

Disentangling Discrimination on Spanish Boards of Directors

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ABSTRACT

Manuscript Type: Empirical

Research Question/Issue: This study seeks to find evidence of discrimination behind the scarce presence of women on Spanish boards of directors through factors within firms linked with different theories of discrimination.

Research Findings/Insights: Using data on the boards of directors from the top 1,000 Spanish companies in 2005 and 2008, we identify some signals of discrimination. We find that women directors are scarcer in those sectors where there are fewer female managers or where the directors mainly draw on the firm's executive staff. There is also evidence of the dynamics of Becker's theory of discrimination, since time and competition seem to play in favor of a female presence on Spanish boards. We also find a contagion effect, implying a positive relationship between the number of women already on the board and the likelihood of adding a woman. This could signal some kind of underestimation of women's skills and preconceptions about their attitudes (such as risk-aversion) and hence their capacity to hold these positions.

Theoretical/Academic Implications: This study provides empirical support for the prediction of Becker's theory of discrimination. The study also furnishes evidence in favor of the existence of false preconceptions concerning the skills and risk attitudes of female managers.

Practitioner/Policy Implications: In order to reduce discrimination before reaching the board we propose to implement education and mentoring initiatives to improve the training of the female candidates, and to improve the work- and family-life balance. Once they are included in the pool of candidates the implementation of good corporate governance practices related to transparency and objectivity in selection procedures and/or even the establishment of a women's quota on boards may contribute to dismiss employers' negative beliefs about the capabilities of female candidates.

Keywords: Corporate Governance, Gender Discrimination, Board of Directors, Glass Ceiling

INTRODUCTION

The objective of this paper is to find evidence of gender discrimination on the boards of directors of the largest Spanish companies through the analysis of observable factors related to their presence on boards and their possible relationship with the different types of discrimination provided by the literature. To do this, we analyze the composition (both in 2005 and 2008) in terms of gender of the boards of directors of the top 1,000 Spanish companies, where we have found that the mean percentage of women has grown from 6.6 per cent to 8.6 per cent. When seeking to identify possible causes of female underrepresentation, we opt to

study determinants on the demand rather than the supply side. Supply-side determinants relate to the tendency of women to participate less in the labor market and to their relative lack of long-term career commitment when compared with men, mainly as a consequence of motherhood, child care, and the unequal allocation of household tasks. In looking for these kinds of causes, survey data, such as that of Bertrand, Goldin, & Katz (2009) are a useful reference. However, survey data are likely to be biased by the self-selection of those women who wish to "showcase" their successful careers¹. Besides, once a woman has reached the top executive rank, it is reasonable to assume that such supply-side differences are minimized and that such men and women are likely to be similar, sharing a high level of job motivation and lofty career ambitions (Bertrand & Hallock, 2001). Hence, additional causes on the demand side should be explored.

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TABLE 1
Previous Research on Women's Presence on the Boards of Directors of Spanish Companies

Research	Sample	Women's participation	Boards without women
Natividad (2002)	300 companies ranked by operating revenues	4.6%	76%
Ethical Investment Research Service (2004)	FTSE All World Developed Index (24 companies)	3.8%	–
Félez, Romero, Pueyo, and Llaría (2004)	<i>Ibex</i> -35 (35 companies)	3.57%	63%
European Professional Women's Network (2004)	250 European companies by operating revenues	3%	60%
Spencer Stuart (2004)	90 Spanish companies	4%	66%
Albert-Roulhac (2005)	<i>Ibex</i> -35 (35 companies)	2.6%	69%
Gómez Ansón (2005)	119 Spanish listed companies	4.04%	68.07%

The study of gender discrimination on the boards of directors of Spanish companies is important for a variety of reasons. Firstly, in today's corporate world, gender diversity has become a relevant topic at a time when a number of market regulators are considering quotas for women on publicly traded companies' boards as a requirement in their Codes of Conduct, and when improving governance is a key issue for firms to survive in a global crisis. In Spain this is a pressing issue since the government, by introducing in 2007 the "Equality Law" (Constitutional Act 3/2007 of 22 March 2007 for Effective Equality between Women and Men), has undertaken to increase female representation on publicly traded companies' boards to 40 per cent by 2015, although this female quota is not mandatory, but merely a recommendation. Secondly, the study of women's representation on boards is especially interesting as an extreme case in the broad research of possible causes of discrimination against women in the labor market. In fact, many studies (Adams & Ferreira, 2004; Carter, Simkins, & Simpson, 2003; Farrell & Hersch, 2005) have addressed the differences in gender and race compositions of boards of directors. Terjesen, Sealy, & Singh (2009) offer a thorough review of the literature on women on corporate boards. And finally, the causes of discrimination in labor markets remain an open issue, where no clear evidence has been found to favor one theory over another. Indeed, the characteristics of the different types of discrimination are usually mixed and distorted by elements of segregation (vertical and horizontal) in the labor market. In view of this, the key is to identify the type of discrimination that occurs in the labor market since different kinds of discrimination have different economic implications and imply diverse policy actions for policymakers.

The Spanish case offers a suitable setting for distinguishing among different causes of discrimination. In the Spanish business environment, women's economic integration remains a cause for concern given the marked lack of women in the higher decision-making positions (de Anca, 2008). While data from the quarterly survey of the labor market conducted by the Spanish national statistics office show that female participation in the Spanish labor market has steadily increased from 28 per cent in 1976 to 44 per cent

in 2009, the same increase is not observed in directorships and, especially, on boards of directors. According to the World Economic Forum 2009 Gender Gap report (Hausmann, Tyson, & Zahidi, 2009), Spain ranks 90th out of 134 countries in terms of Economic Participation and Opportunity and 120th in terms of wage equality. In this sense, according to the Spanish Women's Institute's 2006 data, while the participation of women in executive positions of companies and the public sector is around 32 per cent, it is only between 6 per cent and 8 per cent on the boards of directors of the largest Spanish companies in 2005 and 2008, respectively, according to our estimates (see Table 1 for previous reports on women's presence on Spanish boards of directors). This proportion is one of the lowest among developed countries. In fact, Terjesen & Singh (2008) shows that Spain has the 8th lowest percentage of women on boards among 43 countries studied, ahead only of Japan, Italy, Luxembourg, Iceland, Ireland, Austria, and Argentina.

Nevertheless, the disadvantageous economic position of women in Spain does not equate to that exhibited in other social realms. In this respect, the WEF report shows that Spain ranks 9th regarding political empowerment (6th for women in ministerial positions with 44 per cent female representation, and 11th in women in parliament with 36 per cent of female members), and in terms of education it occupies first position for level of enrolment in secondary and tertiary education (96 per cent and 76 per cent of all women, respectively). Therefore, there may be something in the economic area of Spanish society explaining this disparity.

Several theories explain this underrepresentation of women in the corporate world, based on adverse selection (women's incentive problems in the labor market) leading to self-fulfilling prophecies about their professional development. Moreover, De la Rica, Dolado, & Llorens (2008) find evidence that discrimination against women plays a key role in the Spanish labor market when explaining differences across gender, despite the fact that men and women are ex-ante identical. Given that outcome, we focus our study on the possible presence of a "glass ceiling"² (Morrison, White, & Van Velsor, 1987; Powell & Butterfield, 1994) as a crucial

factor behind the scant presence of women on Spanish corporate boards.

We contribute to the literature on gender discrimination on boards of directors in several respects. Firstly, when looking for signals of discrimination on Spanish boards of directors we try to disentangle the mechanisms through which this might be taking place resorting to alternative theoretical models. In this sense, we take a step forward from similar studies by going into a level of detail which, to the best of our knowledge, no other study has achieved. Secondly, we control for a wider range of explanatory variables than the extant literature, which concentrates almost exclusively on visually observable firm characteristics. In this sense, we include variables that add features of the firm's industrial sector, such as industry competition (the Herfindahl-Hirschmann Index) and the proportion of female directors in an industry, along with a variable to control for the exogenous shock caused by the introduction in 2007 of the "Equality Law". And finally, unlike previous studies which mainly focus on Spanish listed companies or on a small sample of the largest Spanish companies, we focus on the top 1,000 Spanish companies using similar criteria to those of the countries that usually monitor diversity on boards as an indicator of good corporate governance. The result of this is a database of unparalleled size and extensive scope in Spain (Catalyst gathers large scale data on women on boards in its Annual Census of the Fortune 500, but from US firms) that comprises more than 6,000 board members in 2005 and around 5,300 in 2008, with information collected from different sources (the SABI database, the files from the Mercantile Registry, e-Infirma database, companies' annual reports, and websites). This comprehensive database has allowed us to expand the number and the types of companies compared with previous studies and to estimate, through discrete outcome models, the probability of a directorship being held by a woman.

The rest of the paper is organized as follows. In the next section, we review the theoretical models of discrimination and develop our hypothesis drawing on these theories. We then describe the data and the methodology of sample selection, and define the independent variables used. In the following section, discrete outcome models (negative binomial regression models) are used to estimate the probability of a director being a woman along with two additional models to gain further evidence for Becker's predictions and the contagion effect. Finally, we discuss the results obtained and present the main limitations and future research lines.

