Optimal board independence with non-strictly independent directors

Bartolomé Pascual-Fuster*
Departament d'Economia de l'Empresa, Universitat de les Illes Balears,
Cra. de Valldemossa km 7.5, 07122 Palma (Illes Balears), Spain
Telephone: +34971172652
tomeu.pascual@uib.es

Rafel Crespi-Cladera
Departament d'Economia de l'Empresa, Universitat de les Illes Balears,
Cra. de Valldemossa km 7.5, 07122 Palma (Illes Balears), Spain
Telephone: +34971171323
rafel.crespi@uib.es

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* Corresponding author

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Abstract

This paper shows that firms appoint non-strictly independent directors to comply with board independence recommendations. Optimal board structure theories do not necessarily match the one size fits all codes' recommendations. We investigate whether firms solve this tradeoff by appointing non-strictly independent directors in terms of formal independence requirements. The empirical analysis, performed in an institutional context where large controlling shareholders are predominant, shows that firms tend to avoid the costs of non-compliance with non-strictly independent directors, and that the adjustment to the optimal structure is done similarly with strictly and non-strictly independent directors. The determinants of optimal board structure are relevant whether firms comply or not with the codes' recommendations, the ownership structure being the most relevant. We conclude that formal independence requirements are of little value for firms.

Keywords: non-strict board independence, optimal board independence, formal independence requirements, corporate governance.

JEL classification: G30, G34, K22

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1. Introduction

Board independence is recommended by regulators to properly monitor and minimize the potential opportunism of managers and large controlling shareholders in a principal agent context. Codes and recommendations of corporate governance best practices all around the world promote board independence (Aguilera and Cuervo-Cazurra, 2009). Even mandatory rules such as the Sarbanes-Oxley Act of 2002 in the USA promote board independence by requiring independence in the audit committee. Following this tendency, issuers of best governance practices, such as the New York Stock Exchange and Nasdaq, require a majority of independent directors on the full board of directors. In the continental European setting of concentrated ownership structures, board independence is also recommended to prevent the expropriation of minority shareholders by large controlling shareholders.[1]

However, recent theoretical advances address the endogenous nature of board composition, known in the literature as the optimal board independence theory. This literature suggests that different firms may have a different optimal level of board independence, claiming that, under certain circumstances, less board independence may be better for shareholders' value (e.g., Hermalin and Weisbach, 1998; Raheja, 2005; Adams and Ferreira, 2007; Harris and Raviv, 2008; Kumarand and Sivaramakrishnan, 2008). This theory is supported by empirical research such as Boone et al. (2007), Linck et al. (2008), Coles et al. (2008), and Lehn et al. (2009).

These theoretical and empirical findings contrast with the corporate governance regulation (mandatory or voluntary) based on the *one size fits all* rule. Consequently, the question that arises is whether these recommendations really do push firms to deviate from their optimal level of board independence, according to the shareholders' interests. There is evidence that firms do indeed declare an increasing level of board independence. For example, Gordon (2007) found that the average board independence increased from approximately 20% to 75% from 1950 to 2005 in large US public companies. However, firms that do not meet the recommended proportion of independent directors on the board may assume costs that come from exposure to the critique of regulators, shareholder advocates, and other agents, including the media. Santella et al. (2006) pointed out how rating agencies look for the presence of a qualified number of independent directors as an element in their rating outputs. Coles et al. (2008) noted that large pension funds require a relevant role of independent directors to invest in a firm. Furthermore, Wu (2004) showed that the valuation of corporate

[1] See for example the Commission of the European Communities Recommendation of 15 February 2005, or the codes of good governance for listed companies in France, Germany, or Spain.

governance practices by a large investment fund (the California Public Employees' Retirement System) induces changes in the corporate governance of firms. To avoid such criticism, and its consequences, firms have incentives to appoint non-strictly independent directors to reach the recommended level when it is higher than the level that firm characteristics would suggest.

There is anecdotal and empirical evidence that those appointed as independent directors by firms are often board members who, according to the standard criteria, would barely be classified as independent directors. Non-strictly independent directors are approached in different ways in the research published to date. On measuring the connections between the CEO and outside directors, Hwang and Kim (2009) and Fracassi and Tate (2012) found non-strictly independent directors in the USA. Cohen et al. (2012) identified these directors as overly sympathetic to management. Core et al. (1999) and Coles et al. (2014) took any director appointed after the CEO as non-strictly independent. These papers relate non-strictly independence with poor practices of corporate governance, as a consequence of an uncontrolled agency problem. Other research focuses on formal requirements of independence to detect non-strictly independent directors. On examining a sample of Italian firms, Santella et al. (2006, 2007) found that there is not enough information disclosure to prove formal independence requirements. Crespí-Cladera and Pascual-Fuster (2014) went a step further and check a set of eight formal independence requirements in Spanish listed firms to account for non-strictly independent directors. This empirical evidence does not allow poor corporate governance practices to be linked with non-strictly independent directors.

