DEPARTMENT OF ECONOMICS,
MANAGEMENT AND STATISTICS

UNIVERSITY OF MILAN – BICOCCA

DEMS WORKING PAPER SERIES

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No. 367 – July 2017

Dipartimento di Economia, Metodi Quantitativi e Strategie di Impresa
Università degli Studi di Milano - Bicocca
http://dems.unimib.it/

Where Women Make The Difference. The Effects of Corporate Board Gender Quotas on Firms' Performance across Europe*

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Abstract. We study the effect of corporate board gender quotas on firm performance in Belgium, France, Italy and Spain. The empirical analysis is based on accounting panel data from Bureau Van Dijk's Amadeus. Our identification strategy relies on both double and triple difference estimators with ex-ante matching. We find that gender quotas had either a negative or an insignificant effect on firm performance in the countries considered with the exception of Italy, where we find a positive impact on productivity. We then focus on Italy and offer possible explanations for the positive effect of gender quotas using detailed information on board members' characteristics.

Keywords: Gender quotas, corporate governance, firm performance, productivity

JEL Codes: G30, G38, J3

* We thank Margherita Fort, Sissel Jensen, Michele Pellizzari and Nina Smith for their suggestions. Comments by participants at EEA-ESEM Geneva 2016, ESPE Berlin 2016, EALE Ghent 2016, International Association for Applied Econometrics Milan 2016, Brucchi Luchino Workshop 2016 and seminar at Bergamo University are much appreciated.

1. Introduction

Most industrialized countries have registered a significant increase in female educational attainment and labour market participation in recent decades. However, in the same period such improvements have not translated into more female representation in economic leadership positions, even in countries, like the Scandinavian ones, which have already achieved good results in terms of overall gender equality in the labour market. The average share of women on the boards of the largest publicly listed companies in the EU-28 Member States was 9 per cent in 2003 and it grew just to 10 per cent in 2007.

In order to speed up the increase in female representation in top leadership positions and the cultural change needed to favour women's access to top jobs, both international organizations and national governments have considered the possibility of taking legislative action, in some cases of a temporary nature, to promote gender-balanced representation on corporate boards. Norway was the first country to move in this direction. It did so in 2003 by enacting a law mandating that each gender should represent at least 40 per cent of the members of the board of public limited companies. In the EU, the issue of women on boards has been high on the political agenda since 2010, when the European Commission adopted the *Strategy for Equality between Women and Men 2010-2015.* One of its key actions in the field of gender balance in decision-making was "to monitor progress towards the aim of 40 per cent of members of one sex in committees and expert groups established by the Commission" (European Commission, 2011).[1]

Following the European Commission's actions, a lively debate arose both in the EU and within many of its Member States on the usefulness of legal actions to obtain more female representation in the highest job positions. There is no consensus on the potential benefits of such actions (Smith, 2014). The supporters of gender quotas believe that they will help to crack the glass ceiling that prevents productive high skilled women from reaching leadership positions, with beneficial effects on firm performance

[1] A concrete step forward was taken in November 2012, when the Commission proposed a Directive establishing a "procedural quota", which set the objective of a minimum of 40 per cent of each sex among non-executive directors by 2020. On 20 November 2013, the European Parliament voted with a strong majority to back the proposed Directive, confirming the broad consensus on increasing the gender balance on corporate boards in the EU. The Directive, favoured by the majority of Member States, is currently being discussed by the European Council.

(European Commission, 2012 and 2014). The opponents of gender quotas claim that if boards are already set to maximize firm value – or any other measure of firm performance – the introduction of a binding constraint in terms of the number of women among board members should necessarily lead to a sub-optimal output (Demsetz and Lehn, 1985).

Despite the different views on the effect of mandated gender quotas on firm performance, it is indubitable that they are the most effective tool with which to rapidly increase the number of women on corporate boards (Walby, 2013). For this reason, following the Norwegian example and the EU recommendations, a number of EU countries (Spain in 2007; Belgium, France, Italy and Netherlands in 2011 and Germany in 2016) have recently passed national laws with mandated gender quotas for private companies, albeit with different rules in terms of targeted firms, size of the gender quota, and severity of sanctions for non-compliers. Also thanks to these initiatives, in April 2016, the average share of women on the boards of the largest publicly listed companies in the EU-28 Member States reached 23.3 per cent, although only in ten EU Member States (Belgium, Denmark, Finland, France, Germany, Italy, Latvia, the Netherlands, Sweden and the UK) did women account for at least one quarter of board members. The figures are even more dismal when one considers top executive positions: only 5.1 per cent of the largest listed companies in Europe had a female chief executive officer.

The legislative actions on gender quotas provide researchers with a set of quasi-natural experiments to study the causal effect of gender quotas on company performance. Moreover, the progressive adoption of mandated female board quotas in different countries offers fertile ground for investigating country-specific effects of this type of legislation and to explore the potential mechanism through which gender quotas could affect firm value. In this paper, we extend previous research on the effects of gender quotas on firm performance by testing whether results obtained so far in the economics literature for Norway are extendable to the EU countries that have adopted gender quotas.

There is a growing body of economic literature analysing the relationship between women in leadership positions and company performance. The findings in this literature are mixed (Post and Byron, 2015). Some studies find that female representation is either positively (Carter et al., 2003; Erhardt et al., 2003; Smith et al., 2006) or negatively (Adams and Ferreira, 2009; Minguez-Vera and

Martin 2011) correlated with firm's performance. Other studies find no correlation (Carter et al., 2010; Francoeur et al., 2008; Rose, 2007; Marinova et al., 2010, Gregory-Smith et al., 2014). Such heterogeneous results may depend on differences across studies in both methodologies and in contextual factors, like the time period or the country analysed (Adams et al. 2015).

More recent analysis exploits the exogenous introduction of gender quotas in Norway for identification and shows that, after the legislative action in 2003, the stock price of the affected firms and Tobin's Q significantly dropped in the following years, consistently with the idea that firms choose boards to maximize value (Ahern and Dittmar, 2012). Matsa and Miller (2013) find that Norwegian firms affected by the reform reduced workforce less than unaffected firms did, raising relative labour costs and employment levels and reducing short-term profits. Bohren and Staubo (2016) find that the mandatory quota is associated with increased board independence and reduced firm value. Bertrand et al. (2014) show that a large number of public limited companies changed their status to private after 2003. Ahern and Dittmar (2012) point out that, among companies listed on the stock exchange prior to the reform, the likelihood of delisting at any time between 2003 and 2009 was larger among those with a smaller initial share of women on their board, which were those companies that found it more demanding to comply with the law.

Overall, papers on the Norwegian experience generally find a negative relationship between gender quotas and firms' outcomes, at least in the short run. However, broadening the evaluation of gender quotas effects beyond the Norwegian borders is necessary to ensure external validity of the results found in this literature so far. Indeed, recent studies emphasise the need for comparative empirical research to extend the generally single-country studies' results (Terjesen and Singh, 2008; Terjesen et al., 2015). The existing mixed empirical evidence on the relation between board gender diversity and firm performance discussed above may well be related to country-level variation in institutional features (e.g. related to corporate governance) or in cultural attitudes regarding the role of women in leadership positions. As a growing number of countries are adopting legislation on board gender quotas, research aimed at understanding its effect in different contexts beyond Norway may help bring out interesting

differences in the relationship between female representation and firm performance and in the channels through which these latter variables are related (Hillman, 2015).

In this paper, we contribute to the literature on gender quotas by providing, in a comparative perspective, an analysis of the effects of mandated female board representation on firm performance in four EU countries: Belgium, France, Italy and Spain. We use accounting data taken from Bureau Van Dijk's Amadeus for the 2004-2014 period. To estimate the causal effect of the legislation on gender quotas on firm performance, we start by using a difference in differences (DD) estimator, which compares treated and untreated firms within the same country. We identify the treated firms according to the country-specific legislation on mandated female board representation.

The DD identification strategy requires parallel trends of outcomes before the introduction of the mandated gender quota. Given that in some cases the parallel trend assumption is not verified, we move to a triple difference estimator (DDD). More specifically, we compare the double difference in each country with the same estimate for Germany, which had not adopted such type of legislation in the period that we consider, but which has some features in common with the treated countries in terms of socio-economic and institutional characteristics. Confirming the concern expressed by Ferreira (2015) that there is no natural control group to which the treated firms should be compared, we show that in some cases Germany is a good counterfactual country, but in other cases the within-country control group used in the DD model is preferable. To further address the issue of comparability between treatment and control groups, in all our specifications (both DD and DDD) we use an ex-ante matching algorithm to select, for each treated firm, the set of the control firms more similar in terms of observed characteristics.

We consider a set of firm outcomes. More specifically, as well as ROA (a profitability indicator commonly used in this literature) and the number of employees, we extend the analysis to productivity measures, paying specific attention to both labour productivity (measured by the value added per employee) and total factor productivity (TFP). The results of our analysis show that gender quotas have no significant effect on firm profitability and either a negative or an insignificant effect on productivity.

However, a major exception regards Italy, where, differently from other countries, we find that gender quotas affected positively firm productivity.

Given the dissimilarity between our results for Italy and those found for other countries, we focus on the former country and explore the possible channels driving this difference, focussing on changes in the quality of board members on the basis of matched firm-board member data.

Overall, our results suggest that Italian firms complied with the law by hiring new highly-educated women, mostly graduates in fields such as law, management and economics, and with the same amount of work experience in managerial positions as the incumbents. Furthermore, it appears that more experienced men directors were appointed, suggesting that gender quotas actually triggered a thorough restructuring of the board, with a potential subsequent positive impact on firm productivity. Descriptive evidence shows also that the share of independent directors grew after the introduction of gender quotas, with a possible beneficial effect on board monitoring and, in turn, on firm performance.

The rest of the paper is organised into six sections. Section 2 discusses the main theoretical arguments underlying the relationship between gender quotas and firm performance; Section 3 describes the institutional background related to the introduction of mandated gender quotas in the EU, and it provides empirical evidence on the impact of gender quotas on female board representation. Section 4 describes the data and the empirical strategy. Section 5 presents the main results, while Section 6 extends the analysis with further estimates on Italy; Section 7 concludes.

2. Theoretical background

In this Section, we discuss the main theoretical arguments underlying the relationship between gender quotas and firm performance. There are different potential channels relating the two variables. They mostly depend on the motivations behind directors' appointments (maximisation of firm's profit or maximization of managers' private benefits) and on whether or not managers and shareholders that appoint directors are informed about potential directors' characteristics.

The first theory that might explain how gender quotas could affect firm performance assumes that boards are chosen to maximize firm value by managers and shareholders are perfectly informed about

potential directors' skills. In this context, a gender quota imposing a constraint on this choice may lead to a decline in firm value (and performance) because women may be appointed directors even when they are not the most talented or appropriate candidates (Demsetz and Lehn, 1985).[2] According to this hypothesis, some firms may react to gender quotas by trying to avoid the law – or minimize its impact – by changing their legal status (e.g. delisting), reducing the size of the board, or hiring women only for non-executive positions (Ahern and Dittmar, 2012; Bertrand et al., 2014).

The negative gender quotas effect predicted by this theory relies on the assumption that directors are appointed with the sole aim of maximizing firm value. However, the second theory often adduced to relate gender quotas to firm performance is agency theory, which argues that entrenched managers who have captured the board will appoint directors that maximize their private benefits, rather than firm value. The proponents of this view argue that gender quotas impose external discipline on managers through more intense monitoring: when new women directors are appointed, firm value increases because they prevent entrenched managers from diverting firm resources to managers' private benefit. The channel through which gender quotas would enhance monitoring and curb agency problem between owners and management is independence: independence is a characteristic much more common among female directors (Adams and Ferreira, 2009; Bianco et al., 2015; Bohren and Staubo, 2016), and independent directors may be better able than dependent directors to monitor and reduce managers' discretion.[3] Gender diversity positively affects board monitoring intensity especially in firms with a dominant owner and in family firms (Bianco et. al, 2015).