THEORETICAL MODELS OF DISCRIMINATION AND HYPOTHESIS DEVELOPMENT

In corporate governance, the concept of diversity relates to board composition and refers to the mix of attributes, characteristics, and expertise contributed by individual board members in relation to board procedures and decision-making (Van der Walt & Ingley, 2003). In the widest sense, the various types of diversity in the boardroom include gender, age, ethnicity, race, nationality, culture, religion, constituency representation, independence, professional

background, knowledge, technical skills and expertise, commercial and industry experience, and career and life experience (Dalton, Daily, Ellstrand, & Johnson, 1998; Milliken & Martins, 1996; Point & Singh, 2003; Singh, Terjesen, & Vinnicombre, 2008). In this paper we focus on the first of these.

Progress towards more diversified boards in terms of gender has been slow and efforts to diversify boards away from homogeneous, closed, and elitist cultures have encountered many difficulties. Many explanations may lie behind the low representation of women on boards of directors. In the first place, there may be a limited proportion of women with the professional profile desired by the company to join the board and therefore, they are generally excluded from the pool of potential executive candidates to hold these positions. Generally, candidates to the board of directors are required to have, among other prerequisites, a high level of previous experience in positions of responsibility in departments such as production and finance, whereas the heads of departments in other areas, like human resources or marketing, where there is a greater presence of women, are not considered to the same degree as potential candidates to hold directorships.

The second explanation is discrimination due to preferences. In this sense, the company may discard female candidates for its board of directors even when they are available because the decision-makers prefer forfeiting income rather than hiring women (Becker, 1957). The third explanation for the scarce presence of women on boards is due to the fact that the abilities of women candidates are not correctly assessed. This includes statistical discrimination defined by Phelps (1972) that occurs when women are judged according to the average characteristics of their group and not on the basis of their own personal characteristics; and also the closely related mistake-based discrimination with respect to the systematic underestimation of women's skills (Wolfers, 2006).

The Reduced Pool of Female Candidates

Regarding the first group of explanations, which we call "reduced pool of female executive candidates", the limited presence of women on boards of directors would not be due so much to gender discrimination in the selection process as to the existence of socio-cultural obstacles in the early stages leading up to the professional promotion of women. Nevertheless, even in a context without discrimination, it is an empirical (and unresolved) question whether this is efficient or not. In fact, some authors (Rodríguez Mora, 2009) argue that, even if there were no discrimination, an outcome where female participation is scarce would be inefficient insofar as the preferences and outlook on life that women have are a consequence of "nurture" (they are brought up in certain ways) and not "nature", i.e., because of their inherent condition of being women.

Among the factors that explain why there are fewer women than men with the potential to be appointed to boards of directors, there are some explanations, such as the existence of occupational segregation (Dolado, Felgueroso, & Jimeno, 2004), which reduce the proportion of women in

finance-related or more technical positions, which are precisely those functions more likely to be represented on a corporate board. Bertrand & Hallock (2001) state that there are differences between men and women that could prevent the development of a successful executive career, such as women's relative lack of long-term career commitment possibly induced by lower wages, or a greater taste for fringe benefits or good working conditions, family responsibilities that, in many cases, unlike with men, interrupt the development of the professional activity of the female worker, or the anticipation by many women of the glass ceiling that drives them to sacrifice their professional development in favor of their family life (according to data from Spanish Woman's Institute, in 2006 Q4, among the people who were not seeking employment due to family reasons, 97 per cent were women, with women also requesting leave in 98 per cent of cases of maternity/paternity leaves). All of them mean that there is a lower proportion of ready-for-the-board female executives.

If there is a shortage of suitable-prepared female executives, we would expect to find a lower proportion of female directors among those economic sectors where there is a lower supply of female managers.

Hypothesis 1a. There is a positive relationship between the industry proportion of female executives and the proportion of women on the board.

Additionally, the special characteristics of the pool where the companies chose board members are important when determining the effect of the reduced pool of women candidates on the percentage of women on the board. So, in those firms where the board members are filled mainly among the owners of the firm do not apply the restriction of a reduced pool of women in the executive management. This is the case of family-based firms, where the pool of candidates for the board comes from family ties and where women board members assume at the same time their roles as managers and as owners. In this sense, insofar as in family-based firms female executive candidates to the board are drawing on the owners-managers women family members females find a easier access to the board and we should expect a greater presence of women on their boards compared to the rest of companies. Ruigrok, Peck, & Tacheva (2007) found that in Swiss family-based companies in which women with family ties were more likely to have access to boards and where the owners have a greater control of the company and managers are less likely to be on the board, female directors will make up a higher proportion of the board.

Hypothesis 1b. Family-based firm variable has a positive relationship with the proportion of women directors.

Lack of Competition

The reduced pool of female candidates could imply that the number of women who are actually willing and able to hold a position on boards of directors is not equal to that of men. Nevertheless, considering that the population of female executives (31.7 per cent according to the Spanish Woman's Institute 2006 data) is a good proxy of directors' eligibility, a proportion higher than the actual 6–8 per cent should be

expected for women's presence on boards. Therefore, the significant gap between these figures points to the possibility of some kind of discrimination against women.

We label the first group of discrimination drivers as "discrimination for preferences". According to Becker's theory of discrimination (Becker, 1957), we refer to cases where those responsible for appointing board members have a dislike for female directors, sacrificing efficiency in order to select people they "like" instead of people they "need". Thus, the Becker theory predicts that the discriminatory practices (what he called taste-based discrimination) of those companies that prefer not to work with women would lead to higher costs, in terms of loss of efficiency and lower profits, than those of companies that did not discriminate. Consequently, in a perfectly competitive market, the companies that discriminated would not survive in the long term.

The usual criticism of Becker's theory focuses on the point that discrimination, implying higher costs or diminished income, should have disappeared as a result of market dynamics, since time and competition would ultimately resolve the problem of discrimination in the long run. In spite of this, Heckman (1998) argues that this prediction may not be false in the end. According to this author, discrimination will only disappear in the presence of strong competition and even then it may take decades to remove inefficient companies (such as those that discriminate) from the market. In less competitive markets, extra rents allow companies to indulge their tastes, and therefore discrimination can be seen as an affordable option for those who like it even when this is uneconomical. Cavalluzzo, Cavalluzzo, & Wolken (2002) found that African Americans were more likely to be denied credit in less competitive financial markets (those more concentrated). Thus, in our empirical study we look for signs of lower numbers of female directors among less competitive sectors. Using the level of industry concentration as an inverse indicator of competition we can formulate the following hypothesis:

Hypothesis 2a. An industry's level of competitive concentration has a negative relationship with the percentage of women on the board

Additionally, according to Heckman's (1998) proposition, market dynamics will take some time to work through before removing a new company with discriminating practices from the market. Indeed, among start-ups one could find all type of companies, discriminating and non-discriminating ones. Those less inefficient companies have higher chances of surviving. As long as we consider discriminating practices as inefficient, we expect a lower presence of women among younger companies and a higher proportion of women on boards among older ones, because only in older companies the detrimental effect of discrimination would have reduced their chances of survival and only the non-discriminating ones remain in the market.

Hypothesis 2b. The firm's age has a positive relationship with the proportion of women directors.

Lack of Personal Information

Sometimes, the absence of female directors does not stem from an act of deliberate discrimination or preference for male directors, but as a consequence of an underestimation of women's skills. This underestimation is linked with diverse theories of discrimination. For instance, according to statistical discrimination (Phelps, 1972), the company that seeks to maximize its expected profit will discriminate against women if it believes them to be less qualified on average than men, or if the cost of gaining information about the individual applicants is excessive. Thus, the company will look for easily observable variables (i.e., gender), instead of personal characteristics, which may reflect biased inferences on the part of the company and have nothing to do with productivity or information. Although there may be some economic rationality to this, inefficiencies can also be involved, as the *a priori* preference for male over female candidates might not only stem from the employer's previous statistical experience with the two groups, but also from the prevailing sociological beliefs concerning the abilities of women and from prejudices about them in society.

Closely related to this is mistake-based discrimination. Biased knowledge about female candidates has its roots in stereotyped profiles of men and women that have no real and objective basis. Therefore, if the low representation of women on the board were caused by this type of discrimination, the companies involved would be inefficient in their resource allocation, entailing a clear cost for them. We, therefore conclude that, given an underestimation of women's skills, in those cases where board nomination committees have some additional information about candidates, women's presence is substantially higher. This information prevents women from being assessed in terms of some kind of average of a female group or stereotype.

If there are stereotypes and social prejudices that bias the perception of women's abilities, this bias tends to disappear if more women are already on the board, since direct contact with people of the discriminated group, and the information provided by this, can offset the effects of social stereotypes and prejudices (Bertrand, Dolly, & Mullainathan, 2005). According to this contagion factor, we are more likely to observe the addition of a woman to the board the higher the previous existing representation of women on the board.