The aim of our research is twofold: the first objective is rather descriptive and intends to confirm whether firms appoint non-strictly independent members to reach the recommended levels of the codes of corporate governance best practices. The second objective is to shed light on the tradeoff that firms face between reaching the recommended level of independence versus achieving the optimal level of independence that best suits their characteristics. More specifically, we test whether firms appoint non-strictly independent directors to balance the costs of non-compliance with recommendations and the costs of deviating from the optimal structure.

Our methodology is based on the empirical model of Linck et al. (2008), adjusted to the institutional setting of Spain in order to take into account the determinants of optimal board independence theory. We also provide further empirical evidence on the relation between board structure and firms' performance. Given the endogenous nature of board structure, there should be no effect on performance, once the optimum level is achieved (see also Coles et al., 2008, or Lehn et al., 2009). This endogeneity generates an econometric issue that is addressed with the GMM methodology introduced by Wintoki et al. (2012).

Our contribution to the literature is threefold. First, we provide evidence of the appointment of non-strictly independent board members as a way to reach the level of

independence recommended by the codes. Second, we develop a testable model that empirically checks how firms adjust their level of independence when there are both strictly and non-strictly independent members. Third, we disentangle the tradeoff that firms face between complying with the regulators' recommendation of a fixed proportion of independent directors on the board, and the variable nature of this endogenous decision of firms to achieve their optimal level. The formal requirements of independence, according to our findings, are not relevant to firms' decisions.

Our test of the optimal independence theory is performed on a sample of firms with levels of board independence that are expected to be low, within a context of firms with high ownership concentration. This ownership structure is common in continental European countries, and shows a negative relation between board independence and ownership concentration (Kim et al., 2007), in contrast to the previous literature focused on the US market (Boone et al., 2007; Linck et al., 2008; Coles et al., 2008; Lehn et al., 2009; Wintoki et al., 2012). In our model, ownership structure becomes the most relevant determinant of optimal board independence.

The next section introduces the three pillars of this research: the determinants of optimal board independence theory, the recommendations on board independence, and the development of testable implications when firms appoint non-strictly independent directors. Section 3 presents the data and the methodology. Section 4 shows the empirical results, section 5 offers the results of additional robustness checks, section 6 discusses the results, and section 7 concludes.

2. Optimal board independence, code recommendations and strict independence

From different perspectives, theoretical papers suggest that friendly boards may also be optimal for shareholder value under different circumstances (e.g., Hermalin and Weisbach, 1998; Raheja, 2005; Adams and Ferreira, 2007; Harris and Raviv, 2008; Kumarand and Sivaramakrishnan, 2008). However, the optimal board independence is a non-unified theory in the sense that each model analyzes different dimensions of board independence. For instance, Harris and Raviv (2008) showed that firm value is maximized with less board independence when the cost of monitoring by outsiders is high, such as in growth firms. Hermalin and Weisbach (1998) found a similar impact in well-performing firms, when the CEO has proven to be a rare commodity with special decision-making abilities. Raheja (2005) revealed that, under circumstances where managers face relevant potential private benefits, independent boards help to optimize shareholders' value. These theoretical contributions suggest the existence of a firm-specific optimal degree of board independence.

Indeed, advances in corporate governance emphasize the endogenous nature of corporate governance mechanisms (e.g., Coles et al., 2012; Wintoki et al., 2012). Firms select the optimal combination of corporate governance devices so as to maximize shareholders' value. Among these devices, board structure and more specifically board independence are relevant. This endogenous nature is consistent with the contradictory empirical evidence found in the literature regarding the effectiveness of board

independence for value creation. Papers such as Byrd and Hickman (1992) or Cotter et al. (1997) found a positive effect on shareholders' wealth. Other researchers found a negative relationship (Agrawal and Knoeber, 1996; Klein, 1998; Bhagat and Black, 2002), or no relation at all, such as Hermalin and Weisbach (1991), Mehran (1995) or Ferris and Yan (2007).

Taking into account the endogenous nature of board structure, Boone et al. (2007), Linck et al. (2008), Coles et al. (2008), and Lehn et al. (2009) found empirical evidence on the determinants supporting the optimal board independence theory. Wintoki et al. (2012) sophisticated the econometric approach by using dynamic panel generalized method of moments (GMM) estimators, finding that concerns about endogeneity are especially relevant when firm performance is the dependent variable, but not when board independence is the variable to be explained. Exogenous shocks in board independence, such as changes in regulation (Duchin et al., 2010) or sudden deaths of independent directors (Nguyen and Nielsen, 2010), are used to capture the effect on shareholders' value, the results being consistent with the optimal board independence theory.