The third theoretical argument that might explain how gender quotas affect firm performance is related to informational problems associated with assessing skills (information asymmetry). In this case, the managers and shareholders appointing directors are standard profit-maximising agents, but they do not observe the actual productivity and skills of female candidates. However, they may be induced to

[2]In line with this view, a number of studies have found a negative relationship between women's presence on boards and firm performance (Adams and Ferreira, 2009; Mınguez-Vera and Martin, 2011; Ahern and Dittmar, 2012: Matsa and Miller, 2013).

[3] On the other hand, Adams and Ferreira (2007) highlight that optimal board independence implies a tradeoff between monitoring and advice functions, these latter being better provided by dependent directors. Bohren and Staubo (2016) find evidence consistent with this argument for Norway.

perceive women as being less talented than men by either statistical or taste-based discrimination. Negative stereotypes and beliefs may create biased perceptions about women's ability to lead effectively, and this will influence appointment decisions, also when male and female candidates are equally qualified or perhaps female ones are more qualified. As a result, women may be underrepresented despite their equal or superior ability, and women's talents are underutilized at the top executive positions. When firms are forced to appoint female directors, firm value may increase because the availability of greater average managerial talent from women fosters better corporate decisions. Indeed, one of the main reasons why policy-makers are concerned about the relative underrepresentation of women on boards is their belief that there is a business and economic case for more women on boards. Gender quotas may help to crack the glass ceiling that prevents productive high-skilled women from reaching leadership positions, with beneficial effects on firm performance (European Commission 2012 and 2014).

More in general, the introduction of gender quotas imposes an adjustment process to make the firm's governance structure compliant with the policy. Entering women may have characteristics different from those of retained board members (both males and females): for instance, a different age, education, managerial experience or independence. The sign of the impact of this broad reorganization ultimately depends on the characteristics of the pool of women from which the new directors are selected. However, we may expect an improvement in average board characteristics in countries characterized by negative attitudes towards women in top leadership positions where, even when highly skilled women are available, they are prevented from entering corporate boards. In those contexts, any effect of board quota policies on firm performance does not stem from the gender itself, but rather from the change in average board characteristics generated by the board restructuring process required to comply with the law.

A final point to consider when discussing the possible channels relating gender quotas to firm performance is board diversity. An effective board is a multipurpose instrument, one providing expert advice and monitoring but also market connectedness and different perspectives. Some studies have

provided evidence on differences in corporate styles between male and female directors[4], and most of the literature on board diversity suggests that diversity can have positive effects on firm performance. Female directors can bring varied viewpoints and non-traditional approaches to problems (Anderson et al., 2011). Due to innate differences between men and women, the appointment of women directors conveys new skills and talents into the firm, and a broader set of alternatives is considered, reducing status quo bias (Milliken and Martins, 1996). In this regard, Kim and Starks (2016) employ data on directors' expertise for the US and categorize each director's expertise into 16 critical skills (e.g. financial, marketing, human resources, etc.). They show that appointed women diversify a board's expertise more than do their male counterparts and contribute particular kinds of expertise missing in the incumbent board. They thus enhance board's advisory effectiveness. In addition, the presence of female directors may improve gender-diverse market understanding (Hillman, 2015).[5] However, board diversity may also encourage social categorization that can be expected to disrupt board effectiveness (Adams et al., 2015), especially if the incumbent male board members do not welcome the newly-hired women if they believe that they obtained their jobs only because of the law and not for their skills. This may limit communication, reduce cohesiveness, and cause conflicts within the board, with negative effects on firm strategy and management. Overall, therefore, it is not clear how the greater diversity triggered by mandated gender quotas will impact on firm performance. But if barriers to female leadership stem from prejudice against women in top positions, the pre-quota level of diversity will most likely be sub-optimal, and one may expect a positive impact of gender quotas on firm performance.

[4] For instance, Huang and Kisgen (2013), examining corporate financial and investment decisions made by female executives compared with male executives, suggest that men exhibit relative overconfidence in significant corporate decision making compared with women. Faccio et al. (2016) document that firms run by female CEOs adopt more risk-avoidance behaviour than do otherwise similar firms run by male CEOs, and that transitions from male to female CEOs are associated with economically and statistically significant reductions in corporate risk-taking.

[5] On the other hand, some studies have suggested that certain characteristics of female directorship candidates, such as their risk aversion, are different from those in the general female population and more similar to those of the incumbent male directors (Adams and Funk, 2012). In this regard, Rose (2007) does not find any significant link between firm performance as measured by Tobin's Q and female board representation. According to the author, a plausible reason is that female board members may have decided to adopt the behaviour and norms of the conventional (male) board members. As a consequence, the gains from board diversity are not realized.

Overall, a firm grasp of the barriers to top executive positions for women is necessary to form predictions on the effect of gender quotas on firm performance. The applicability of the various theoretical arguments is strongly related to the reasons for the reduced female access to board positions. A key question is the extent to which this reflects systematic unobserved differences in productivity, preferences, prejudice, or systematically biased beliefs about the ability of female managers.[6]

3. Institutional setting

The reduction of the gender gap in corporate boards can be pursued in a number of ways, ranging from (i) voluntary initiatives and the diffusion of good practices by both governments and businesses to (ii) legislative measures. Recent studies point out that the former are usually perceived by firms as a more flexible and less invasive mechanism than national laws, but their effects in terms of increasing the share of women on boards have so far been uneven and slow. By contrast, legal quotas seem to be the most effective and fastest mechanism to increase gender diversity in corporate boards (Walby and Armstrong, 2012).

After a long debate on the necessity of binding gender quotas across the EU Member States, in November 2012 the European Commission proposed a law to ensure that women have a fair chance in the recruitment of potential board members through the adoption of a transparent and fair selection procedure (a so-called "procedural quota") rather than introducing a fixed quantitative quota.[7] One year later, the European Parliament voted in favour of this proposal with an overwhelmed majority, but further steps are required to make it an official Directive enforceable by the EU Member States.

[6] Although outside the scope of this study, it is worth emphasising that gender quotas may also produce spillover effects both inside and outside firms, for instance on other gender disparities in the labour market. More women on the board may push for the hiring or promotion of women also for other managerial positions within firms, or it may create an environment more favourable to women's employment, for example through more flexible working time schedules. There may also be more incentives for young women to graduate in fields (such as management, finance, economics or law) more valuable for business careers. In this regard, Bertrand et al. (2014) exploit the Norwegian law to investigate the effects of board gender quotas on the labour market opportunities of women. However, their findings suggest that in the short run the reform had very little impact on women beyond its direct effect on the newly-appointed female board members.

[7] If a publicly listed company in Europe does not have 40 per cent of women among its non-executive board members, the new law will require that company to introduce a new selection procedure for board members which gives priority to qualified female candidates. However, **t**he law only applies to the supervisory boards or non-executive directors of publicly listed companie**s**, with the exception of **s**mall and medium firms (i.e. with fewer than 250 employees). Furthermore, individual EU Member States will have to put in place appropriate sanctions for non-compliers. The law will automatically expire in 2028.

In the meantime, following the leading example of Norway, which was the first country in the world to introduce gender quotas in corporate boards by law, doing so in December 2003, in the past decade a growing number of EU Member States have adopted legislation with similar prescriptions, albeit with different mechanisms and rules. In the various countries, the target firms are identified by considering the size of the firm (in some cases excluding small and medium sized ones) and/or its type of ownership (state-owned versus private or private listed versus private unlisted). The size of the gender quota varies between 30 and 40 per cent. In almost all cases, companies were given a period of time to meet the required quota so that they could adjust gradually to the new requirements in terms of the gender composition of their boards. In some countries, a phased application with sequentially higher quotas was established, also depending on the type of targeted company. Finally, national legislations also differ in the presence and type of sanctions for non-compliers. In this regard, the experience of Norway provides useful indications. Gender quotas for public limited companies were introduced at the end of 2003 without sanctions for non-compliers. After two years, the fraction of women on the boards of directors of these companies had changed little (it was around 17 per cent at the end of 2005). Consequently, the Norwegian government introduced severe sanctions for firms not reaching the target quota by 2008. Statistics show that at the end of that year the share of women on boards of public limited companies in Norway actually reached the target of 40 per cent.

With particular regard to legislative actions targeted on private companies, Spain was the first EU country to follow Norway by introducing, in 2007, a quota to secure the presence of women on corporate boards. It was followed by Belgium, France, Italy and the Netherlands in 2011. Germany has recently passed a similar legislation, which is in force as of 2016.[8] Table 1 reports the main features of the legislation by the EU Member States that have passed a law prescribing gender quotas in private firms. As a benchmark, in the last row of the table we also report the same information for Norway.

[8] Our analysis is limited to private companies. However, in most of the countries considered the legislation applies also to state owned companies. The latter are the only type of companies subject to gender quotas also in a number of other EU countries (Austria, Finland and Ireland). In some cases, as in Norway, the legislation was applied first to state owned companies, and later to private companies. In Denmark, mandatory gender quotas do not exist, but since 2013 a target determined by companies accompanied by establishment and explanation of company policy to increase share of underrepresented gender should be set by listed and non-listed companies. Outside the EU, in 2010 Iceland adopted a legal initiative to promote gender quotas on boards.

TABLE 1

In the following empirical analysis, we will concentrate on the effects of quotas on the EU countries that have promoted gender quotas by law by 2014. We exclude the Netherlands because the number of potential control firms was too small with respect to affected firms.[9] We include German firms in the control group because Germany was unaffected by the law in the period under analysis. Given that we shall take into account the country-specific definition of the targeted firms to identify treated firms, we now turn to a more detailed description of the legislations in the affected countries that we consider in the empirical analysis.

In Spain, in 2007 the government adopted a law establishing a quota of at least 40 per cent of each gender on the boards of all publicly limited companies with more than 250 employees. It was to be reached by 2015. The law does not establish measures to punish non-compliers, but it states that gender diversity in the boardroom will be positively evaluated by the Public Administration when awarding public contracts.

In Belgium, a federal law adopted in 2011 established a share of at least 33 per cent of each gender on the executive boards of large publicly listed companies by 2016. Moreover, the quota is applicable to companies with less than 50 per cent shares listed on the stock exchange and to small and medium-sized listed companies within year 2018. The legislation includes a temporary loss of financial and non-financial benefits by board members of non-compliant companies.

In January 2011, a law on female board representation was adopted in France. The law requires all listed companies and companies with more than 500 employees or revenues higher than 5 million euros to have at least 40 per cent of each gender on their boards. The targeted companies have to meet the 40 per cent target by the year 2016, within 6 years from the introduction of the law. However, an *ad interim* regulation required a share of 20 per cent of women by the end of 2013, but only for listed firms. The law establishes that the appointment of board representatives in breach of the law can be considered as invalid and subject to annulment.

[9] The Amadeus dataset contains around 400 public limited companies in the Netherlands, of which around 350 are subject to the national legislation on gender quotas; hence, fewer than 50 firms may be considered as potential controls.

Italy adopted a legislative action to promote gender balance on corporate boards in 2011. The law applies to all listed companies, and it requires at least 20 per cent representation of each gender on boards and supervisory boards on their first renewal, within 12 months, starting from June 2011. The quota must be augmented to 33 per cent on the second and third renewal, by 2015. The sanctions for non-complying firms include first an admonishment by the listed-company regulatory body, then (after four months), a fine of up to one million euros, and finally (after a further three months) annulment of the board.

Overall, although in most countries the target quota has still to be met, official data on the largest publicly listed companies in each country provided by the European Commission actually confirm that most of the EU countries that adopted a specific legislation for gender quotas experienced the largest increase in the share of women on boards between 2010 and 2016.[10] The largest percentage point increase was recorded in Italy (25.5 percentage points) and France (24.8 percentage points). Figure 1 shows EC data on proportions of women on boards for the EU countries that have adopted gender quotas and for the EU28 average.[11] Apart from Spain, in all countries with mandatory quotas the proportion of women on boards increased sharply after the date of the introduction of the legislation (identified by the vertical lines in the country-specific figures) and it is well above the EU average in all countries. Moreover, although the average proportion in the EU28 is increasing as well, pointing to a general trend towards more women in top positions, no clear discontinuity can be observed in this case.