Hypothesis 3a. The absence of women on the board has a negative relationship with the probability of hiring new female candidates.

One example of this underestimation of women's skills that can be easily tested is to look at risk-aversion. The perception that women are more risk-averse than men (Jianakoplos & Bernasek, 1998; Sundén & Surette, 1998) is considered by some authors as a stereotype and as a major cause of the "glass ceiling" on corporate promotion ladders (Johnson & Powell, 1994). In this sense, Schubert, Brown, Grysler, & Brachinger (1999) found that, in contextual financial decisions, the preconceptions concerning the risk attitudes of female investors and managers may be more prejudice than fact, and they would be a source of statistical discrimination against women in financial and labor markets. The lower presence of women on the boards of

firms engaged in riskier business can also be seen as a sign of statistical discrimination in the sense that, if women are expected to be more conservative investors than men, they are consequently excluded from those positions more concerned with risk-taking. This discrimination means that when a company faces a significant level of risk, it is less likely to hire women for the board, since they are wrongly seen as less skilled to make the risky decisions that may be necessary for a firm's success. To test whether risk-aversion is a true stereotype, we expect the level of risk only to affect the hiring of new female directors in those companies with no woman on the board. By contrast, once women are on the board and their risk propensity can be correctly assessed by the whole board, there should be no effect of the level of risk on the gender of new board members.

Hypothesis 3b. The risk level of the firm has no effect on the gender of new directors when there are already women on the board.

To sum up, Table 2 presents and summarizes all of the propositions and the hypotheses of our study and their relationship with the various theories of discrimination

SAMPLE AND DESCRIPTIVE STATISTICS

Data Selection

In Spain, the board of directors is the chief governing body of a company, and it is appointed by the shareholders' meeting. The company's bylaws specify the composition and number of members of the board and how they are to be chosen. However, Article 116 of the Securities Market Law obliges Spanish listed companies to inform in their Annual Report on Corporate Governance on compliance with the official recommendations concerning corporate governance. According to this article, when dealing with aspects related to board practice and standards, Spanish corporations follow the "comply or explain principle" (De Anca, 2008).

These recommendations were established in the Unified Code of Good Corporate Governance of Listed Companies approved by the CNMV (National Securities Markets Commission, the Spanish equivalent to the US Securities and Exchange Commission), in May 2006. This Code sets out recommendations concerning functional structure, size, and board composition. The board should reflect the diversity of knowledge, gender and experience needed to perform its functions effectively, objectively and independently. For that reason, the board should ideally comprise no fewer than five and no more than 15 members; External directors (non-executive directors) – both proprietary and independent – should hold a large majority of board places. In particular, independent directors should account for at least one-third of all board members; gender diversity has been introduced into the new code in Recommendation N.15 whereby when the number of female directors is low or zero, the board must explain the reasons and actions taken to correct the situation.

With reference to this gender diversity, the Code recommends that companies with a limited presence of women on their Boards should make a deliberate effort to find potential

TABLE 2
Summary of Hypothesis Tested, Type of Discriminations Involved and Related Variables

	Proposition 1:	Proposition 2:	Proposition 3:
Proposition	The reduced pool of female executive candidates compared to men limits the number of women on the Board of Directors.	Lack of competition hinders the presence of women on the board.	Lack of information about actual personal abilities raises barriers against female candidates.
Ultimate Cause	Discrimination on the first stages of the professional career. Adverse selection.	Taste-based discrimination	Mistake-based, statistical discrimination.
Hypothesis	H 1.1. There is a positive relationship between the industry proportion of female executives and the proportion of women on the board. H. 1.2. Family-based firm variable has a positive relationship with the proportion of women directors.	H 2.1. An industry's concentration has a negative relationship with the percentage of women on the board. H 2.2. There is a positive relationship between a firm's age and the proportion of women directors.	H 3.1. The absence of women on the board has a negative relationship with the probability of hiring new female candidates. H 3.2. The risk level of the firm has no effect on the gender of new directors when there are already women on the board.

female candidates whenever a vacancy has to be filled (especially that of independent directors). In particular, the nomination committee must ensure that in the process of selecting new board members: 1) there are no implicit biases preventing or impeding the selection of women; and 2) companies will have to look intentionally for and include among potential candidates women with the professional profile sought. The Code also specifies more specialized procedures for the selection of new board members. Although the CNMV considers there have been significant improvements in corporate governance at listed Spanish companies, it also underlines the need to have better board transparency, in particular in the selection processes.

The present study focuses on Spanish companies whose operating revenues exceeded 100 million euros in the year 2003, according to the SABI³ database. This includes both listed and unlisted companies. We have chosen to analyze the largest companies because they mark a clear business and social reference. Small and medium-sized enterprises behave quite differently in terms of their corporate governance (Linck, Netter, & Yang, 2008; Zahra, Neubaum, & Huse, 2000) and the quality of information deteriorates quite sharply when the size of the company analyzed shrinks. Additionally, the firm size criterion corresponds to those used in other countries that usually monitor diversity on boards as an indicator of good corporate governance, which makes for readier comparison with neighbouring countries. Also, this is the criterion of the economic literature for analysing diversity on boards. For example, Carter et al. (2003) use Fortune 1,000 companies as their sample, while Farrell & Hersch (2005) base their study on Fortune 500 lists, as do Adams & Ferreira (2004). The search showed a total of 1,148 non-financial companies, once companies that had closed

down⁴ had been eliminated. In 2003 these companies had a total of 1.35 million employees, representing 10 per cent of the total Spanish workforce. They also accounted for 65 per cent of the companies with more than 5,000 employees, 40 per cent of those with more than 1,000, and 30 per cent of those with more than 500. Their aggregate operating revenue was equivalent to 65 per cent of GDP and accounted for 78 per cent of the returns of Spanish companies.

Information on the board members of companies was also obtained from the SABI database⁵, as updated in June 2005 and June 2008. This interval of three years is the same used by Garay & González (2008), to ensure mobility of the board members. In some cases, it was necessary to supplement that data with information obtained from files from the Mercantile Registry, e-Infirma database, and companies' annual reports and websites.

In order to determine the gender composition of the boards, we examine the first names of the board members. Spanish first names clearly identify gender, even for those names with the same root they have a different suffix (i.e., *Antonio* for male, *Antonia* for female). And in the case of composite names, the order signals the gender (i.e., *María-José* for female and *José-María* for male). Therefore, the gender of almost all directors was clearly signalled by their first names. For those remaining (mainly foreign – e.g., Japanese, Korean, French, and Scandinavian – names), the matter was clarified one-by-one using internet search: by the use of gender-specific language in a biography given in the Annual Report (Mr., Ms., he, she, his, her); by a photograph given in the Annual Report; by internet materials (mainly news articles and the websites of foreign companies). Institutional board seats held by other corporations are excluded, since they are represented by a changing group of

TABLE 3
Spanish Boards of Directors in 2005 and 2008

Variable	2005					2008				
	Sum	Mean	St. dev.	Min.	Max.	Sum	Mean	St. dev.	Min.	Max.
Number of board members	6,525	6.01	4.59	1	57	5,806	5.85	4.49	1	55
Number of direct board members	6,003	5.53	4.08	1	50	5,277	5.32	3.98	1	47
Number of female direct board members	397	.37	.82	0	6	457	.46	.95	0	10
Number of male direct board members	5,606	5.16	3.89	0	47	4,820	4.86	3.66	0	42
Boards without women	830	76.5	.42	0	1	708	71.4	.45	0	1
Boards with one woman	174	16.0	.37	0	1	185	18.6	.39	0	1
Boards with two women	44	4.1	.20	0	1	59	5.9	.24	0	1
Boards with more than two women	37	3.4	.18	0	1	40	4.0	.20	0	1
% of women among direct members		6.61	13.96	0	100		8.66	15.19	0	100
						Sum	Mean	St. dev.	Min.	Max.
Number of directors leaving the board 2005–2008						2,619	2.29	2.52	0	18
Number of directors entering the board 2005–2008						1,893	1.65	2.12	0	16
Number of male directors leaving the board 2005–2008						2,483	2.16	2.41	0	18
Number of male directors entering the board 2005–2008						1,697	1.48	1.92	0	15
Number of female directors leaving the board 2005–2008						136	.12	.44	0	5
Number of female directors entering the board 2005–2008						196	.17	.52	0	6

For the flows of directors we used a sub-sample of 992 companies: from the original sample of 1,148 non-financial companies, we have excluded those which were extinct in 2008 and those companies whose boards were entirely formed by institutional board members.

individuals whose identities and gender are unknown. Thus, to measure the number of female board members, only individual direct members were counted. There were only 633 institutionally held board positions in 2005 out of 6,636 (9.54 per cent) and 675 in 2008 out of 5,952 (11.34 per cent) in the top 1,148 companies. Additionally, under the hypothesis that the percentage of women among the total of individual direct members is, or should be, approximately the same as that found among the total administrators, it should not produce significant biases to exclude institutional board seats in the calculated percentage of female participation on boards. Therefore, the exclusion of these seats from this study has a relatively small impact on the proportion of women on the boards of directors of these companies – 63 companies were excluded for 2005, since all their boards were filled with institutionally designated directors. That left 1,085 companies suitable for the following analysis of gender composition. In 2008, 1,076 companies out of the original sample of 1,148 non-financial companies were still in existence (67 had liquidated, another four were in a liquidation process, and one had disappeared from the original sample because it was a joint venture that had been dissolved), and there were 84 companies whose boards were entirely made up of institutional board members, reducing the final sample to a total of 992 firms.

