008–2011–2014	(2) 2009–2012–2015	(3) 2010–2013–2016	(4) pooled
γ_1				4.961*
				(2.881)
γ_2				7.445*
				(4.200)
DD	4.757*	5.017***	-0.454	
	(2.713)	(1.820)	(3.107)	
Observations	279	194	216	495
R–squared	0.400	0.497	0.441	0.491
Constant–trend test				
Observations		342		
F–test		0.0662		
p–value		0.936		

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

DD in column (1) is an estimation of γ_1. DD in Column (2) is an estimation of $\hat{\gamma}_1 = \left(\bar{y}_{t+3} - \bar{y}_t\right) - \left(\bar{y}_t - \bar{y}_{t-3}\right)$.

DD in column (3) is an estimation of $\gamma_2 - \gamma_1$. as estimated from the sample 2010-2013-2016.

Table 11 – Mandatory gender quotas and board characteristics: instant and follow up effects on the interlocking

A) INTERLOCKER DIRECTORS

Variables	(1) 2008-2011-2014	(2) 2009-2012-2015	(3) 2010-2013-2016	(4) pooled
γ_1				-5.257 (3.926)
γ_2				-3.004 (5.061)
DD	-7.244* (3.867)	-4.128 (3.000)	1.507 (3.314)	
Observations	279	194	216	495
R-squared	0.540	0.512	0.481	0.524

Constant-trend test	
Observations	342
F-test	2.477*
p-value	0.086

B) FEMALE INTERLOCKER DIRECTORS

Variables	(1) 2008-2011-2014	(2) 2009-2012-2015	(3) 2010-2013-2016	(4) pooled
γ_1				16.51** (6.761)
γ_2				20.07** (9.431)
DD	15.94** (7.064)	18.08** (8.239)	3.538 (7.114)	
Observations	182	152	168	350
R-squared	0.303	0.287	0.234	0.298

Constant-trend test	
Observations	168
F-test	0.402
p-value	0.669

C) NUMBER OF DIRECTORSHIPS

Variables	(1) 2008-2011-2014	(2) 2009-2012-2015	(3) 2010-2013-2016	(4) pooled
γ_1				-0.126* (0.0700)
γ_2				-0.157* (0.0938)
DD	-0.169** (0.0694)	-0.103 (0.0642)	-0.0385 (0.0656)	
Observations	279	194	216	495
R-squared	0.774	0.881	0.827	0.839

Constant-trend test	
Observations	342
F-test	2.366*
p-value	0.096

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

DD in Column (1) is an estimation of γ_1. DD in Column (2) is an estimation of $\hat{\gamma}_1 = \left(\bar{y}_{t+3} - \bar{y}_t\right) - \left(\bar{y}_t - \bar{y}_{t-3}\right)$.

DD in column (3) is an estimation of $\gamma_2 - \gamma_1$. as estimated from the sample 2010-2013-2016.

Table 12 – Effects of the quota law on ROA

Variables	Static regressions		Dynamic regressions		
	(1) OLS	(2) TSLS	(3) AB	(4) AB	(5) AB
Percentage women	–0.0575 (0.0881)	–0.165 (1.238)	–1.006*** (0.382)	–1.098** (0.471)	–0.985** (0.496)
Percentage women squared	0.00345 (0.00232)	–0.00153 (0.0306)	0.0253** (0.00990)	0.0230** (0.0112)	0.0208* (0.0116)
L.roa			0.0966 (0.173)	0.159 (0.138)	0.162 (0.138)
L2.roa			0.0615 (0.0846)	0.0477 (0.0773)	0.0434 (0.0775)
L3.roa			–0.204 (0.154)	–0.130 (0.123)	–0.122 (0.111)
Wedge				0.134 (0.121)	0.135 (0.120)
Age				–0.643** (0.276)	–0.610* (0.350)
Lcapit				3.978** (1.937)	2.973 (4.632)
percentage independent				0.0643 (0.0508)	0.0546 (0.0513)
Percentage interlockers				–0.00493 (0.0403)	0.000856 (0.0365)
Constant	1.699*** (0.626)	3.056 (4.590)			
Observations	2,137	2,137	939	939	939
Number of companies	312	312	224	224	224
R–squared	0.014				
Year dummies	YES	YES	YES	YES	YES
F–test pvalue for perc_w & perc_w2=0	0.320	0.211	0.030**	0.022**	0.089*
First–stage partial F–test perc_w2		93.89			
First–stage partial F–test perc_w		129.3			
$perc\_w^*=-\beta_1/2\beta_2$			19.9%***	23.9%***	23.7%***
F–test pvalue for dyn. Coefficients			0.012**	0.001***	0.002***
AR(2) test p–value			0.561	0.479	0.464
Hansen test p–value			0.107	0.461	0.511

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. In the specification in column (5) the capitalization variable is treated as endogenous.