FIGURE 1

[10] In 2003, the European Commission established a database to monitor the numbers of men and women in key decision-making positions in order to provide reliable statistics for use in monitoring the current situation and trends through time. Up-to-date data covering female board representation are available online at: http://ec.europa.eu/justice/gender-equality/gender-decision-making/database/business-finance/supervisory-board-board-directors/index_en.htm. The countries covered are the EU28 Members, Montenegro, FYR of Macedonia, Serbia, Turkey, Iceland and Norway for the 2003-2016 period (however the temporal coverage is lower for some countries, see notes to Table 2). The companies covered are the largest publicly listed companies (max.50) in each country. The largest companies are taken to be the members of the primary blue-chip index, which is an index maintained by the stock exchange covering the largest companies by market capitalisation and/or market trades.

[11] Note that the EC reviewed the sampling methodology in 2007 because it recognised that it was not appropriate to sample the largest companies in each country. As a result, the smallest firms exited the sample and the number of covered companies decreased substantially, especially for The Netherlands and for Belgium. This may explain the jump in female board membership in the Netherlands in 2007, years before the quota was adopted.

The relationship between gender quota legislation and women's representation can be analysed using the following regression based on the European Commission country-year panel:

$$P_{j,t} = \alpha + \beta TREATED_{j,t} + \sum_{t \in T} \gamma_t YEAR_t + \sum_{j \in J} \delta_j COUNTRY_j + e_{j,t} \quad (1)$$

where $P_{j,t}$ is the share of women on boards in country j and year t, $TREATED_{j,t}$ is a dummy for country/period observations with a gender quota legislation, $YEAR_t$ are year dummies intended to control for shocks that are common to all countries, $COUNTRY_j$ are country dummies controlling for time invariant differences between countries, and $e_{j,t}$ is the error term. We estimate equation (1) with controls for country-specific time trends as well, in order to consider the possibility of nonparallel evolution in the proportion of women on boards in the absence of a gender quota. Both specifications are estimated also with weighted least squares, using countries' populations as weights. Standard errors are adjusted for heteroscedasticity.

The estimates of β reported in Table 2 suggest that gender quotas caused a statistically significant increase, ranging between 5.9 and 10.9 percentage points, in the share of women on boards.[12]

TABLE 2

4. Data and empirical strategy

The aim of the empirical analysis is to assess the effect of the introduction of the legislation on gender quotas in private corporate boards on different measures of firm performance. To this end, we use accounting data taken from Bureau Van Dijk's Amadeus for the 2004-2014 period. Amadeus is a panel database of comparable financial information for public and private companies, and it contains comprehensive information on around 21 million companies across Europe. For our analysis, we selected four EU countries that have recently passed a law with mandated corporate gender quotas (i.e.

[12] Note that the data provided by the EC is biased towards the largest firms, and large firms may react to gender quotas differently from small firms. However, in Section 6 we show a qualitatively similar result for Italy where we have data on boards' composition for all treated firms before and after the introduction of mandatory gender quotas.

Belgium, France, Italy and Spain). For each country, since gender quotas laws usually apply to large companies, we extracted all the companies with sales of at least ten million euros in one of the years between 2010 and 2014. We then excluded from the analysis agricultural, mining and quarrying and state-owned companies, partnerships, non-profit organizations and companies with unknown status, keeping only public limited companies in our samples. After this selection, our dataset consists of more than four hundred thousand observations.

The main issue that we have to address in order to identify the causal effect of gender quotas on firm performance is the choice of a suitable counterfactual methodology able to provide reliable results on the effects of the reform. In the following empirical analysis, we will use two different models: a fixed-effect double difference (DD) estimator and a fixed-effect triple difference (DDD) estimator. Within each treated country, we start our analysis by considering the following simple DD model:

$$Y_{it} = \alpha + \beta_1^{DD} TREATED_i \times Post_t + \tau_t + \mu_i + \theta X_{it} + \varepsilon_{it} \quad (2)$$

where "*it*" denotes the *i*-th firm at time *t*. *Y* is a measure of firm performance, *TREATED* is a dummy for the treated firms, *Post* is a dummy for the years after the implementation of gender quotas in the treated country, τ_t and μ_i are, respectively, time and firm fixed effects, *X* is a vector of time-varying firms' characteristics and ε is the error term. β_1^{DD} is the parameter of interest.

In light of the legislation discussed in Section 2, we define as treated those firms who had the requisites for the application of the legislation on gender quotas two years before the law was passed. More specifically, we consider as treated all the publicly listed firms in 2009 in Belgium and Italy; in France, we classify as treated all the firms publicly listed in 2009 and those unlisted with at least 500 employees and revenues of more than 50 million euros over the three years preceding 2009 and in Spain all the public limited companies with at least 250 employees in 2005. As regards the outcome variables, we consider different indicators of firm performance. More specifically, as in previous studies we use an indicator of profitability (ROA) and the number of employees. In addition, we consider two productivity indicators: labour productivity (measured by value added per employee) and total factor productivity

(TFP), which makes it possible to evaluate the increase in productivity not accounted for by changes in inputs like capital and labour.[13] We estimated TFP following the procedure suggested by Levinsohn and Petrin (2003)[14].

The inclusion of the firm fixed-effect μ_i in equation (2) allows us to address potential bias related to the correlation between treatment and time-invariant heterogeneity. However, an additional threat for identification is that time-varying firm characteristics may affect treatment assignment. Put differently, if treatment in any time period is correlated with idiosyncratic changes in the counterfactuals, we would get biased estimates. In fact, DD fixed-effect estimates are consistent in this setting if the assignment of firms to the policy is strictly exogenous in year *t*, i.e. it is not correlated with the past, present of future error term ε_{ist}. Note, however, that the eventual bias is small and negligible whenever we can assume contemporaneous exogeneity ($Cov(TREATED_{it}; \varepsilon_{it}) = 0$) (Imbens and Wooldridge, 2009), which is a reasonable assumption in our setting. Using a pre-treatment base year to define the treatment and keeping it constant partly prevents the problem of selection into and out of treatment, providing us with a set of conservative results from our estimations, similar to an intention to treat estimator. Of course, year fixed effects allow to control for any change affecting all the firms in any given year.

The main challenge of interpreting β_1^{DD} as the causal impact of gender quotas on outcome variables is the absence of pre-treatment parallel trends in the outcomes between treated and control firms. In fact, DD estimations are valid only if we can provide evidence of the existence of a parallel trend for each outcome for treated and control firms in the absence of the mandated gender quota. We test for the presence of parallel pre-treatment trends using the following equation (Muralidharan and Prakash, 2013):

$$Y_{it} = \alpha + \gamma_1^{DD} TREATED_{it} \times Trend + \gamma_2 Trend_t + \theta X_{it} + \varepsilon_{it} \quad (3)$$

[13] Except for ROA, which includes some zeros, we take the logarithm of all the dependent variables.

[14] According to this method, the key issue of the correlation between unobservable productivity shocks and inputs is solved using intermediate inputs as a proxy for these unobservable shocks. Using a semi-parametric estimator, for each country we estimated the TFP by two-digit industry, using value added as output and the number of employees and fixed tangible assets as inputs.

where the variable *Trend* is a linear trend that takes the value of 1 in 2004 and ends the year before the introduction of the policy[15], while the other variables are defined as in equation (2). A not statistically significant estimation of the coefficient of the interaction term γ_1^{DD}, will eventually confirm the existence of the parallel trends and validate the estimation of the effect of gender quotas on firm performance based on equation (2). Otherwise, DD estimates would not be valid.

If the common trend assumption is not verified, an alternative is using the DDD estimator as in Matsa and Miller (2013). This estimator compares changes in the outcome variables between treated and untreated firms in a country with gender quotas with the corresponding differential in a comparable country without such legislation. A DDD estimator makes it possible to take simultaneously into account of two sources of potential confounding trends, namely changes in performance of all companies in the treated country (i.e. due to changes in country-specific business conditions or policies adopted when legislation on gender quotas was passed and that may potentially affect all firms in that country), and changes in the performance of the (potentially) treated firms across countries (which have nothing to do with gender quotas). Given the economic and institutional characteristics of the treated countries and the definition of the treated companies used in the empirical analysis (i.e. listed and/or large companies), we selected Germany, which did not pass any legislation on gender quotas in corporate boards over the period considered, as our preferred control country. In order to test the sensitivity of our results to the choice of the control country, we also perform a robustness check using Portugal as an alternative control country in the case of Spain.[16] For each treated country, we estimate the following model:

$$Y_{it} = \alpha + \beta_1^{DDD} TC_j TREATED_i \times Post_t + \beta_2 TC_j \times Post_t + \beta_3 TREATED_i \times Post_t + \tau_t + \mu_i + \theta X_{it} + \varepsilon_{it} \qquad (4)$$

[15] 2011 for Italy, France and Belgium and 2007 for Spain.

[16] One may argue that, among potential untreated countries, Portugal may be much more comparable than Germany in terms of socio-economic and institutional conditions, especially in the case of Italy and Spain. Unfortunately, however, due to the small number of listed companies in Portugal, a DDD analysis cannot be carried out for Italy and Belgium. Only in the case of Spain, where gender quotas were formally applied to a relatively large and heterogeneous pool of companies (i.e. all large public limited companies), was the choice of Portugal as control country feasible.

where *TC* is a dummy for the treated country, *TREATED* is a dummy for the treated firms in the treated country and for the potentially treated firms in the control country, and the other variables are defined as in equation (2).[17]

In this specification, β_1^{DDD} may be interpreted as the change in the differential in firm performance between treated and untreated firms in the treated country, compared to the corresponding change in the same differential between firms that would have been treated and untreated had a similar law been introduced in the other (untreated) country (Imbens and Wooldridge, 2009).

Similarly to the DD case, the validity of the DDD estimates relies on the assumption of parallel trends between treated firms in the treated country and those firms that would have been treated had the law been passed also in the control country (Germany). We test this assumption in the pre-treatment period by using the following specification (Muralidharan and Prakash, 2013):

$$Y_{it} = \alpha + \gamma_1^{DDD} TC_j \times TREATED_i \times Trend + \gamma_2 TC_j \times Trend + \gamma_3 TREATED_i \times Trend + \gamma_4 TREND_t + \theta X_{it} + \varepsilon_{it} \qquad (5)$$

where the variables are defined as in equations (3) and (4).

An awkward issue when using counterfactual methodologies is the choice of the control groups. Given that there is no natural control group to which the "treated" firms should be compared (Ferreira, 2015), we follow the literature on pre-treatment matching in panel fixed effect estimation and carefully select our control samples. Of course, we have to be able to create control samples that are as similar as possible to our treatment group on observables although, even if we fail, time-invariant differences will be controlled for by fixed-effect estimators. In the DD model, we select the control group among the non-treated firms in the same country as the treated firms (*Control 1*). In the DDD model, in addition to the latter, we selected control firms among, respectively, the potentially treated (*Control 2*) and the potentially non-treated (*Control 3*) groups in the non-treated country (Germany). We applied the same definition of each national law to define the potential German treatment group (*Control 2*). In order not

[17] For example, in the case of Italy *TC* is equal to 1 for Italian companies (and 0 for German ones), *TREATED* is equal to 1 for publicly listed companies (in Italy and Germany), *Post* is equal to 1 for all the years after 2011 (when the gender quota law was passed in Italy).

to have identification of our coefficients rely on residual unobserved heterogeneity, we restrict our sample of treated firms to a common support.[18]

Within each control group, we selected firms using Abadie et al.'s (2004) semiparametric matching approach. More specifically, for each treated firm in each treated country, we identified the closest five firms in each control group on the basis of the value of the following observable characteristics two years before the introduction of the law[19]: industry, ROA and the logarithm of assets, sales, labour cost per employee, number of employees, TFP, and value added per employee, allowing for replacement. As is usually done with balance sheet variables in fixed-effect models, we excluded companies with missing information on the relevant variables and cut the tail below the bottom 5 per cent and above the top 5 per cent of the TFP distribution for each country.[20]

For each country, in Table 3 we show the average characteristics two years before the treatment separately for the treated and for the control groups obtained after applying the procedure described above. Almost all the outcome variables are fairly well balanced for Belgium for all the control groups (Panel A). The national control sample (*Control 1*) is very similar to the treated sample in Italy (Panel C) while, with the exclusion of Belgium, some differences persist when we try to match national treated firms with German ones. However, given our estimation strategy, which relies on a fixed-effect identification, differences in means in one year should not affect the results if the parallel trends assumption is valid.