In addition, the functions of Commissioner (*comisario*), Manager/Administrator, General Manager, and Secretary of

the Board were eliminated from the sample of directors since these, as a general rule, do not qualify as board members when identified by SABI. The study regards as board members the functions of President, Vice-President, Executive Director, Administrator, Joint Administrator (Member of the Board), Sole Administrator, and other functions (such as the Treasurer and those on the governing boards of three cooperative companies: COFARES; COREM; and ANCOOP). With reference to those companies in which a sole administrator represents the board of directors, in the absence of a complete board, these companies are counted as having a board formed by a single individual within the set of board directors represented in this study.

With regard to the characteristics of the boards of directors (Table 3), we conclude that, in June 2005, just 6.61 per cent (397) of individual board directorships of the 6,003 in the top 1,085 Spanish companies were held by women. The average number of direct members per board was 5.53, of which only .37 were women, and only 255 companies (23.5 per cent) included at least one woman on their boards. Referring to the figures for June 2008, there has been a slight increase in the diversity of Spanish boards, since now 8.66 per cent (457) of the 5,277 individual seats on the boards of directors in the top 992 Spanish companies are held by women.

Between 2005 and 2008, 1,893 directors were appointed, 196 of them women (10.35 per cent). In the same period,

TABLE 4
Descriptive Statistics

	Total				Family-based			
	2005 N = 1,085		2008 N = 992		2005 N = 244		2008 N = 233	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Total assets th.€ (t-4,t-2)	683,434	3,460,024	770,893	3,361,705	400,395	1,010,370	549,554	1,347,437
Return on Assets (t-4,t-2)	5.52	9.96	5.50	34.56	7.23	8.08	7.72	9.36
St. Deviation Return on Assets (t-14,t-2)	6.70	14.24	6.72	19.01	4.97	5.02	4.56	4.07
Indebtness Ratio (t-4,t-2)	.70	.25	.71	.40	.65	.21	.63	.20
Productivity by Employee (t-4,t-2)	2,803	18,628	3,368	16,185	806	2,058	1,525	6,935
Firm Age	29.29	21.98	32.31	22.00	33.01	20.32	35.82	20.26

	Listed				Cooperative			
	2005 N = 58		2008 N = 59		2005 N = 15		2008 N = 16	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Total assets th.€ (t-4,t-2)	5,335,793	12,800,000	5,531,110	11,800,000	406,328	859,930	525,313	1,043,272
Return on Assets (t-4,t-2)	7.14	5.92	9.24	8.18	3.23	3.73	3.85	4.87
St. Deviation Return on Assets (t-14,t-2)	4.45	4.58	4.10	3.29	1.92	1.68	1.67	1.21
Indebtness Ratio (t-4,t-2)	.62	.15	.61	.18	.65	.10	.66	.12
Productivity by Employee (t-4,t-2)	497	695	498	574	814	703	1,001	804
Firm Age (Log)	52.93	29.99	54.31	30.63	43.20	16.17	46.31	15.63

2,619 directors left boards, with just 5.19 per cent (136) of them female directors. This indicates that 56.4 per cent of all the directors in the 2005 sample remained in their position in 2008, but for female directors there was a higher retention rate, at 65.7 per cent). We use these data to analyze Hypothesis 3 in the following section.

Defining Independent Variables

We identify various firm characteristics as independent variables in our models since previous research documents relationships between the representation of women on corporate boards and specific firm characteristics (Farrell & Hersch, 2005). We use measures of board size, firm size, degree of independence with regard to shareholders, firm age, profitability, productivity by employee, firm risk, indebtedness ratio, public contracts, competition in the industry, and its proportion of female directors. Additionally, we include the following variables: the cooperative association form of the company; if the firm is stock market-listed; its family-based character; and industry control dummies. Descriptive statistics concerning these variables are shown in Table 4.

The availability of financial variables (profitability, productivity, risk and indebtedness, as well as firm size) depends on the existence of a firm's financial statements, which in some cases (unlisted companies) are available to the public only with considerable delay. Therefore we lag these variables a minimum of two years to ensure we have data for all the firms in the sample. This lag has the added advantage of reducing the risk of possible endogeneity between these variables and female representation (Carter, D'Souza, Simkins, & Simpson, 2010; Garay & González, 2008). In this way, we speak about causality in Granger's sense in such a way that financial variables produce the distinct proportion of women on boards of directors, and not vice versa. Additionally, firm effects and year dummies will help to reduce any bias on omitted variables (Carter et al., 2010).

Board size is measured by the number of individual direct members on the board. We have also included the square of this variable to take into account possible non-linearities. There are multiple ways of defining firm size. The most common quantitative criteria to measure it are: number of employees, total assets and net income (Osteryoung & Newman, 1993). We choose total assets, since this measure is an established way of accounting for differences in firm size

and has been used in previous board-related studies (Agrawal & Knowber, 2001; Carter et al., 2003). In order to avoid unusual results in one year distorting the measure, we calculate a two-year lagged three-year mean.

Shareholder control in the company is measured by the Bureau van Dijk's Independence Indicator, which constructs an indicator through its Database of Ownership to measure the degree of independence of the company in relation to its shareholders. The indicator is constructed as follows: the A indicator denotes the maximum degree of independence and is assigned when there are no shareholders registered with direct or complete ownership equal to or higher than 25 per cent of the capital; it is also divided into A+, A or A- based on the criteria that the higher the number of shareholders, the more difficult the control of a company; the B indicator is applied to companies in which none of the registered shareholders possesses 50 per cent or more (direct or total) of the company's equity, again, this is classified as B+, B or B- depending on the identified number of shareholders; the C indicator is applied to a company with a registered shareholder who has more than 49.99 per cent (direct or total), and also if a source indicates that there is a final ownership. Lastly, the indicator U shows an unknown degree of independence. We categorize this variable using values from 1 to 6, where 1 indicates the lowest grade of independence (C) and 6 the highest (A+).

Another variable used to characterize different attitudes toward the presence of women on boards of directors is the firm's age. To the best of our knowledge, while the relationship between time and discrimination is straightforwardly determined from the studies of Becker (1957) and Heckman (1998), no other paper has empirically analyzed this linkage. The firm's age is introduced into the model in logarithms because the main differences are expected in the early years of the company.

We select two ratios to measure firm performance: profitability, measured using the two-year lagged mean of the return on assets (ROA) over three consecutive years, computed as net income divided by total assets; and the three-year mean of productivity per employee, calculated as the ratio of operating revenues (in thousands of euros) per employee lagged two years.

We also include a measure of leverage: the first is the three-year average of the firm's indebtedness ratio lagged two years, computed as the long-term debts of the company divided by the share capital plus reserves. Furthermore, we study the level of risk, as the volatility of profitability, measured by the standard deviation of the annual ROA computed over a two-year lagged 13-year period.

Additionally, we include the variable "public contracts" to control for the exogenous shock caused by the introduction in 2007 of the Act for Effective Equality between Women and Men (Constitutional Act 3/2007 of 22 March, 2007) by the Spanish government. This statute, in order to encourage the inclusion of women on company boards, provides that the government may give special priority when giving public contracts to those firms that promote labor market equality between women and men. To take into account the possible impact of this Act on those firms that undertake government contracts, we add the percentage accounted for by government contracts in total income between 2004 and

2006 as a new variable. If companies heed this statute, when government contracts represent a sizeable percentage of a firm's total income, then it may be more likely to have more women on its board.

We also include two variables that add features of the firm industry. One is competition. To compute this variable we have used the Herfindahl-Hirschmann Index (HHI) at industry level. The HHI measures industry concentration and it is a widely accepted measure of industry competition (Rhoades, 1993) as it decreases as industry competition increases. The HHI index is calculated as the sum of the squared market shares as a percentage of all firms in an industry (2-digit CNAE, Spanish equivalent of SIC codes) for 2003. We transform the variable to its natural logarithmic to avoid skewness. The second variable is the proportion of female directors in an industry (2-digit CNAE), obtained from the Spanish Labor Force Survey for 2003.