Table 13 – effects of the quota law on ROE

Variables	Static regressions		Dynamic regressions		
	(1) OLS	(2) TSLS	(3) AB	(4) AB	(5) AB
Percentage women	−1.275* (0.764)	−5.329 (5.738)	−3.873** (1.737)	−5.593** (2.328)	−5.002* (2.880)
Percentage women squared	0.0299** (0.0132)	0.114 (0.135)	0.0935** (0.0423)	0.134** (0.0546)	0.117* (0.0679)
L.roe			−0.291** (0.137)	−0.278* (0.144)	−0.303* (0.162)
L2.roe			−0.190*** (0.0658)	−0.160 (0.121)	−0.169 (0.107)
L3.roe			−0.0593 (0.0944)	−0.0554 (0.0942)	−0.0617 (0.0894)
Wedge				0.937 (1.531)	0.865 (1.560)
Age				−0.408 (1.426)	−0.716 (1.615)
Lcapit				15.13* (8.129)	−1.433 (52.50)
Percentage independent				0.0641 (0.269)	0.129 (0.305)
Percentage interlockers				−0.166 (0.161)	−0.150 (0.201)
Constant	4.768 (3.709)	21.53 (23.20)			
Observations	2,078	2,078	917	917	917
R-squared	0.013				
Number of companies	309	309	215	215	215
Year dummies	YES	YES	YES	YES	YES
F-test pvalue for perc_w & perc_w2=0	0.0567	0.400	0.083*	0.050**	0.221
First-stage partial F-test perc_w		139.1			
First-stage partial F-test perc_w2		113.6			
F-test pvalue for dyn. coefficients			0.002***	0.263	0.222
AR(2) test p-value			0.497	0.634	0.583
perc_w*=−β₁/2β₂			20.7%***	20.9%***	21.4%***
Hansen test p-value			0.820	0.865	0.873

Robust standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. In the specification in column (5) the capitalization variable is treated as endogenous.

Table 14 – Effects of the quota law on ROS

Variables	Static regressions		Dynamic regressions		
	(1) OLS	(2) TSLS	(3) AB	(4) AB	(5) AB
Percentage women	-0.852* (0.514)	-4.119 (2.644)	-11.27*** (4.151)	-14.23*** (5.089)	-16.90*** (5.423)
Percentage women squared	0.0142 (0.0114)	0.0986 (0.0662)	0.302*** (0.110)	0.344*** (0.122)	0.415*** (0.135)
L.ros			0.243 (0.189)	0.266 (0.194)	0.219 (0.186)
L2.ros			0.208** (0.0829)	0.194* (0.103)	0.202* (0.122)
L3.ros			0.0590 (0.104)	0.0759 (0.104)	0.144 (0.104)
wedge				-0.511 (0.566)	-0.389 (0.988)
age				-3.666 (3.779)	-1.630 (2.923)
lcapit				19.52*** (7.484)	140.4** (65.29)
Percentage independent				1.022* (0.539)	0.850** (0.411)
Percentage interlockers				0.0437 (0.266)	0.0171 (0.315)
constant	-0.205 (2.865)	11.11 (9.389)			
Observations	2,158	2,158	1,010	1,010	1,010
R-squared	0.006				
Number of companies	311	311	226	226	226
Year dummies	YES	YES	YES	YES	YES
F-test pvalue for perc_w & perc_w2=0	0.201	0.283	0.023**	0.018**	0.008***
First-stage partial F-test perc_w		137.3			
First-stage partial F-test perc_w2		99.71			
F-test pvalue for dyn. coefficients			0.000***	0.000***	0.000***
AR(2) test p-value			0.480	0.278	0.441
Hansen test p-value			0.112	0.041**	0.633
perc_w=-β_1/2β_2			18.7%***	20.7%***	20.3%***

Robust standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. In the specification in column (5) the capitalization variable is treated as endogenous.

Table 15 – Effects of the quota law on ROIC

Variables	Static regressions		Dynamic regressions		
	(1) OLS	(2) TSLS	(3) AB	(4) AB	(5) AB
Percentage women	−0.0987 (0.501)	−1.354 (2.237)	−1.497* (0.834)	−1.593** (0.750)	−1.723** (0.818)
Percentage women squared	0.0224 (0.0171)	0.0366 (0.0572)	0.0361* (0.0209)	0.0378** (0.0170)	0.0420** (0.0194)
L.roic			0.477*** (0.133)	0.473*** (0.137)	0.476*** (0.145)
L2.roic			0.0114 (0.0814)	0.0135 (0.0845)	−0.00203 (0.0882)
L3.roic			−0.171*** (0.0473)	−0.172*** (0.0499)	−0.162*** (0.0523)
wedge				0.195 (0.128)	0.223 (0.169)
age				−0.244 (0.594)	0.0444 (0.869)
lcapit				3.333 (2.061)	15.63 (18.60)
Percentage independent				0.0620 (0.0779)	0.0576 (0.0877)
Percentage interlockers				0.0492 (0.0667)	0.0652 (0.0788)
constant	3.901 (3.532)	10.54 (8.499)			
Observations	2,134	2,134	938	938	938
R-squared	0.021				
Number of companies	309	309	223	223	223
Year dummies	YES	YES	YES	YES	YES
F-test pvalue for perc_w & perc_w2=0	0.129	0.814	0.181	0.084*	0.097*
First-stage partial F-test perc_w		137			
First-stage partial F-test perc_w2		106.2			
F-test pvalue for dyn. coefficients			0.000***	0.000***	0.000***
AR(2) test p-value			0.823	0.828	0.783
Hansen test p-value			0.408	0.405	0.481
perc_w=−β_1/2β_2			20.7%***	21.1%***	20.5%***

Robust standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. In the specification in column (5) the capitalization variable is treated as endogenous.

Table 16 – Marginal effects of percentage of women

% women	(1) ROA	(2) ROE	(3) ROIC
10%	-0.500***	-2.003**	-0.774*
20%	-0.005	-0.134	-0.051
30%	0.510**	1.734**	0.67
40%	1.016**	3.603**	1.393
50%	1.521**	5.473**	2.11*
60%	2.027**	7.342**	2.83*

*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

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