TABLE 3

5. Results

Tables 4 to 7 present our main results on how firm performance is affected by gender quotas in the four countries analysed. In each table, we show both DD (based on equation (2), panel A) and DDD

[18]We estimate a propensity score on (log)sales, (log) total assets, (log) number of employees (excluding Spain), (log)tfp, roa, (log) cost for employee and (log) value added for employees, define a standard common support, and exclude from the analysis those treated firms that lay outside the common support.
[19] 2010 in Italy, France and Belgium; 2006 for Spain.
[20] This trimming ensures that our results do not rely on outliers, to which fixed effect estimates are rather sensitive. One per cent trimming provided similar results that are available upon request.

estimates (based on equation (4), panel C). We report the estimated coefficients of the interaction terms $TREATED_i \times Post_t$ (panel A) and $TC_j \times TREATED_i \times Post_t$ (panel C, where *TC* is the name of the treated country in each table). For the DDD model, we also report estimates of the coefficients of the interaction terms $TC_j \times Post_t$ and $TREATED_i \times Post_t$.[21]

For both DD and DDD models, we also show the results of the test of the parallel trends assumption (panel B and D respectively). We test this assumption estimating equations (3) and (5) using only observations up to the year before the introduction of gender quotas in each country. A not statistically significant estimate of the coefficients of the interaction terms, respectively, $TREATED_{it} \times Trend$ and $TREATED_i \times Trend \times TC_j$, will eventually confirm the existence of parallel trends before treatment.

For each country, we show results for all the outcome variables considered (logarithm of value added per employee, of TFP and of the number of employees and ROA, columns 1-4). All specifications include firm and year fixed-effects. In the case of the value added per employee, we also control for the logarithm of capital per employee, while the ROA equation contains controls for the logarithm of sales. Standard errors are clustered at the firm level.

The first set of estimates in Table 4 refers to Belgium. The results in Panel B and D show that the parallel trends assumption is verified for both models (DD and DDD) and for all outcomes, suggesting that the outcome variables had similar trends for treated and untreated firms in the pre-treatment period. Turning to the effect of gender quotas on firm performance, both DD (Panel A) and DDD (Panel C) estimates show that in this country gender quotas did not produce any statistically significant effect on firms outcomes: the coefficients for both the productivity and profitability indicators are negative but very imprecisely estimated. Similarly, we find no statistically significant effects on the number of employees.

The results are quite different for France (Table 5). First, in this case it seems that it is more difficult to find good control groups, both within the country and outside. The common trends hypothesis is violated when considering TFP in the DD model (see Panel B). Moreover, Germany does not seem a good

[21] Full estimates are available upon request.

counterfactual country: estimates of equation (5) presented in Panel D show that treated firms in France had a different trend from that of (potentially) treated firms in Germany in the pre-treatment period when considering both productivity (both valued added per employee and TFP) and profitability (ROA). Second, in specific regard to valid DD estimates (Panel A), the results show that gender quotas have a negative and significant impact on labour productivity. The impact on the number of employees is positive and significant when using the DDD specification (Panel C). When considering ROA, the coefficients are always negative but either not statistically significant (in the DD model) or non-valid (in the DDD model).

In the case of Italy, DD effects shown in Table 4 are valid since we never reject the null hypothesis of parallel trends (Panel B). On the other hand, the parallel trends hypothesis is rejected in the DDD model for three outcome variables out of four, suggesting that, also in the case of Italy, Germany is not a good control country (the parallel trends assumption is verified only in the case of TFP).

When we look at the effect of gender quotas on firm performance, when considering productivity the results for Italy are different from those we found for the previous two countries. Both DD and DDD estimates suggest a positive and significant impact on productivity, when measured both by valued added per employee and by TFP (although the common trend hypothesis is violated in the DDD model when considering value added per employee as outcome). Similarly to the former countries, the effect on firm profitability as measured by ROA is not statistically significant. Finally, according to the preferred specification (i.e. the DD, where the common trends assumption is verified), gender quotas do not seem to have had an impact on the number of employees.

The results for Spain are presented in Table 7. For this country, the parallel trends hypothesis is rejected in both DD and DDD models for three out of four outcome variables. Therefore, it seems that for Spain it is particularly problematic to use the introduction of gender quotas to establish causality. Given that Germany may be an unlikely counterfactual for Spain, we replicate the test for the common trends using Portugal as untreated country instead of Germany (see Table A1 in the Appendix).[22]

[22] Unfortunately, Portugal could not be used as counterfactual country for the other three countries (see footnote 14).

However, also in this case we reject the null hypothesis of parallel trends for both the number of employees and the ROA. Consequently, the only (marginally) significant and valid estimate that we find regards a negative impact of gender quotas on labour productivity when Portugal is used as control country. Note that the difficulty of finding good control groups for treated firms in Spain may be related to the fact that the reform was introduced just before the Great Recession started; hence, any asymmetric effect of the crisis limits the validity of our results. Admittedly, we cannot address this issue credibly.

TABLES 4 TO 7

Overall, the results presented in this section have to major implications. First, the exploitation of gender quotas as a natural experiment to establish causality is not always a reliable empirical strategy. We show that in many cases both the DD and the DDD results are not valid because the parallel trends assumption is violated. Second, when the chosen identification strategy is reliable, taken together our results show that there is no effect of gender quotas on firm profitability and either a not statistically significant or a negative effect on productivity. However, a significant difference regards Italy, where we found that gender quotas positively affect firm productivity. Consequently, we may conclude that the effect of gender quotas is heterogeneous across countries. This confirms that single country results cannot be automatically extended to other countries.

At this stage of the analysis, it is interesting to explore the potential reasons for the different effect of gender quotas. In general, a factor to be considered is variation in corporate governance across countries. In this perspective, all the four treated countries share a predominant model of concentrated ownership, implying the presence of a shareholder who, alone or in concert, holds a share of voting rights large enough to control the company (OECD, 2015). Family businesses represent the majority of listed companies in all the four countries: around two thirds of the companies quoted in the French stock market, almost 60 per cent of the companies quoted in the Italian one, and more than 50 per cent of those quoted in Belgium and Spain (Faccio and Lang, 2002; Sraer and Thesmar, 2007). Some differences emerge in terms of board structure, with a one-tier system (one administrative body) adopted in Belgium and Spain, and the possibility to choose between a one-tier and a two-tier system (a supervisory body

and a management one) in France and Italy.[23] However, according to recent data based on the STOXX Europe 600 index, the one-tier board model predominates also in the latter countries (covering more than 80 per cent of the listed companies in France and 90 per cent of the listed companies in Italy surveyed by the Expert Corporate Governance Service (ECGS) in December 2014).

Other dimensions to consider are board size and board independence. However, the average size of the board is very similar in the four countries, ranging from 12 in Belgium, to 13 in France and Spain and 14 in Italy. The share of independent directors is between 40 and 45 per cent in Belgium, France and Italy, while it is around 33 per cent in Spain (ECGS 2014). Hence, differences in corporate governance across countries are not such to explain the heterogeneous effects of gender quotas on firm performance, particularly between Italy and France, which share a very similar corporate governance and board structure. Furthermore, as long as corporate governance did not change with gender quota laws and only for the treated group, this should not be an issue with our estimation strategy.

Another factor to consider is the timing of adoption of gender quotas over the business cycle. However, differences in the business cycle when gender quota laws were passed should not be an issue in our case, since three out of four countries considered in the analysis (namely, Belgium France and Italy) introduced gender quotas in the same year (2011).

Other potential mechanisms behind the observed heterogeneous effects of gender quota boards on firm performance may be related to the theoretical arguments discussed in Section 2. Unfortunately, the available data do not allow us to test directly the application of the competing theories described in all the countries considered, but we can look into the role played by differences in gender imbalances and equal opportunities in influencing women access to top jobs and hence the composition of the boards. As we highlighted in Section 2, because the introduction of gender quotas forces firms to hire more women, it may trigger an overall restructuring of the board. The ultimate effect on firm performance

[23] In Italy firms can also choose a third "hybrid" (traditional) model, with a board of directors and a board of statutory auditors (*collegio sindacale*) appointed by the shareholders' meeting. Furthermore, the relevant EU regulation (EC/2157/2001) stipulates that a European public limited liability company (*Societas Europaea*) shall have the choice of a one-tier system or a two-tier system.

depends on the characteristics of the available women (and men) that firms can select to sit on their boards. Like any regulation that forces firms to change their current behaviour, mandatory gender quotas are expected to affect firms' performance negatively, unless there is an excess of supply of highly qualified (female) managers ready to sit on boards (Ferreira, 2015). Excess of supply is more likely when firms make their choices also on the basis of either statistical or taste-based discrimination and/or when gender quotas are targeted on a small sample of firms. Among the four EU countries considered, Italy is the one characterized by the worst performance in terms of overall gender imbalances, women's economic participation and share of women on boards before the introduction of gender quotas.[24] Furthermore, in Italy the gender quota law applies to a very small pool of firms, which are those publicly listed (around 300 companies, corresponding to less than 5 per cent of large Italian companies in 2012). Consequently, excess of supply should be more likely in Italy than in other countries with less gender imbalance and with a broader application of gender quotas.

In this regard, Italy is an interesting case study because it presents some of the features that, according to the existing literature, may favour a positive impact of gender quotas on firm performance through an improvement of the quality of the board. In order to explore these issues and the role played by changes in the composition of the board after the introduction of gender quotas, in the next Section we conduct a more thorough analysis of the Italian case.

6. Further evidence on Italy

As mentioned in Section 3, mandated gender quotas on corporate boards were introduced in Italy by law in 2011 and they became effective in August 2012. The law applies to publicly listed companies and state owned companies, which are required to appoint at least 33 per cent of either gender on their boards. Since one of the stated objectives is to remove stereotypes and change cultural and social norms

[24] According to the World Economic Forum's Global Gender Gap Index, in 2014 Italy ranked 69th in 142 countries, much lower than Belgium (10th) and France (16th) and relatively worse than Spain (29th). As a benchmark, Norway was in the 3rd place, after Iceland and Finland. Italy performed even worse when considering the sub-indicator of equality in economic participation and opportunity (Italy ranked 114th, Spain 84th, France 57th and Belgium 27th). According to European Commission data on gender balance in decision-making positions, in 2007 the share of women on boards in Italy was 3 per cent, half of that registered in Belgium and Spain and one third of that in France.

preventing women from reaching top jobs, the mandatory gender quota is temporary and should "naturally" expire in 2022. The rationale for this choice is that, given that corporate boards usually last for three years, the law should "force" appointment decisions by a certain targeted company for around three times when it has to renew the main governance bodies. Since the initial share of women on boards was very low, the law set an intermediate goal (equal to 20 per cent of women on boards) for the first board renewal. Severe sanctions apply to non-compliers, including a monetary fine of up to one million euro and termination of the elected boards of companies that persist in not complying with the mandated gender quota.