We include three dummy variables in the models: family-based firm; listed company (quoted on a stock market); and cooperative association form since among the companies studied, the representation of women on the governing bodies of cooperative companies is greater than in any other type of company (i.e., public limited companies and limited liability companies). In the case of the family-based firm variable, we use the dimensions of ownership and power as a classification criterion (Gersik, Davis, Hampton, & Lansberg, 1997). Thus, a company is considered a family-based firm when various members (at least two) of the same family hold seats on the board of directors and/or a significant portion of the shares of the company are owned by the same family⁶. When a company is a subsidiary or is part of a family group, but no member of the family is on its board of directors, this company is not classified as a family-based firm since the family is not directly involved in its management. To verify the family nature of the companies in the sample analysed, we have the help of the *Instituto de la Empresa Familiar* (Family Business Institute), which checked our list against its confidential database of member companies to find possible errors or omissions. The final inventory offers a total of 244 family-based firms, representing 22.5 per cent of the studied sample (1,085 companies).

Finally, in order to take into account possible differences between industries, we combine the companies into industry classifications used by the Spanish Stock Markets (*Bolsas y Mercados Españoles* [BME]), and we include industry fixed effects based on these classifications⁷. In Table 5 we show a correlation matrix for all the variables used in this section.

MODELLING WOMEN'S PRESENCE ON BOARDS OF DIRECTORS

The number of female directors on the board of a company (y_i) can be modelled with a count data model. In the present case, where the variance of the dependent variable (the number of female directors) is higher than the mean, we estimate a negative binomial regression model (equation (1))⁸. In this model the probability of finding k women on the board of directors of a company is given by equation (1).

TABLE 5
Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Number of direct members of the board	1													
2 Listed firm	.44	1												
3 Cooperative	.10	-.03	1											
4 Family-Based firm	.01	.03	-.06	1										
5 Independence Indicator	.29	.47	.02	.15	1									
6 Firm Age (Log)	.21	.22	.09	.13	.17	1								
7 Total assets th.€ (t-4, t-2) (Log)	.39	.41	-.01	-.03	.20	.20	1							
8 Return on Assets (t-4, t-2)	.07	.05	-.03	.07	.03	.17	.04	1						
9 St. Deviation Return on Assets (t-14, t-2)(Log)	-.16	-.07	-.15	-.09	-.15	-.02	-.12	.12	1					
10 Indebtness ratio (t-4, t-2)	-.08	-.06	-.02	-.10	-.08	-.16	-.10	-.43	.02	1				
11 Productivity by employee (t-4, t-2) (Log)	-.10	-.13	.01	-.14	-.06	-.22	-.09	-.01	-.03	.12	1			
12 Proportion of women executives in industry	.06	.07	-.03	.03	-.02	-.00	-.04	.06	.05	-.08	.02	1		
13 Herfindahl-Hirschman Index (Log)	-.03	-.05	-.01	-.14	.02	-.08	.12	.03	.08	-.04	.07	-.08	1	
14 Public contracts over income (2004–2006) (%)	-.03	-.01	-.02	.04	-.02	.05	.05	-.01	-.02	.04	-.10	-.07	-.15	1

$$\Pr[y_i = k] = \frac{(v\lambda_i)^k}{k!} e^{-v\lambda_i} \quad (1)$$

This model is a generalisation of a Poisson regression model that adds a random variable (v) with a Gamma distribution of parameters $1/\alpha$ and α ($g(v) \sim \text{Gamma}(1/\alpha, \alpha)$) to account for the extra variability of the distribution. As in a Poisson distribution, λ_i is the expected number of female directors on the board of company i ($E[y_i] = \lambda_i$). The expectations of the dependent variable vary mainly with the size of the board (n_i) that is considered as the exposure variable. Therefore, the expected number of female directors can be modelled (Equation 2) as the product of the number of directors (n_i) and the proportion of women among them (p_i). This latter variable (p_i) can vary in accordance with a group of independent variables (X_i), referred to the whole company.

$$\lambda_i = n_i p_i = n_i e^{X_i \beta} \quad (2)$$

In this negative binomial model, parameter α allows us to quantify the grade of over-dispersion of variable y_i (the greater α is, the greater the variance will be with respect to the mean). In this way, if $\alpha = 0$, the negative binomial becomes a Poisson distribution (equal mean and variance). However, if $\alpha \neq 0$, then there is a so-called *contagion effect*, i.e., having a positive case makes it more probable that there will be further positive cases. This contagion factor can be derived from the case where the gender of each member of the board is not independent of the gender of the other members. We make use of this contagion effect as a sign that reinforces Hypothesis 3a, the presence of women on the board lessens barriers to other female candidates, although further test are presented in Table 8.

Robust estimations of the negative binomial regression models are presented in Table 6⁹. The number of direct members of the board is used as the exposure factor (n_i) in the negative binomial regression models. This implies that,

although the independent variable is the number of direct members, the outcome of the regression, and the effects of the independent variables can be interpreted in terms of the expected **proportion** of female directors p_i , instead of the **number** of female directors y_i .

Moreover, we consider two possible specifications for the model. The first one (Model I) uses pooled data from 2005 and 2008 to fit a negative binomial model with a single over-dispersion parameter common to all companies. The second (Model II) uses panel data to fit a negative binomial model with a random-effects over-dispersion parameter that varies randomly from company to company. The results of both models are quite similar, and the tests to measure the goodness of fit, such as the *Wald* test or the likelihood test, show that the estimated models describe reasonably well the behavior of the dependent variable (the proportion of women on boards of directors) even at a 1 per cent significance level.

RESULTS

Regarding the interpretation of the significant explanatory variables in the models, we include four groups of variables: the control variables; the variables concerning hypotheses; the results for each of these explanatory variables of the proportion of women on boards of directors; and to clarify the implications of the results, we compute the expected proportion of female directors in a base case company where variables are considered in their means (quantitative variables) and their modes (qualitative variables).

Beginning with the control variables, the number of direct members of the board is used as the exposure factor in the negative binomial regression models, but is added, as well, as an explanatory variable. In the latter role, we observe that it is effectively a significant explanatory variable ($z = 2.93$, $p < .01$), in which an increase in board size implies an increase in the proportion of positions held by women, as

TABLE 6
Negative Binomial Regression Models on the Number of Women on the Board (with Exposure to the Number of Direct Members of the Board)

	Pooled data (2005–2008) Model I	Panel data (2005–2008) Model II
Constant	–2.89	–3.19
Number of direct members of the board	.05**	.05*
Number of direct members of the board (squared)	–.01**	–.00
Listed firm	–.59*	–.28
Cooperative	1.99***	1.15**
Family-Based firm	1.35***	.98***
Independence Indicator	–.12*	–.08*
Firm Age (Log)	.20*	.22*
Total assets th.€ (t-4,t-2) (Log)	–.06 [†]	–.07
Return on Assets (t-4,t-2)	–.00	–.00
St. Deviation Return on Assets (t-14,t-2)(Log)	–.12**	–.10 [†]
Indebtness ratio (t-4,t-2)	–.01	.11
Productivity by employee (t-4,t-2) (Log)	–.02	.01
Herfindahl-Hirschman Index (Log)	–.10*	–.10 [†]
Proportion of women executives in industry	.90*	1.12*
Public contracts over income (2004–2006) (%) *Year 2008	–.00	–.00
Year 2008	.37***	.26***
Industry effects	Yes	Yes
Company random effects	No	Yes
Contagion effect (α)	.45***	1.28***
Number of observations	1730	1730
LR test	204.01***	120.77***
Wald test	254.85***	121.45***
LR test against a Poisson	38.87***	204.17***
LR test against a Zero-Infl. Negative Binomial	2.65	.25

Estimations obtained with STATA v.9. A robust variance-covariance matrix is used in order to correct heteroscedasticity and correlation among directors of the same board.

For each variable, an LR test has been performed between a model with and without this variable.

Stars give the significant level of the null hypothesis rejection: ***.1%, **1%, *5% and [†]10%.

documented by Carter et al. (2003) and Agrawal and Knowber (2001). The variable is also significant (negatively) in squared terms ($z = -2.92$, $p < .01$), so an increase in board size only has an effect for small boards, since the effect on the proportion of female directors reaches a maximum when the board has around 20 to 25 members (see Figure 1).

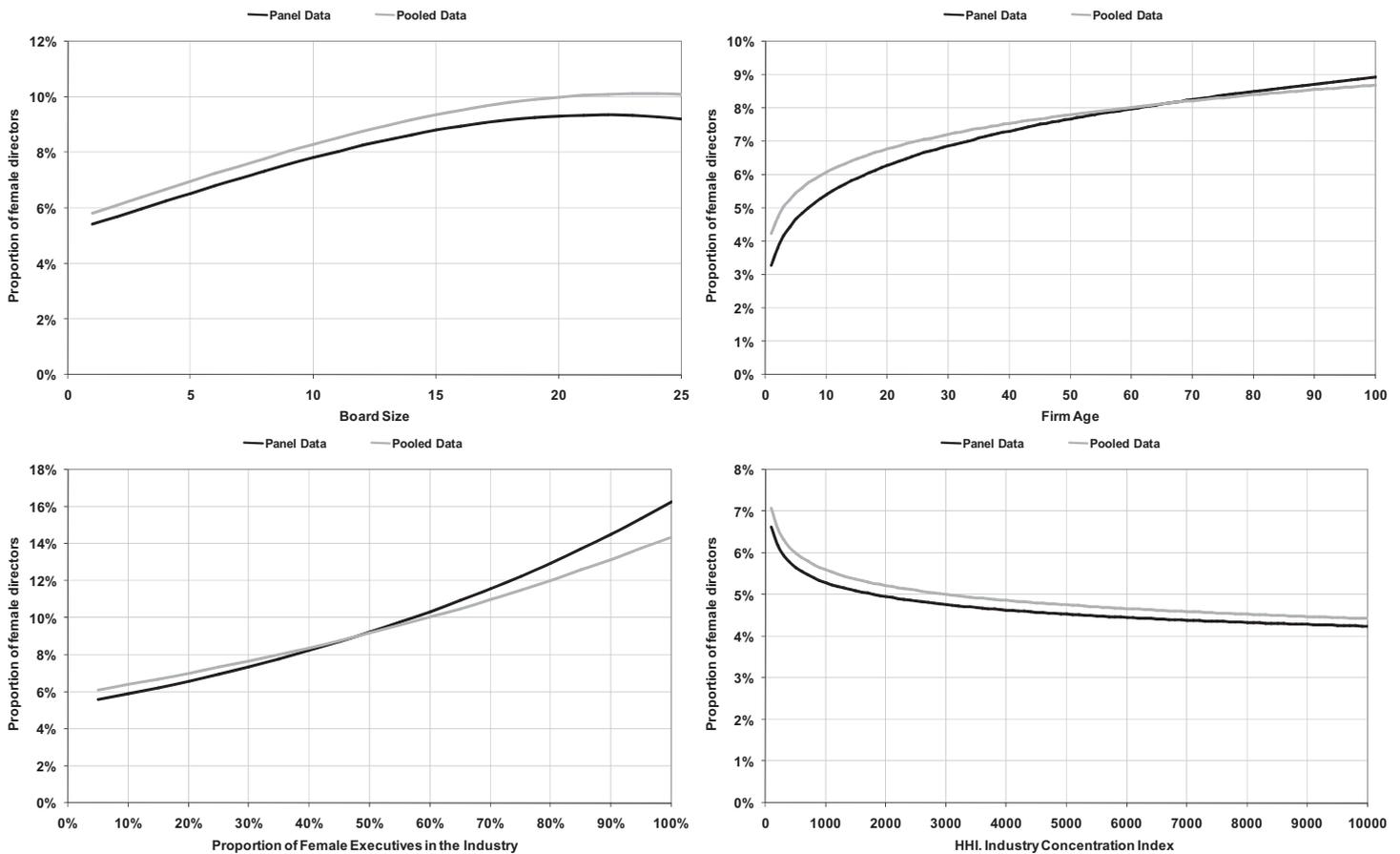
As prior research suggests (Brammer, Millington, & Pavelin, 2007; Fryxell & Lerner, 1989; Harrigan, 1981), we find that the type of industry is significant in explaining the presence of women on corporate boards (LR: 12.42, $p < .05$). Thus it turns out that industries with a higher presence of women (financial services and real estate agencies, consumer goods and consumer services) are service-oriented, such as labor-intensive industries; while those with a lower presence are the more technical ones such as oil and energy; commodities, industry, and construction; and technology and telecommunications.

There was also a significant increase in the number of female directors between 2005 and 2008 ($z = 4.15$, $p < .001$).

Nevertheless, it is not possible to know whether this implies a tendency towards reducing the discrimination gap or just a discrete change. A possible explanation for this increase is related to the Equality Law. In this sense, if the Act were the main driver in the observed increase, this shift should be higher among companies where government contracts represent a sizable percentage of their total income, since it lays down that, to retain government contracts, those companies should have (among other things) a gender-balanced board by 2015. Nevertheless, the variable that takes it into account (the share of public contracts in a company's income) has not implied a greater increase between 2005 and 2008 ($z = -1.1$, $p > .1$).

With respect to the significant influence of the Bureau van Dijk's Independence Indicator ($z = -2.46$, $p < .01$), given that in Spain the presence of activism in favor of diversity on the boards of directors by institutional shareholders is not detected, as Carleton, Nelson, & Weisbach (1998) and Gillan & Starks (2000) document in their studies, we consider a

FIGURE 1
Probability of a Board Position Being Held by a Woman



Influence of Board Size (upper left-hand side), Firm Age (upper right-hand side), Proportion of Female Executives in the Industry (lower left-hand side), Industrial Concentration Index (lower right-hand side). Probabilities computed for the models in Table 4 (models I and II). A representative company in 2008 has been considered to be a non-family-based one, that is not listed and not a cooperative, with an independence indicator equal to C, mean risk and assets, 24 years old, and belonging to the category of Consumer Services, with the mean proportion of female executives and sales concentration and with five direct members of the board (mean and mode of each quantitative and qualitative variable, respectively). All variables are fixed to the base case and moving each variable one by one.

more likely cause is the fact that women in Spain tend to hold seats on boards as External Proprietary directors. The cooperative variable result ($z = 4.33$, $p < .001$) can be explained by the practice of these companies of having representatives of the partners on the board on the basis of a democratic voting procedure (one member, one vote).

Additionally, we find a (marginally significant) negative relationship between the presence of women on the board of directors and the fact of being a listed company ($z = -1.92$, $p < .1$), and the firm size variable ($z = -1.71$, $p < .1$). By contrast, Agrawal & Knowber (2001) found for the US a positive sign that they attribute to a greater demand for diversity directed at these companies through public opinion. Usually, these types of companies (large and listed) include a smaller proportion of proprietary directors on their boards while having a higher proportion of executives and independent directors, where women are under-represented.

Other control variables related to profitability (ROA, $z = -.38$, $p > .1$) and productivity (turnover per employee, $z = -.46$, $p > .1$) do not have a significant effect on the representation of women in Spanish boards. This result does not coincide with previous studies (Adler, 2001; Carter et al., 2003; Catalyst, 2004; Erhardt, Verberl, & Shrader, 2003), which found a positive relationship between female representation on the board and the company's performance. However, to test this hypothesis, the model specification should be the reverse, with profitability as the dependent variable and the gender composition of the board as a lagged independent variable as in Carter et al. (2003).

Regarding Hypothesis 1a, the proportion of female executives in the industry has a positive (and statistically significant) effect on the expected number of female directors on the board ($z = 2.13$, $p < .05$). This result reinforces the hypothesis that a reduced pool of women candidates from

TABLE 7
Probability of a Board Position Being Held by a Woman. Marginal Effects of Independent Variables

	Panel Data	Pooled Data		Panel Data	Pooled Data
St. dev. ROA (Log)			Family-based companies		
$\mu - 2\sigma$	7.90%	8.70%	No	6.53%	6.97%
$\mu - \sigma$	7.14%	7.74%	Yes	17.28%	17.24%
μ	6.48%	6.90%	Cooperative		
$\mu + \sigma$	5.88%	6.13%	No	6.53%	6.97%
$\mu + 2\sigma$	5.33%	5.45%	Yes	20.48%	20.72%
Total Assets. th. Eur. (Log)			Year		
$\mu - 2\sigma$	8.06%	8.46%	2005	6.27%	6.28%
$\mu - \sigma$	7.28%	7.70%	2008	8.05%	8.66%
μ	6.57%	7.00%	Listed		
$\mu + \sigma$	5.94%	6.36%	No	6.58%	6.97%
$\mu + 2\sigma$	5.73%	6.16%	Yes	5.11%	4.83%
Industrial sector			Independence indicator		
Financial services and real estate agencies	8.15%	9.69%	A+	4.36%	4.64%
Oil and energy	7.14%	7.91%	A	4.73%	5.03%
Consumer services	6.53%	6.97%	A-	5.13%	5.45%
Consumer goods	6.24%	7.06%	B+	5.56%	5.90%
Commodities, industry and construction	4.18%	4.92%	B-	6.03%	6.41%
Technology and telecommunications	4.33%	4.05%	C	6.53%	6.97%

Probabilities computed for the models in Table 4 (models I and II). A representative company in 2008 has been considered to be a non-family-based one, that is not listed and not a cooperative, with an independence indicator equal to C, mean risk and assets, 24 years old, and belonging to the category of Consumer Services, with the mean proportion of female executives and sales concentration and with five direct members of the board (mean and mode of each quantitative and qualitative variable, respectively). All variables are fixed to the base case and moving each variable one by one.

executive positions diminishes the number of female members of the Board of Directors.

The results (see Table 6) confirm Hypothesis 1b. Family-based companies, where board members are chosen mainly among owners and where the pool of candidates stems from family ties and not from executive positions, has a positive relationship with the proportion of women directors ($z = 9.55, p < .001$). In fact, Family-based firm is the variable that has the greatest positive impact on the presence of women on boards of directors (see Table 6).