The institutional setting and our estimates in the previous section point to Italy as an interesting case study for a number of reasons. First of all, since the introduction of gender quotas by law, the share of women among board members in private companies has dramatically increased in a few years (see Section 3), exhibiting a sharp discontinuity with respect to previous trends. Furthermore, the introduction of gender quotas by law seems to have generated positive effects on firm performance, specifically on productivity (see Section 5). Finally, the Italian institutional setting makes it possible to circumvent some of the limitations that are common to previous papers that exploit gender quotas in Norway as a quasi-natural experiment to identify the effect of female directors on firm performance (Ferreira, 2015). More specifically, the introduction of gender quotas in Italy was accompanied from the outset by severe sanctions for non-compliers, and firms were required to adjust immediately when they had to renew their boards formally, albeit complying with the *ad interim* quota in the first years of adoption of the law. Furthermore, the political debate preceding approval of the law lasted only a few months (between February and June 2011).[25] This implies that the exact date of the quota shock is well

[25] The law was first proposed in May 2009 by a member of the centre-right wing of the national Chamber of Deputies (Lella Golfo) and resubmitted a few months later by a member of the centre-left wing (Alessia Mosca). However, the Italian Parliament started discussing the proposal only in February 2011. A very simple Google search provides some evidence of low public interest in the topic before 2011. Google reports that the number of news in Italy related to "*quote rosa*" (gender quotas) between January 2009 and January 2011 was 684, while it was 306 in the following five months (between February and June 2011), when the law was under discussion at the Italian Parliament. The number of news items on this topic jumped to 1370 in the year between the approval and the adoption of the law (between July 2011 and July 2012) and reached 5240 in the following two years (between August 2012 and July 2014). If we add the word "*cda*" (corporate board) to the search, the corresponding numbers are: 82, 47, 126 and 396. The relatively larger drop registered for the last period is due to the fact that in those years there was also a lively debate on the need for gender quotas in politics.

defined. Moreover, the relatively short "event window" that has characterized the introduction of gender quotas in Italy should minimize the threat of confounding effects, such as other governance-related reforms that could have taken place simultaneously with the introduction of gender quotas. However, no relevant reforms of corporate governance of private companies took place in Italy when gender quotas were adopted.

Another concern may be self-selection into treatment and non-treatment. In this perspective, the main issue is that firms may change their legal status to avoid the law. There is evidence that this happened in the Norwegian case, where a non-negligible share of firms changed their legal status from public limited to private limited companies to avoid gender quotas (Bertrand et al., 2014), while some other firms intentionally did not adopt the organizational form subject to regulation (Bohren and Staubo, 2016). However, this should not be an issue in the Italian case, where the law applies to publicly listed companies and delisting is much more costly (and visible) that changing from public to private limited status. Official data on the number of delisting companies over the 2004-2014 period do not show any structural break since 2012 (Figure 2). If any, there has been a slight decline in the average number of delisting companies since 2012, which went from 14.2 in 2004-2011 to 13.3 in 2012-2014.[26]

Overall, then, we believe that our identification strategy and the features of the Italian law allow us to address the main existing threats to identification when the introduction of gender quotas is used as a natural experiment. This supports the validity of our results for Italy.

FIGURE 2

Therefore, in the remaining part of this Section, we shall provide some evidence on a number of potential channels, particularly related to the quality of the newly appointed (female) board members, which may help explaining the positive effects of mandatory gender quotas on firm productivity in Italy discussed in Section 5.

[26] Information on the causes of delisting also shows that this usually happens for mergers, tender offers and failure procedures. Conversion to ordinary shares and voluntary requests, which may be the causes more related to avoidance of the gender quota, are rare events (involving 1 or 2 companies in few years) and without significant changes after the introduction of gender quotas.

To this end, starting from the sample of Italian firms used in the previous empirical analysis, we selected the sub-sample of publicly listed companies over the 2004-2013 period and merged it with information on the names of the board members provided by CONSOB (Italian Stock Exchange Commission). We then tried to collect the CV of each board member using a number of sources, namely official corporate documents published on companies' websites, business journals, and information directly provided by board members on their professional profiles posted on Linkedin. For each board member we identified, other than gender, the following personal characteristics: age, education (whether he/she had a college degree and in which major), years of work experience in managerial positions, and years of work experience as board member. The great heterogeneity in CV formats and in the quantity and quality of the information that they contain made this work particularly complex and time consuming. Nonetheless, we were able to collect comparable information on 2,420 board members in 173 publicly listed companies in Italy over the 2004-2013 period.

The 2004-2013 evolution of the share of women on boards in this sample of firms closely resembles that reported in Section 2 based on European Commission data (see Figure 3). The share of women on the boards of these companies was roughly stable – around 7-8 per cent of total board members – until 2011, the year of introduction of the gender quotas law for publicly listed companies in Italy. It then reached almost 12 per cent in 2012 (the law became effective in August 2012) and surged to more than 16 per cent in 2013. Interestingly, the sharp discontinuity observed in 2012 is entirely driven by firms with an initial share of women on board below the gender quota ('non-compliers' in the Figure). As expected, much smaller changes in the female share and no discontinuity around the date of introduction of mandatory gender quotas is detected for the sub-sample of already compliant firms.[27]

FIGURE 3

We now exploit the detailed information on board composition and board members' characteristics to formulate some hypotheses regarding the potential channels through which the positive effects on firm performance of the legislation on gender quotas have been obtained for Italy. More specifically,

[27] Very few firms in our sample (20 out of 173) had a pre-quota share of women on the board at least equal to 20 per cent.

we seek to understand whether such channels might be related to the characteristics of the newly appointed female members. Moreover, it might be that the law induced the targeted firms to reorganize the entire board, changing also (some of) its male members. If so, improvements in firm performance may be related to changes in the overall quality of the board members rather than to the gender of the newly appointed women.

Figure 4 shows the evolution of the main characteristics of board members over the period considered. The main change since the introduction of mandatory gender quotas has been the sharp increase in the share of women with a college degree (from around one third in 2004-2010 to almost two thirds in 2013), particularly with a degree in law, economics or management, which should be the fields of study most likely to provide managerial skills (panel B). This has occurred without any significant decline in women's mean age (panel A) or women's work experience in managerial positions (panel C). By contrast, there has been a significant decline in average women's work experience as board members (from around 9 years in 2010 to less than 7 years in 2013, panel D).

FIGURE 4

In order to furnish more insight into the changes in board members' characteristics following the board reorganization required to comply with gender quotas, Table 8 presents board members' statistics by gender for appointed members (panel A), exiting members (panel B), and retained members (panel C). We report average characteristics separately for two pre-treatment periods (2004-2008 and 2009-2011) and for the post-quota years (2012-2013), to distinguish changes in board composition related to the quota from longer-term trends already in place before the introduction of the law. In the last row of the table, we report also the share of firms changing their board composition in each sub-period.

TABLE 8

The first feature to be noted is that in all three groups (newly appointed, exiting and retained members) no statistically significant difference in female characteristics emerges between the two pre-quota periods, while some characteristics of the newly appointed women changed significantly after the 2011 law. More specifically, the share of the newly-appointed women with a degree grew significantly after the introduction of the gender quota with respect to the before-quota period (twelve percentage points),

and there was an even greater increase in the share of newly-appointed women with a degree in law, economics or management (18 percentage points more). The average age of newly appointed women did not decrease significantly after the reform. Furthermore, we do not observe statistically significant changes in their amount of managerial experience. Finally, we do not observe a slight decrease in board experience for entering women. However, it seems that this natural reduction due to the entrance in the boards of women never previously appointed had been compensated by the dismissal from boards of women with less board experience (on average 4.8 years) while retaining those with more board experience (on average, 10.2 years).

Overall, we observe an improvement in average female board characteristics after the introduction of gender quotas. This improvement can be partly related to the fact that gender quotas have been introduced in a context characterised by the presence of negative attitudes towards women in top leadership positions where, even when highly skilled women were available, they were prevented from entering corporate boards. Because gender quotas forced companies to appoint more women to boards, they allowed these highly qualified women to reach board positions, with potential beneficial effects on firm performance.

Interestingly, for newly appointed men we observe an increase in their age and in their average experience as board members (although partly compensated by similar increases in the average age of exiting men). It might be that more experienced male directors were appointed to compensate for the lower experience as board members of the new female directors. Finally, retained male members had more board and managerial experience on average than both new and exiting men.

In addition to the evidence presented in Table 8, we looked at the surnames of board members before and after the introduction of gender quotas. While for males the share of board members sharing the same surname (and therefore probably belonging to the same family) was around 11 per cent on average, without large variations during the 2004-2013 period, for females the same share was 24.6 per cent in 2004 and decreased to 13.7 per cent in 2013. This evidence suggests that in Italy gender quotas contribute to the selection of women more on the basis of individual skills than of discretionary family-based co-optation mechanisms.

Overall, according to this evidence we can conclude that the introduction of the legislation on mandatory gender quotas did not produce a deterioration in the characteristics of board members, both females and males. More specifically, it does not seem to have negatively affected the quality of women on boards. If anything, it helped to reduce gender differences by education, also favouring the appointment of highly skilled women possessing degrees in fields providing competences well suited to those required by board positions. Moreover, the same evidence is consistent with the hypothesis that gender quotas fostered an overall adjustment process to make the governance structure compliant with the policy and that this adjustment, in turn, might have been one of the factors driving the improved performance of Italian companies after the introduction of gender quotas.

An additional board characteristic that may be correlated with gender and help to explain the positive effect of Italian gender quotas on productivity is independence. Previous evidence has shown that female directors tend to be more independent than males. For instance, Bohren and Staubo (2016) show that the introduction of gender quotas in Norway was associated with a substantial increase in the share of independent board members (from 46 per cent in 2003 to 67 per cent in 2008), especially among women. A similar trend has been registered in Italy, where the share of independent directors grew from 37.6 per cent in 2011 to almost 48 per cent in 2014. The majority of women on boards serve as independent directors and the majority of newly-appointed women are independent (CONSOB, 2015). As we explained in Section 2, greater board independence may increase effective monitoring and limit opportunistic behaviour by entrenched managers, with positive effects on firm performance. Consequently, the positive effect on firm productivity may be related not to gender *per se*, but to the greater independence of the new women hired after the introduction of gender quotas.[28]

As a final step of our analysis, we investigate the relationship between specific board members' characteristics (i.e. age, presence and type of degree, board and managerial experience) and firm performance, also testing whether such relationship has been changing after the introduction of gender quotas. To this end, we estimate a pre-post reform fixed effects model, in which average board member

[28] Unfortunately, we are not able to disentangle the effect of gender from that of independence because the available data do not provide information on the independence of the board members. This could be the topic of future research based on more detailed data on board members.

characteristics at the firm level (separately for men and women) are interacted with a dummy equal to one for the years following the introduction of the gender quota. We focus our attention on labour productivity as our main dependent variable.[29] Table 9 shows estimates controlling for one characteristic at a time (columns from 1 to 5), and for all board member characteristics together (column 6). All specifications include firm and time fixed-effects. We report robust standard errors clustered at the firm level. Clearly, in light of the high numbers of potentially endogenous variables and the lack of a suitable number of instruments, we cannot interpret these estimates as causal effects. Nonetheless, they provide a first interesting insight into the relationship between firm productivity and a number of board member characteristics that has been changing together with the share of females since the introduction of gender quotas.

Estimates in the Table show a positive and statistically significant correlation between labour productivity and men's age, work experience and the share of men with a college degree in business, economics and law, without any statistically significant change after the introduction of the gender quota (see estimated coefficients for men in columns 1, 3 and 4). We find a similar result for women's work experience (column 4): other things equal, a one-year increase in average female experience in managerial positions is associated with an increase in the average productivity of around two per cent. Quite interestingly, the magnitude of the coefficient estimated in the case of work experience is not statistically different between women and men.[30] By contrast, we find a statistically significant positive correlation between the share of women with a college degree and firm productivity only after the reform (column 2). Women's education is the only board member characteristic whose correlation with labour productivity significantly changed after the introduction of gender quotas.[31] This result is robust to the inclusion of all board members characteristics (column 6). Furthermore, we obtain similar results also when we run separate estimates for companies with a pre-quota number of board members, respectively, below and above the median value (i.e., 10 members).[32] The lack of a statistically significant correlation

[29] We obtain similar estimates – available upon request - when we use TFP as dependent variable.
[30] The F-test on the equality of the two coefficients is equal to 0.26, with a corresponding p-value of 0.61.
[31] We obtain similar estimates, albeit much less precise ones, when we consider the share of women with a college degree in business, economics and law (column 3).
[32] Estimates by board size are available upon request.

between women's education and firm performance before the quotas may be due to the low within-firm variation in the share of women with a college degree, caused by the lack of a significant turnover in the female component of the boards. However, this result, together with the descriptive evidence on the characteristics of board members discussed above, is also compatible with the fact that, before the introduction of gender quotas, female appointments was mainly driven by family linkages (Bianco et al., 2015). In this perspective, (high) education was not one of the main criteria used to select highly qualified women to sit on boards, but it could instead be a sort of "incidental" characteristic possessed by women who have grown up in wealthy entrepreneurial families.

TABLE 9

7. Conclusion

In the last decade, a number of national governments adopted legislative actions to promote gender-balanced representation on corporate boards. Norway was the first country to do so, in 2003. More recently, also a number of EU countries have passed similar laws. In this paper, we have used these legislative actions as a set of quasi-natural experiments to study the causal effect of gender quotas on company performance. The progressive adoption of board quotas in different countries has enabled us to provide fresh evidence on country-specific effects of this type of legislation.

In both the economic literature and the political debate there is no general consensus on the potential benefits of legislative actions imposing gender quotas on boards. The literature on Norway has generally shown a negative relationship between mandatory gender quotas and firms' performance, at least in the short run (Ahern and Dittmar, 2012; Matsa and Miller, 2013). However, broadening evaluation of gender quotas is important for at least two reasons. First, single country empirical evidence may be related to country-specific features, such as the institutional background or cultural attitudes regarding the role of women in leadership positions. Second, comparative empirical research on this issue may help identify the mechanisms through which gender quotas and firm performance are related (Hillman, 2015).

Our first conclusion is that the exploitation of gender quotas as a natural experiment to establish causality is not always a reliable empirical strategy. We show that in many cases both the DD and the

DDD results are not valid because the parallel trends assumption is violated, particularly in the case of Spain. In this latter country, the reform has been introduced right before the Great Recession, and any asymmetric effect of this event makes it difficult to find a proper comparison group and establish causality.

Second, looking at valid results, gender quotas did not affect firm profitability, and had either a negative (in the case of France and Spain) or a not statistically significant (in the case of Belgium) effect on productivity. A major exception is Italy where, differently from the former countries, we found that gender quotas affected firm productivity positively. This evidence highlights the importance of the country-specific context in influencing the actual effect of gender quotas on firm performance, and we may conclude that previous empirical evidence on single countries is not automatically extendable to other countries.

Additional detailed information on Italian board members' characteristics allowed us to gain further insight into the relationship between gender quotas and firm performance found for Italy. Indeed, descriptive evidence showed that Italian firms complied with the law by hiring new highly-educated women and with the same amount of work experience in managerial positions as the incumbent ones, although with less board experience. Furthermore, it appears that more experienced men directors were also appointed, probably to compensate for the lower experience as board members of the new female directors. Overall, therefore, it seems that in Italy gender quotas helped to reduce gender imbalances in female representation in leadership positions and to enhance the role of meritocracy as a selection criterion. Moreover, gender quotas triggered a thoroughly restructuring of the board, with the injection of more educated and/or experienced members (both males and females). An additional mechanism is related to board independence. The introduction of gender quotas in Italy was also associated with a substantial increase in the share of independent board members; greater board independence may increase effective monitoring and limit opportunistic behaviour by entrenched managers, with positive effects on firm performance.

In this regard, it is difficult to pin down the true mechanism relating gender quotas and firm performance. All the mechanisms described, namely appointment of new highly-qualified women,

general board restructuring and more board independence, are consistent with our results. However, we cannot test these hypotheses directly with our data and further research is needed to provide more grounded empirical evidence on the channels that actually explain the positive effects of gender quotas in Italy.

A final remark concerns the role of measures favouring a successful match between firms and women available to sit on boards. If it is not a matter of scarcity of highly qualified women, the Italian experience also points out that the introduction of mandated gender quotas should be accompanied by supporting measures intended to make information on the available women easily accessible to targeted companies. In this regard, initiatives such as "Ready4board Women" in Italy (that preceded the introduction of gender quotas) and "Global Board Ready Women" world-wide (supported by the European Commission) – which provide searchable databases to identify and promote senior women executives and professionals who meet strict criteria in terms of skills and previous work experience – should help companies to comply with the mandated gender quota with no costs in terms of firm performance.

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Table 1

Legislation on gender quotas in the EU countries and Norway

Country	Target firms	Gender quota	Introduction date	Compliance date	Sanctions for non- compliers	Notes
Belgium	Publicly listed and state owned companies	33%	2011, September	2017-2018 for publicly listed companies	YES. If the board comprises fewer than the minimum number of each gender, any newly re(appointed) director of the majority gender is void. An additional year is given before benefits and compensation for all members are suspended until compliance	Different compliance dates for other firms: 2011-2012 for state owned companies; 2018-2019 for small listed firms
France	Publicly listed companies + unlisted with at least 500 employees and revenues of more than 50 million Euros over the three previous consecutive years	40% (*ad interim* quota of 20% by 2014 only for listed firms)	2011, January	2017	YES. Fees not paid to directors of noncompliant companies	
Germany	The top 100 publicly traded companies	30% (as of 2018, the proportion of women must be increased to 50%)	2015, March	2016, January	NO, but if the quota is not met, the companies will be required to fill any vacant positions with women or leave them empty	A further 3,500 medium-sized companies will have to determine their own quota for executive and supervisory board seats by January 2017
Italy	Publicly listed and state owned companies	33% (*ad interim* quota of 20% until 2015)	2011, June	2015	YES. Fines levied after four months. Additional three months before members lose their office	It will expire in 2022
Spain	Public limited companies with 250+ employees	40%	2007, March	2015	NO	Gender diversity taken into account for state contracts and public subsidies
Norway	Public limited and state owned companies	40%	2003	2006	YES. Continued non-compliance can result in dissolution of the company. Special circumstances allow for the payment of a fine until compliance	

Source: authors' elaboration on EC (2012), EC (2013), www.catalyst.org/legislative-board-diversity (as of August 2014) and bloomberg.com

Notes. Gender quota laws only for state owned companies in Austria, Denmark, Finland and Ireland.

Table 2

Regression estimates of gender quotas law on the proportion of women on boards of directors

	(1)	(2)	(3)	(4)
Treated	10.335***	10.923***	6.395***	5.928***
	(1.242)	(1.300)	(1.609)	(1.516)
Constant	22.866***	18.469***	-1,055.091***	-641.981
	(2.059)	(3.899)	(366.877)	(1,585.043)
State trends	NO	NO	YES	YES
Weights	NO	YES	NO	YES
Observations	444	444	444	444
R-squared	0.778	0.835	0.913	0.932

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

Table 3

Average characteristics for treatment and control groups

A) BELGIUM

	Treated	Control 1	Diff. (P-value)	Control 2	Diff. (P-value)	Control 3	Diff. (P-value)
Log of sales	10.87	10.88	0.9451	11.24	0.1735	11.13	0.3174
	(0.21)	(0.11)		(0.11)		(0.08)	
Log of assets	10.91	10.81	0.7283	11.12	0.4465	11.02	0.6851
	(0.23)	(0.11)		(0.11)		(0.08)	
Log of labour productivity	4.49	4.49	0.9717	4.37	0.2737	4.39	0.3330
	(0.14)	(0.05)		(0.04)		(0.03)	
Log of TFP	5.53	5.57	0.7712	5.23	0.0042	5.29	0.0304
	(0.11)	(0.05)		(0.04)		(0.03)	
Log of labour cost	4.05	4.05	0.9431	4.00	0.5479	3.99	0.4262
	(0.11)	(0.04)		(0.02)		(0.02)	
Log of nr employees	5.27	5.14	0.6624	5.80	0.0436	5.63	0.1862
	(0.27)	(0.12)		(0.10)		(0.08)	
ROA	4.26	4.72	0.7508	3.6 (0.67)	0.6793	4.36	0.9476
	(1.30)	(0.56)				(0.44)	
Nr of firms in 2010	19	107		95		205	

B) FRANCE

	Treated	Control 1	Diff. (P-value)	Control 2	Diff. (P-value)	Control 3	Diff. (P-value)
Log of sales	12.10	11.53	0.0000	12.25	0.0007	11.90	0.0000
	(0.04)	(0.02)		(0.02)		(0.01)	
Log of assets	11.81	11.14	0.0000	11.99	0.0001	11.60	0.0000
	(0.04)	(0.02)		(0.02)		(0.01)	
Log of labour productivity	4.21	4.21	0.8637	4.24	0.0713	4.24	0.0240
	(0.02)	(0.01)		(0.01)		(0.004)	
Log of TFP	5.32	5.23	0.0005	5.36	0.0656	5.33	0.7936
	(0.02)	(0.01)		(0.01)		(0.01)	
Log of labour cost	3.91	3.91	0.9103	3.90	0.3577	3.91	0.4372
	(0.01)	(0.01)		(0.004)		(0.003)	
Log of nr employees	6.69	6.02	0.0000	6.87	0.0000	6.50	0.0000
	(0.04)	(0.01)		(0.02)		(0.01)	
ROA	5.10	5.66	0.0949	5.76	0.0289	5.94	0.0034
	(0.34)	(0.13)		(0.12)		(0.08)	
Nr of firms in 2010	753	3922		3958		7862	

Table 3 (continued)

C) ITALY

	Treated	Control 1	Diff. (P-value)	Control 2	Diff. (P-value)	Control 3	Diff. (P-value)
Log of sales	12.26	12.13	0.3111	11.96	0.0120	11.91	0.0026
	(0.12)	(0.05)		(0.05)		(0.03)	
Log of assets	12.71	12.47	0.0623	12.13	0.0000	12.06	0.0000
	(0.13)	(0.05)		(0.05)		(0.04)	
Log of labour productivity	4.52	4.52	0.9141	4.39	0.0040	4.42	0.0172
	(0.06)	(0.03)		(0.02)		(0.01)	
Log of TFP	5.94	5.94	0.9944	5.39	0.0000	5.50	0.0000
	(0.05)	(0.02)		(0.02)		(0.01)	
Log of labour cost	3.93	3.94	0.8068	3.95	0.6088	3.96	0.3711
	(0.04)	(0.02)		(0.01)		(0.01)	
Log of nr employees	6.65	6.42	0.1145	6.44	0.0981	6.36	0.0277
	(0.14)	(0.06)		(0.05)		(0.04)	
ROA	2.34	2.78	0.4934	3.45	0.0519	3.88	0.0092
	(0.65)	(0.25)		(0.22)		(0.18)	
Nr of firms in 2010	173	917		820		1678	

D) SPAIN

	Treated	Control 1	Diff. (P-value)	Control 2	Diff. (P-value)	Control 3	Diff. (P-value)
Log of sales	11.04	10.58	0.0000	11.49	0.0000	11.09	0.2083
	(0.04)	(0.02)		(0.01)		(0.01)	
Log of assets	10.80	10.34	0.0000	11.23	0.0000	10.77	0.5859
	(0.05)	(0.02)		(0.02)		(0.01)	
Log of labour productivity	4.05	4.11	0.0132	4.16	0.0000	4.23	0.0000
	(0.03)	(0.01)		(0.01)		(0.01)	
Log of TFP	5.18	5.14	0.1431	5.26	0.0018	5.23	0.0482
	(0.03)	(0.01)		(0.01)		(0.01)	
Log of labour cost	3.59	3.61	0.2694	3.72	0.0000	3.78	0.0000
	(0.02)	(0.01)		(0.01)		(0.004)	
Log of nr employees	5.99	5.25	0.0000	6.28	0.0000	5.72	0.0000
	(0.02)	(0.004)		(0.01)		(0.01)	
ROA	7.07	6.86	0.6123	7.44	0.3866	7.92	0.0356
	(0.46)	(0.16)		(0.16)		(0.12)	
Nr of firms in 2010	524	2728		2737		5541	

Notes. Standard error in parentheses. Treated: firms to which gender quotas would have been applied in 2010. Control 1: non-treated firms of the same country matched to the treated ones. Control 2: potentially treated firms in Germany in 2010. Control 3: potentially non-treated firms in Germany in 2010.