A reduced pool of female candidates is far from being the only explanation of the differences between companies in the observed number of female directors. As we have previously commented, theoretical arguments focused on the characteristics of the female labor supply (which we called the reduced pool of female executive candidates) cannot explain, on their own, the sizable gap found in women's participation in Spanish boards of directors. Therefore, when we interpret the sign and effect of the explanatory variables, we turn to the demand side for the role played by the distinct types of discrimination against women by linking the identified factors with alternative theories.

According to Becker's taste-based discrimination, as discriminating companies incur higher economic costs, in perfect competitive markets they tend to disappear.

Hypothesis 2a states that there is a positive relationship between the proportion of women on the board and industry competition. The results in Table 7 and Figure 1 show that the level of industry concentration, measured by the HHI index, has a negative effect on the proportion of female directors ($z = -2.46, p < .05$). Since this index decreases with industry competition, the sign of the estimated coefficient is congruent with Hypothesis 2a and also in line with the dynamics predicted by Becker's theory, that discrimination is less likely in competitive sectors.

As can be seen in the models of Table 6 and Figure 1, the age of the firm has a positive relationship with the proportion of women on the board (Hypothesis 2b) ($z = 2.45, p < .05$). This also reinforces the idea behind Becker's model of taste-based discrimination. The fact that older companies have more women on their boards seems to indicate precisely that companies that survive are those that integrate more diversity into their boards. By contrast, among younger ones it is easier to find both discriminating companies and those who do not discriminate¹⁰.

Hypothesis 3a states that the presence of women on the board helps to reduce statistical discrimination and other mistake-based discrimination. The estimated negative binomial models show that there is a positive and significant contagion effect ($LR = 38.87, p < .001$). Likelihood ratio tests

also confirm the existence of over-dispersion of the number of women on the boards of directors, since the negative binomial model is preferable to the simple Poisson regression model. By contrast, a likelihood ratio test against a zero-inflated negative binomial allows us to conclude that this later model is not better than the negative binomial model, and that the contagion factor is able to explain sufficiently the observed over-dispersion ($LR = 2.65$, $p > .1$).

This significant contagion effect indicates that the presence of women on the board lessens barriers to other female candidates. That is to say, if there is a woman on the board, it is more likely that other women will be appointed to the same board. So far, there are at least three different causes for this contagion factor. The first two are hypothesized by Farrell & Hersch (2005). One, on the supply side, is that potential female candidates may be more attracted to firms that have already achieved some degree of board diversity. The other reason offered by these authors is on the demand side, bearing in mind that women board members may have an influence in hiring additional women to serve on the board, either by identifying their peers for nomination or by applying pressure. Alternatively, we consider a third explanation (also on the demand side) in line with the possible existence of a certain underestimation of women's skills, based on the fact that the previous presence of women on the board contributes to reducing the bias in the perception of their abilities (removing mistake-based discrimination).

Nevertheless, statistically speaking, an alternative source of the observed over-dispersion in the negative binomial model is unobserved heterogeneity, derived from omitted variables. That is to say, unobserved heterogeneity ("spurious contagion") and "true" contagion can generate the same negative binomial distribution of observed outputs. With a non-dynamic model, it is impossible to determine whether the observed over-dispersed distribution arose from true or spurious contagion (Long, 1997). In order to test whether there is a true contagion factor, we estimate a new dynamical model, where the appointment of a female director depends on the previous presence of women on the board. A true contagion effect implies that in those companies where there is a female director it is easier for a new woman to join the board.

Since our sample includes data from the boards of the same companies in 2005 and 2008, it is possible to compare the composition of both boards for each company, and at the same time to count the number of female and male directors leaving and joining the company's board (see Table 3).

The model specified is also a negative binomial model (Equations 1–2). The dependent variable in the new model is the number of female directors appointed by a company between 2005 and 2008 (y_i) and the total number of directors appointed refers to the exposure variable (n_i). As exogenous variables, we have included the proportion of women on the board in 2005, as well as the number of female directors that left the board in 2005. Farrell & Hersch (2005) use a similar framework, although with a Poisson model specification. Additionally, we include in the model the same variables considered in the previous sections for the gender composition of the board. Results of the model estimated are shown in Table 8.

The results in Table 8 show that there is a positive relationship between the percentage of women already on the board and the likelihood of adding a woman to the board between 2005 and 2008 ($z = 2.41$, $p < .05$), which strongly indicates that a "true" contagion effect exists, and this confirms Hypothesis 4. This result is the opposite to that found by Farrell & Hersch (2005) for Fortune 500 companies, implying that companies in their sample tend to add women to their boards when they have low or no female representation, operating in a manner consistent with tokenism. By contrast, we find no evidence that if a female director leaves the board that gives rise to the probability of another female joining it, as would be expected if diversity were a goal of the firm ($z = .16$, $p > .1$).

Regarding Hypothesis 3b, in the static negative binomial models of Table 6, the risk, measured as the standard deviation of the ROA, helps to explain the different proportion of women directors. Given the sign of the estimated coefficient we can affirm that companies with greater uncertainty in their results are those in which it is less likely to have a woman as a director (see Table 8) ($z = -2.01$, $p < .05$). This result is consistent with statistical discrimination in the sense proposed by Schubert et al. (1999). In this respect, if women are expected to be more conservative investors than men, they will be consequently excluded from those positions more related to risks. Nevertheless, this outcome is compatible with genuine higher female risk-aversion (Jianakoplos & Bernasek, 1998; Sundén & Surette, 1998).

Once again, we can rely on the dynamic negative binomial model approach to disentangle the two alternative explanations. In order to do this, we include in the model the risk variable moderated by the presence of women on the board as stated in Hypothesis 3b (we estimate two different coefficients for the risk variable, one for companies with women on the board and another for those without women). In the last model on Table 8, which includes this moderating term, we observe that the risk variable is significant when there are no women on the board ($z = -2.32$, $p < .05$), but not statistically significant when the company already includes women on the board ($z = -.76$, $p > .1$). So, when there are women on the board, the risk level of the company has no effect on the gender of new directors, while for those companies without women, higher risk on income reduces the probability of hiring additional women. This result is in line with the statistical discrimination interpretation of Schubert et al. (1999), rather than with the actual risk aversion by female executives.

DISCUSSION

In this paper, we have disentangled the relative importance of the main factors explaining the scarce presence of women on the boards of directors of the top 1,000 Spanish companies (6.61 per cent in 2005 and 8.66 per cent in 2008), i.e., the reduced pool of female candidates, taste-based discrimination, and statistical discrimination. This is especially relevant since the first one would indicate a general problem for the society as the preferences and outlook on life that women have may be a consequence of the way they are brought up (and usually both firms and head-hunters specialized in board nominations that tend to explain the underrepresent-

TABLE 8
Negative Binomial Models for the Number of Women Entering the Board from 2005 to 2008

Variables	Negative binominal		
	Model III (All variables)	Model IV (Only significant)	Model V (Only significant)
Constant	-2.08	-1.88	-1.76
% women among direct members in 2005	1.58*	2.25**	1.82**
Number of female departures	-.00		
Number of direct members of the board	.01		
Listed firm	-.05		
Family-based firm	.27		
Independence indicator	-.03		
Cooperative	1.29*		
Firm size	-.02		
Return on assets (2001–2003) (%)	.02		
St. deviation return on assets (1991–2003) (Log)	-.07	-.11*	
St. deviation (Companies with female directors in 2005)			-.05
St. deviation (Companies without female directors in 2005)			-.21*
Productivity by employee (2001–2003) (Log)	-.02		
Indebtedness ratio (2001–2003)	.32		
Firm age (Log)	-.08		
Public contracts over income (2004–2006) (%)	-.85		
Industry effects	YES	YES	YES
α (contagion effect)	.04	.03	.03
LR test	33.95*	39.18**	43.60**
Wald test	61.69**	46.96**	44.20**

Models include an exposure factor of total directors entering the board between 2005 and 2008.

Estimations obtained with STATA v.9. A robust variance-covariance matrix is used in order to correct heteroscedasticity and correlation among directors of the same board.

For each variable, an LR test has been performed between a model with and without this variable.

Stars give the significant level of the null hypothesis rejection: ***.1%, **1%, *5% and †10%.

tation of women use this argument to explain it), the latter ones indicates a problem of efficiency in the nomination process. This inefficiency is not just because having women necessarily have to improve business results in a direct and measurable way, but because the decision to exclude women of the process of recruiting new directors for the mere fact of being women is clearly inefficient (reduces the probability of choosing the best possible candidates for the company independently of their gender).

In fact, the results of our model estimations indicate a positive and significant relationship between the proportion of female executives in the industry and the percentage of women on the board. This result supports the reduced pool of women candidates from executive positions as a cause for the under-representation of women on the Spanish boards of directors. This is also confirmed by the positive relationship between family-based companies and the proportion of women directors. We think this effect is caused by the tendency to favor family ties, regardless of gender, when it comes to promoting directors. In this way, as in family-based firms female executive candidates to the board are chosen

among the owners-managers women family members the restriction of a reduced pool of women in the executive management does not apply.