Table 4

The effect of gender quotas on firm performance in Belgium. DD and DDD estimates with tests for parallel trends

	(1) Labour productivity	(2) TFP	(3) Nr of employees	(4) ROA
A) DD				
Treated x post	-0.014	-0.026	0.031	-0.457
	[0.076]	[0.085]	[0.132]	[1.390]
Constant	4.084***	5.468***	5.101***	-19.203**
	[0.099]	[0.026]	[0.040]	[9.252]
Observations	1,128	1,128	1,128	1,126
Number of firms	170	170	170	169
R-squared	0.059	0.032	0.050	0.121
B) DD parallel trend test				
Treated x trend	0.007	0.014	0.036	0.237
	[0.019]	[0.018]	[0.028]	[0.311]
Trend	0.013**	0.019***	0.022**	-0.813***
	[0.006]	[0.006]	[0.009]	[0.228]
C) DDD				
Belgium x treated x post	-0.035	-0.039	0.025	-0.577
	[0.081]	[0.089]	[0.138]	[1.628]
Belgium x post	0.004	0.004	-0.079*	-2.448**
	[0.036]	[0.039]	[0.047]	[0.962]
Treated x post	0.012	0.009	0.008	0.219
	[0.033]	[0.031]	[0.037]	[0.832]
Constant	3.991***	5.325***	5.373***	-28.13***
	[0.076]	[0.016]	[0.027]	[7.760]
Observations	2,788	2,788	2,788	2,784
Number of firms	394	394	394	393
R-squared	0.051	0.029	0.090	0.088
D) DDD Parallel trends test				
Treated x trend x Belgium	0.008	0.010	0.012	0.420
	[0.020]	[0.020]	[0.030]	[0.381]
Belgium x trend	0.015**	0.017**	0.000	-0.534**
	[0.008]	[0.008]	[0.011]	[0.256]
Treated x trend	-0.001	0.004	0.024*	-0.228
	[0.007]	[0.007]	[0.012]	[0.215]
Trend	-0.003	0.002	0.022***	-0.349**
	[0.005]	[0.005]	[0.007]	[0.137]

Notes. Dependent variables in col. 1-3 are in logarithm. Each DD and DDD equation controls for firm and year fixed effects. The Labour productivity equation in column 1 includes a control for (ln) capital per employee. The ROA equation includes controls for (ln) sales. Clustered standard errors at the firm level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5

The effect of gender quotas on firm performance in France. DD and DDD estimates with tests for parallel trends

	(1) Labour productivity	(2) TFP	(3) Nr of employees	(4) ROA
A) DD				
Treated x post	-0.038**	-0.035*	0.032	-0.136
	[0.019]	[0.020]	[0.033]	[0.490]
Constant	3.710***	5.034***	5.660***	-23.53***
	[0.026]	[0.005]	[0.010]	[3.183]
Observations	30,752	30,752	30,752	30,726
Number of firms	5,045	5,045	5,045	5,039
R-squared	0.094	0.074	0.099	0.049
B) DD parallel trend test				
Treated x trend	-0.006	-0.008**	-0.004	-0.163
	[0.004]	[0.004]	[0.008]	[0.106]
Trend	0.015***	0.026***	0.047***	-0.363***
	[0.001]	[0.001]	[0.002]	[0.032]
C) DDD				
France x treated x post	-0.070***	-0.040**	0.093***	-1.337***
	[0.020]	[0.020]	[0.033]	[0.512]
France x post	0.008	0.008	-0.046***	-0.360**
	[0.005]	[0.005]	[0.009]	[0.170]
Treated x post	0.029***	0.002	-0.055***	1.046***
	[0.004]	[0.004]	[0.007]	[0.134]
Constant	-0.070***	-0.040**	0.093***	-34.13***
	[0.020]	[0.020]	[0.033]	[2.148]
Observations	91,391	91,391	91,391	91,352
Number of firms	13,233	13,233	13,233	13,227
R-squared	0.092	0.059	0.095	0.053
D) DDD Parallel trends test				
Treated x trend x France	-0.008*	-0.007*	0.008	-0.229**
	[0.004]	[0.004]	[0.008]	[0.115]
France x trend	0.013***	0.016***	0.010***	0.060
	[0.001]	[0.001]	[0.002]	[0.042]
Treated x trend	0.002*	-0.002	-0.012***	0.070*
	[0.001]	[0.001]	[0.002]	[0.038]
Trend	0.001	0.010***	0.036***	-0.538***
	[0.001]	[0.001]	[0.001]	[0.034]

Notes. See Table 4.

Table 6

The effect of gender quotas on firm performance in Italy. DD and DDD estimates with tests for parallel trends

	(1) Labour productivity	(2) TFP	(3) Nr of employees	(4) ROA
A) DD				
Treated x post	0.055*	0.051*	-0.044	-0.743
	[0.029]	[0.029]	[0.046]	[0.461]
Constant	1.960***	5.850***	6.283***	-20.48***
	[0.155]	[0.012]	[0.019]	[3.715]
Observations	10,269	10,269	10,269	10,264
Number of firms	1,217	1,217	1,217	1,216
R-squared	0.419	0.019	0.029	0.075
B) DD parallel trend test				
Treated x trend	-0.003	0.001	0.007	-0.196
	[0.007]	[0.006]	[0.009]	[0.123]
Trend	-0.022***	0.007***	0.030***	-0.509***
	[0.003]	[0.002]	[0.004]	[0.047]
C) DDD				
Italy x treated x post	0.081***	0.051*	-0.172***	0.423
	[0.031]	[0.030]	[0.050]	[0.553]
Italy x post	-0.069***	-0.057***	0.011	-0.879***
	[0.013]	[0.012]	[0.020]	[0.239]
Treated x post	-0.016	0.000	0.129***	-1.177***
	[0.011]	[0.010]	[0.019]	[0.309]
Constant	2.597***	5.612***	6.337***	-18.68***
	[0.121]	[0.007]	[0.012]	[2.480]
Observations	23,813	23,813	23,813	23,805
Number of firms	3,065	3,065	3,065	3,064
R-squared	0.272	0.029	0.068	0.061
D) DDD Parallel trends test				
Treated x trend x Italy	0.014*	0.002	-0.042***	0.258*
	[0.007]	[0.007]	[0.011]	[0.145]
Italy x trend	-0.011***	-0.002	0.010**	-0.188***
	[0.003]	[0.003]	[0.005]	[0.066]
Treated x trend	-0.016***	-0.001	0.049***	-0.454***
	[0.003]	[0.002]	[0.005]	[0.078]
Trend	-0.003	0.008***	0.019***	-0.304***
	[0.002]	[0.002]	[0.003]	[0.053]

Notes. See Table 4.

Table 7

The effect of gender quotas on firm performance in Spain. DD and DDD estimates with tests for parallel trends

	(1) Labour productivity	(2) TFP	(3) Nr of employees	(4) ROA
A) DD				
Treated x post	-0.003	-0.007	-0.016	-0.611
	[0.012]	[0.013]	[0.017]	[0.407]
Constant	3.587***	5.074***	5.282***	-53.43***
	[0.027]	[0.005]	[0.006]	[3.858]
Observations	30,593	30,593	30,593	30,582
Number of firms	3,504	3,504	3,504	3,504
R-squared	0.070	0.031	0.041	0.112
B) DD parallel trend test				
Treated x trend	-0.013***	-0.014***	-0.007	-0.630***
	[0.005]	[0.005]	[0.005]	[0.077]
Trend	0.043***	0.054***	0.045***	-0.249*
	[0.002]	[0.002]	[0.002]	[0.146]
C) DDD				
Spain x treated x post	-0.004	0.023*	0.122***	-2.394***
	[0.013]	[0.014]	[0.020]	[0.455]
Spain x post	-0.032***	-0.090***	-0.271***	0.612***
	[0.007]	[0.006]	[0.012]	[0.216]
Treated x post	0.001	-0.031***	-0.140***	1.778***
	[0.006]	[0.005]	[0.011]	[0.201]
Constant	3.732***	5.123***	5.553***	-32.93***
	[0.020]	[0.003]	[0.005]	[2.071]
Observations	76,093	76,093	76,093	76,071
Number of firms	9,341	9,341	9,341	9,341
R-squared	0.050	0.034	0.087	0.066
D) DDD Parallel trends test				
Treated x trend x Spain	0.009	0.013**	0.012*	0.568***
	[0.006]	[0.005]	[0.007]	[0.188]
Spain x trend	0.004	0.003	-0.012**	-0.899***
	[0.003]	[0.003]	[0.005]	[0.112]
Treated x trend	-0.023***	-0.027***	-0.019***	-0.915***
	[0.003]	[0.003]	[0.005]	[0.116]
Trend	0.039***	0.051***	0.057***	0.734***
	[0.002]	[0.002]	[0.004]	[0.109]

Notes. See Table 4.

Table 8

Board members' characteristics by gender – New, exiting and retained members

		A) New						
		2004-2008	2009-2011	2012-2013	Differences			
		(1)	(2)	(3)	(2)-(1)		(3)-(2)	
Age	M	55.21	54.83	57.32	-0.38		2.48	***
	F	46.54	50.17	48.84	3.63		-1.33	
Degree	M	0.85	0.84	0.84	-0.01		0.00	
	F	0.71	0.77	0.89	0.06		0.12	**
Degree in economics, management, law	M	0.59	0.61	0.61	-0.02		0.00	
	F	0.44	0.52	0.70	0.08		0.18	**
Managerial experience	M	11.53	12.87	13.80	1.34	**	0.93	
	F	4.94	8.17	8.44	3.23	*	0.26	
Board experience	M	7.70	8.15	10.52	0.45		2.37	***
	F	5.77	4.67	3.61	-1.10		-1.06	
		B) Exiting						
		2004-2008	2009-2011	2012-2013	Differences			
		(1)	(2)	(3)	(2)-(1)		(3)-(2)	
Age	M	56.92	57.98	59.42	1.06	*	1.44	*
	F	48.88	48.37	53.72	-0.49		5.35	**
Degree	M	0.87	0.81	0.85	-0.06	***	0.04	*
	F	0.78	0.74	0.86	-0.04		0.12	
Degree in economics, management, law	M	0.61	0.59	0.60	-0.02		0.01	
	F	0.58	0.51	0.55	-0.07		0.04	
Managerial experience	M	12.27	13.46	12.94	1.19		-0.52	
	F	3.92	5.47	9.62	1.55		4.15	*
Board experience	M	8.58	10.54	12.00	1.96	***	1.46	**
	F	5.83	6.16	4.76	0.33		-1.40	
		C) Retained						
		2004-2008	2009-2011	2012-2013	Differences			
		(1)	(2)	(3)	(2)-(1)		(3)-(2)	
Age	M	57.34	58.60	59.46	1.26	***	0.86	**
	F	48.49	49.56	51.68	1.07		2.12	*
Degree	M	0.82	0.82	0.84	0.00		0.02	
	F	0.64	0.65	0.72	0.01		0.07	
Degree in economics, management, law	M	0.56	0.56	0.57	0.00		0.01	
	F	0.35	0.37	0.46	0.02		0.09	*
Managerial experience	M	12.31	13.31	14.77	1.00	***	1.46	***
	F	9.18	9.48	12.29	0.29		2.81	**
Board experience	M	9.83	11.75	13.07	1.92	***	1.32	***
	F	8.46	10.05	10.17	1.58	**	0.12	
		% firms changing the board						
		2004-2008	2009-2011	2012-2013	Differences			
		(1)	(2)	(3)	(2)-(1)		(3)-(2)	
		60.37	49.15	63.54	-11.22**		14.39***	

Notes. M refers to male board members and F to female board members. *** p<0.01, ** p<0.05, * p<0.1

Table 9

Board member characteristics and firm productivity.