One of the important practical implications of these results is that if we want to raise the proportion of female directors it seems necessary to look for mechanisms to reduce the exclusion of women from the pool of potential candidates to join the board. On one hand, the reduced proportion of female candidates can only be resolved in the medium to long term with education and mentoring initiatives to improve their training for boards and management responsibility. Mentorship of young female managers by veteran CEO's (Lee & Nolan, 1998) could help potential future directors to built self confidence, develop particular skills, learn about industry, and increase personal impact. Another way to mitigate the socio-cultural obstacles women find in the early stages leading up to their professional promotion is the implementation of policies to achieve work/life balance and to share home duties more equally between men and women. A possible solution to enlarge the reduced pool of female candidates is to expand the selection criteria

to include other talent sources that are usually disregarded (such as human resources or customer relations managers, independent directors from liberal professionals, universities, research centers, and non-profit organizations, in which women are highly represented). In the same sense, there is a growing number of networking initiatives designed to help potential non-executives to enhance their credibility as candidates for board, and a growing number of non-commercial organizations developing databases of qualified women individuals interested in board positions.

Nevertheless, in order to focus on customized measures that better improve the chances of a female executive reaching the board, it would be worth analyzing how her personal (social, familiar, economic) characteristics affect her professional development, including her subjective perception of positive/negative gender discrimination measures.

Although the reduced pool of women candidates is a major cause, we find it quite improbable that the large gap existing between the scarce female representation on Spanish boards of directors and the approximately 32 per cent of women's participation in top executive positions can only be attributed to differences in the labor supply. In fact, results related to the rest of the hypotheses we analyze in the paper confirms that the reduced pool of candidates is not the only argument.

In this sense, there is evidence of taste-based discrimination. Moreover, we interpret the fact that older firms and more competitive sectors have a greater presence of female directors as a manifestation of the prediction from Becker's theory of discrimination (Becker, 1957). In this respect, we can point out that both competition and time seem to be playing in favor of women's presence on Spanish boards. Another relevant consequence of this finding is that the relationship of women directors and firm performance (that is out of the purpose of this paper) cannot be properly measured without controlling for this two factors that affect both the gender composition of the board and the results of the company and to the best of our knowledge no study has yet done it.

Further research on this issue could give more evidence on the presence of discriminating practices. For instance, knowing the gender composition of a company's management could help ascertain whether there is some discrimination bias in the nomination process by comparing this group with the actual board members. Event studies could also be helpful. Analyzing the curriculum vitae of actual candidates to a board position and the candidate finally selected could help separate the relevance given to the personal skills of candidates from the role their gender plays in the final decision. Although data on failed candidates are difficult, if not impossible, to find, one exception is the case of a mergers and acquisitions where the board of the resulting company is generally chosen from among the boards of the original companies and therefore we also know the names of the former directors that are excluded from the new board.

Through the estimation of a negative binomial model, we also detect a contagion factor, according to which the presence of women on the board smoothes the way for other women joining the board. The results of the empirical model that analyzes the likelihood of adding a female to the board

strongly confirm that this is a true contagion rather than a consequence of unobserved heterogeneity in the sample ("spurious contagion").

We interpret this contagion effect as evidence of the possible existence of a certain underestimation of women's skills, based on the fact that the presence of women on the board contributes to reducing the bias in the perception of their abilities, since direct contact with people of the group discriminated against could reduce the effects of stereotypes and social prejudices (Bertrand et al., 2005).

Additional evidence of incorrect preconceptions about women's attitudes and their capacity to hold these positions is found through a moderator effect of the presence of women on the risk variable. In this sense, although the lesser presence of women on the boards of riskier firms can be interpreted by using the explanation that women are usually more risk-averse than men (Jianakoplos & Bernasek, 1998; Sundén & Surette, 1998), we find that this negative effect disappears in the presence of women directors. The absence of a significant parameter of the interaction of women directors and risk support the theory of Schubert et al. (1999) since the prejudices concerning the female attitudes to risk would be eliminated or, at least, reduced as the actual presence of female directors provides information on their real attitudes to risk.

These evidences on inefficiencies in the nomination process does support public policy initiatives such as the implementation of those good corporate governance practices related to transparency and objectivity in selection procedures (i.e., preparation of training programs for Incentive and Nomination Committees to select and evaluate candidates, objectiveness, and precision in directors' selection criteria, and request for public explanations from the board when women directors are few or nonexistent). Even establishing quotas for women may be useful, since discrimination stemming from the underestimation of women's skills can only be overcome by the presence of women on the boards that, in the medium-term, would provide more accurate information to banish biased evaluations on their capability regarding being appointed to boards of directors.

In this connection, in recent years some public measures have attempted to tackle the problem of gender discrimination on Spanish boards. Since 2006, the CNMV has required all listed companies to inform in their Annual Report in compliance with the official recommendations concerning corporate governance recommendations including their board functional structure, size, and gender diversity issues. Similarly, the Equality Law of 2007 established this gender balance as one of their objectives. However, we are aware that companies, for the time being, have not reacted to any of these measures. Perhaps some time is required in both cases to fulfill their aims. In this sense, a continuous monitoring of the gender composition of the companies analyzed in this study could provide us in the near future with a powerful tool to assess the success of these initiatives. Comparative research with other countries that have established a similar quotas programme, such as Norway, could help gauge the effectiveness of these kinds of measures.

Finally, we can conclude that although several theories explain the underrepresentation of women in the top corporate world relying upon adverse selection or women's incen-

tive problems in the labor market, at least in the Spanish case the reduced pool of women executive candidates cannot be claimed as the only and principal cause. On the contrary, there is a clear case of discrimination against women (taste based, statistical, and mistake-based discrimination) that hinder their access to the board, and which requires active gender equality policies to reduce and remove it. The problem is much more complex and we have found evidence of several kinds of discrimination against women. This is something that academics, companies, and policy-makers should have in mind when trying to explain and cope with this problem.

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NOTES

1. Furthermore, it is difficult to obtain honest answers to questions regarding unpleasant experiences like *Have you suffered discrimination in your professional career?* Besides, "suffered discrimination" can have a different interpretation for each woman.
2. The term glass ceiling is thought to have first been used by two women at Hewlett-Packard in 1979, Katherine Lawrence and Marianne Schreiber, to describe how while on the surface there seemed to be a clear path of promotion, in fact women seemed to hit a point which they seemed unable to progress beyond. Later, the term was used in a March, 1984, *Adweek* article by Gay Bryant. Then the term glass ceiling became a permanent part of the American lexicon with a subsequent article in the *Wall Street Journal* published on 24 March 1986 by Carol Hymowitz and Timothy Schellhardt.
3. SABI (Analysis System of Iberian Balances) is a database that contains general and financial information about more than 800,000 Spanish companies. The information is obtained from distinct official sources, Mercantile Registries, BORME, newspapers, etc. and is updated periodically. SABI is distributed in Spain by *Informa* and *Bureau Van Dijk*. <http://www.bvdep.com/SABI.html>.
4. IZAR was eliminated since it was in the process of liquidation. EMYTEC Coop. Valenciana was eliminated since, according to the annual accounts of the Community of Valencia Cooperative Registry, its operating revenues in 2003 did not exceed 100 million euros.
5. An alternative way to obtain data about the composition of boards of directors is the use of surveys. However, survey data have low response rates that could drastically reduce the base of analysed companies. Furthermore, as Carter et al. (2003) suggest, survey data would likely be biased towards those firms wishing to "showcase" their diverse boards.
6. For those companies with a sole administrator, they can be considered as a family-based firm when the family (at least two members) possesses a significant portion of the shares of the company, and when the function of Sole Administrator is held by one member of the family.
7. These six sectors are the following: Oil and energy; Commodities, industry and construction; Consumer goods; Consumer services; Financial services and real estate agencies; Technology and telecommunications.
8. We have also estimated Poisson, Zero-Inflated Poisson and Zero-Inflated Negative Binomial Regression Models. Nevertheless, using Likelihood Ratio Tests the Negative Binomial model is found to be superior to the Poisson model, while the Zero-Inflated Negative Binomial Model is superior to the Zero-Inflated Poisson and Poisson models, but no significant difference is found relative to the simpler Negative Binomial Model. Results on these models would be provided by a request to the authors.
9. In order to check the consistency of the significance of the coefficients, we have estimated each model twice, first including all the independent variables; and a second one eliminating one-by-one all the non-significant variables. In both cases we obtain the same significant variables, which can be considered as a robustness check for the significance of the coefficients against multicollinearity. Results on these models would be provided on request by the authors.
10. As a robust check of this later result and taking into account that 72 companies among our sample disappeared between 2005 and 2008, it is possible to estimate a probit/logit model on the probability of a company being closed down. Following Altman (1968), equity over debt, reserves over assets, working capital over assets, income over assets, and return on assets are used as predictors of bankruptcy, as well as the number of women on the board, age of the company, industry dummies, and other control variables. The result of this probit estimation reinforces our previous conclusions: younger companies and start-ups as well as a lower proportion of female directors have a higher proportion of default.

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