Pre-post fixed effects estimates. Dependent variable: logarithm of value added per employee

	(1)	(2)	(3)	(4)	(5)	(6)
F mean age	0.000					-0.000
	[0.002]					[0.004]
F mean age x post	0.005					0.002
	[0.003]					[0.004]
M mean age	0.038***					0.047***
	[0.014]					[0.016]
M mean age x post	-0.024					-0.022
	[0.018]					[0.021]
% F with college degree		-0.076				-0.034
		[0.124]				[0.252]
% F with college degree x post		0.387**				0.455**
		[0.153]				[0.205]
% M with college degree		0.547				0.237
		[0.347]				[0.394]
% M with college degree x post		-0.461				-0.486
		[0.440]				[0.460]
% F with degree in business, economics or law			-0.088			-0.119
			[0.160]			[0.194]
% F with degree in business, economics or law x post			0.284			-0.129
			[0.183]			[0.226]
% M with degree in business, economics or law			0.580**			0.701**
			[0.285]			[0.335]
% M with degree in business, economics or law x post			-0.240			-0.045
			[0.312]			[0.348]
F mean experience in managerial positions				0.018**		0.018
				[0.008]		[0.011]
F mean experience in managerial positions x post				0.001		0.001
				[0.006]		[0.007]
M mean experience in managerial positions				0.024**		0.021*
				[0.012]		[0.011]
M mean experience in managerial positions x post				-0.000		0.011
				[0.008]		[0.009]
F mean experience as board members					0.022	-0.076
					[0.083]	[0.087]
F mean experience as board members x post					-0.019	-0.025
					[0.045]	[0.071]
M mean experience as board members					0.004	-0.020
					[0.021]	[0.024]
M mean experience as board members x post					-0.025	-0.009
					[0.021]	[0.024]
Constant	2.722***	4.444***	4.557***	4.501***	4.773***	1.622
	[0.795]	[0.312]	[0.194]	[0.203]	[0.170]	[1.020]
Observations	1,192	1,192	1,192	1,192	1,192	1,192
Number of firms	173	173	173	173	173	173
R-squared	0.018	0.014	0.012	0.017	0.009	0.036

Notes. Amadeus sample of publicly listed companies matched with information on board members. M refers to male and F to female. All specifications include firm and time fixed effects. Clustered standard errors at the firm level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

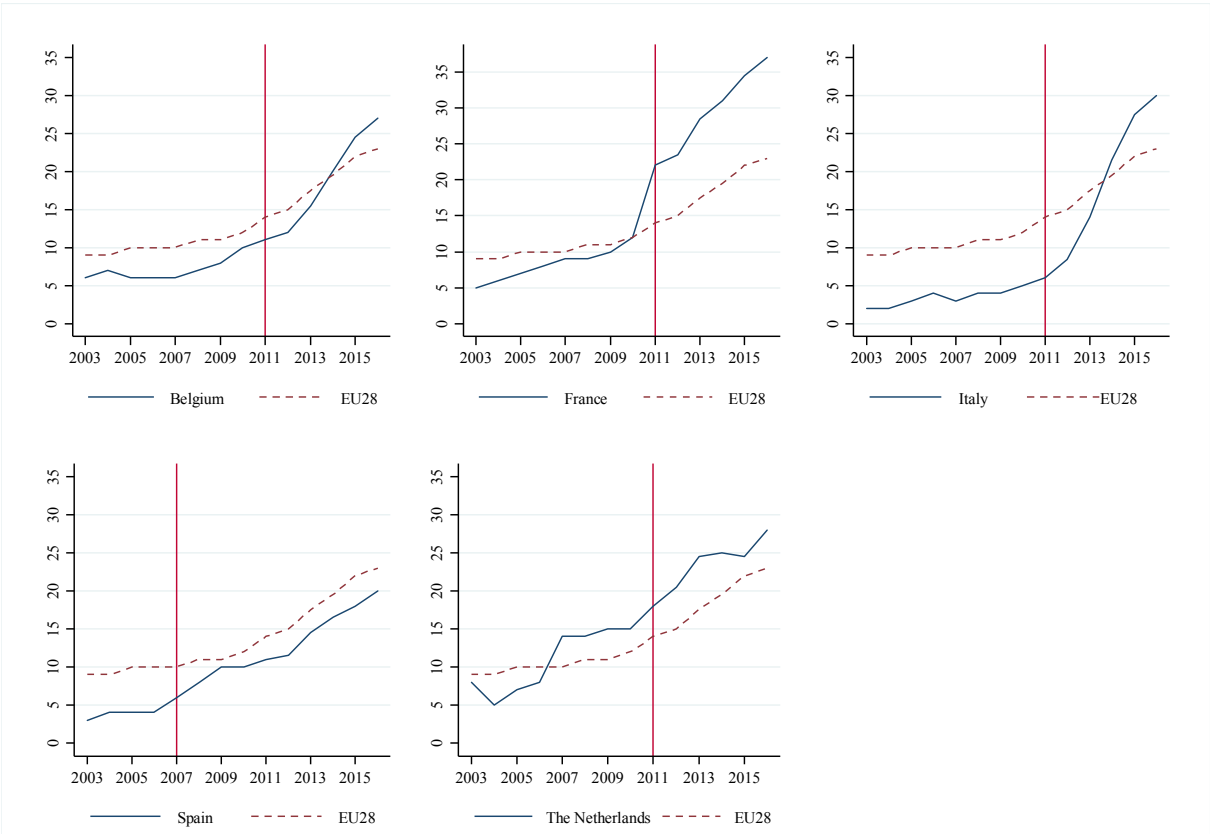

Fig. 1. *Female proportion on boards of directors*

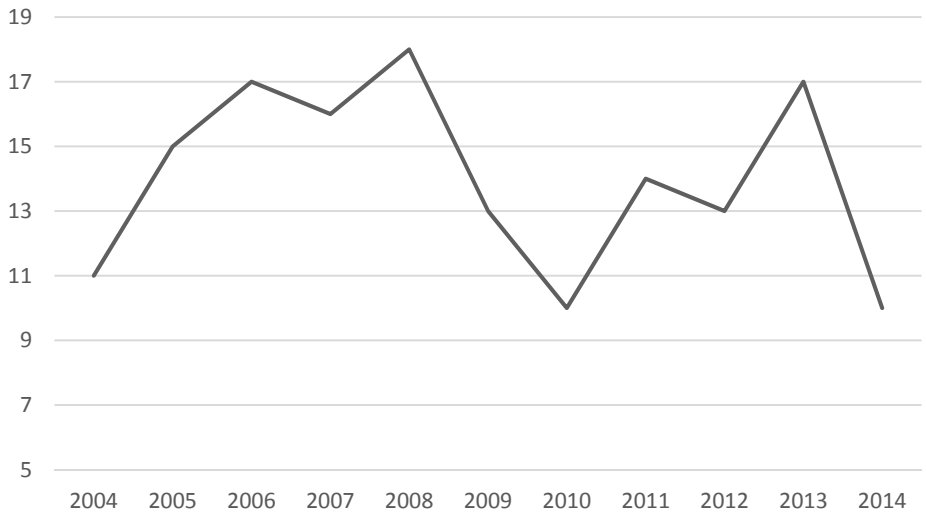

Fig. 2. *Number of delisting companies – Italy (2004-2014)*
Source. Borsa Italiana

Fig. 3. *Share of women on boards – Italy (2004-2013)*

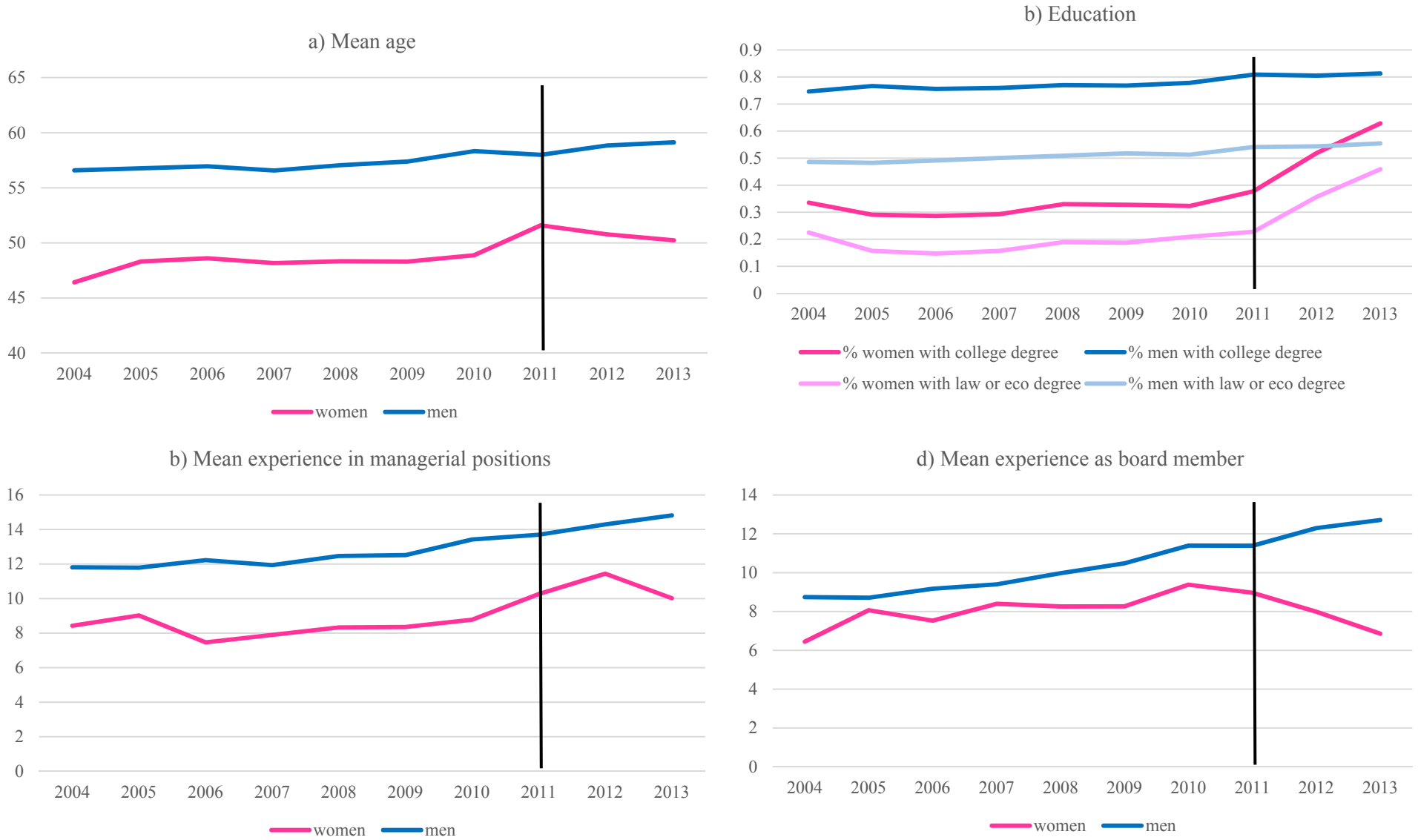

Fig. 4. *Boards characteristics by gender, 2004-2013 (Italy)*

Table A1

The effect of gender quotas on firm performance in Spain. DDD estimates and parallel trends test (Portugal as control country).

	(1) Labour productivity	(2) TFP	(3) Nr of employees	(4) ROA
A) DDD				
Spain x treated x post	-0.024*	-0.005	0.046**	-1.277***
	[0.014]	[0.015]	[0.019]	[0.443]
Spain x post	0.032***	0.008	-0.070***	-0.239
	[0.007]	[0.008]	[0.009]	[0.190]
Treated x post	0.023***	-0.001	-0.061***	0.687***
	[0.007]	[0.007]	[0.008]	[0.174]
Constant	3.530***	5.000***	5.374***	-52.34***
	[0.018]	[0.005]	[0.006]	[2.119]
Observations	72,786	72,786	72,786	72,769
Number of firms	9,195	9,195	9,195	9,191
R-squared	0.059	0.049	0.044	0.110
B) Parallel trends test				
Treated x trend x Spain	0.005	-0.002	-0.040***	0.459**
	[0.007]	[0.007]	[0.006]	[0.219]
Spain x trend	-0.004	0.002	0.021***	-0.592***
	[0.005]	[0.004]	[0.003]	[0.136]
Treated x trend	-0.019***	-0.012**	0.033***	-0.690***
	[0.005]	[0.005]	[0.003]	[0.163]
Trend	0.047***	0.052***	0.025***	-0.123
	[0.004]	[0.004]	[0.002]	[0.127]

Notes. See Table 4