2.1. The determinants of the optimal board independence theory

The optimal board independence theory explains the observed structure of the board of directors, especially board size and composition, taking into account the costs and benefits of board monitoring and advising roles. Our analysis is based on the empirical model in Linck et al. (2008), which analyzes the determinants provided by the non-unified theoretical models and their expected effect on board independence and board size. We adapt the implications on the board structure to the characteristics of our institutional context. These determinants are firm complexity, advising and monitoring costs, private benefits of control, ownership structure, and CEO characteristics.

*Firm complexity***,** understood as the scope of business and of operating and financial structures, should benefit from independent directors who provide the firm with valuable expertise and connections, resulting in bigger and more independent boards. Harris and Raviv (2008) predicted that, in some circumstances, an increase in the relevance of outsiders' information also increases the optimal number of outsiders. Thus a positive relation with board size and independence is expected.

Monitoring and advising costs. Theoretical models suggest a negative relationship of these costs with optimal board size and independence (Harris and Raviv, 2008; Adams and Ferreira, 2007; Raheja, 2005). These costs are assumed to be positively related to growth opportunities and information asymmetry between insiders and outsiders.

In firms where the *private benefits available for managers* are larger, the gains from the monitoring of independent boards are larger. The models of Harris and Raviv (2008), Adams and Ferreira (2007), and Raheja (2005) predict board independence to be higher as the private benefits become larger.

Ownership incentives. Raheja (2005) predicts that boards will be smaller when shareholders' incentives are aligned with those of insiders. This alignment also reduces the need for outsiders to prevent insiders from taking on inferior projects. As a consequence, the ownership of the firm by insiders should be negatively related with board size and the proportion of independent directors. Raheja (2005) also points out that outsider ownership reduces monitoring costs (generating monitoring benefits) and therefore a positive relation is expected with the size of the board and the proportion of outsiders. Furthermore, in a context with large controlling shareholders, the larger the ownership stakes of these shareholders is, the stronger the control over managers will be, thereby aligning interests. In consequence, the optimal board size and the proportion of independent directors is lower. This prediction is consistent with the findings in Linck et al. (2008), Lehn et al. (2009), Dutching et al. (2010), and Kim et al. (2007).

CEO characteristics. CEOs with higher perceived abilities are optimally allowed with less board independence in Hermalin and Weisbach (1998), who also argued that firms add insiders to the board as part of the CEO succession process. However, Raheja (2005) argued that the stronger the CEO is, the larger the need for independent directors to prevent harmful decisions for the firm will be. Therefore, proxies of CEOs' ability and of the succession process are expected to be negatively related with optimal board independence, while proxies of CEOs' power will be positively related.

2.2. Recommendations of codes of best practices

The growing number of corporate governance codes, which are frequently updated, include recommendations on the board structure and, more specifically, on the number or proportion of independent directors. The British Corporate Governance Code recommends that half the directors should be independent. In Germany, the recommendation is simply that "the supervisory Board shall include what it considers an adequate number of independent members". The Netherlands Corporate Governance Code recommends that all but one of the members of the supervisory board should be independent. In France, the AFEP/MEDEF code recommends that half the directors should be independent in a widely held company, but only one third in a closely held one. The Polish Corporate Governance Code, as of 2010, has a recommendation of two independent members in the boardroom, while the previous code of 2002 established a majority of independent board members. In Spain, as in the above-mentioned countries, corporate governance is regulated with the "comply or explain" soft legislation of the Unified Code of Good Governance for listed companies. The Spanish code recommends one third of independent directors on the board, and also states that non-executive delegated board committees should be chaired by an independent director, and that independent directors should represent the majority of the nomination committee. These recommendations do not account for any characteristic of the firm such as its size, its ownership structure, CEO duality or any other variable that could affect optimal board independence.

2.3. Measureable consequences of non-strictly independent directors as a result of regulation and optimal board independence

We can break down the proportion of declared independent directors on the board of directors into strictly independent and non-strictly independent directors. Let us assume that firms comply with the recommended proportion of declared independent directors, where a usual figure is one third (the level recommended by the Spanish regulation), the proportion of non-strictly independent directors being set in such a way as to reach this level. In a realistic setting, where there are frictions preventing exactly one third from being achieved (e.g., the number of independent directors must be an integer), the decomposition will be:

$$DIND_i = SIND_i + NSIND_i = SIND_i + \left(\frac{1}{3} - SIND_i + \varepsilon_i\right) = \frac{1}{3} + \varepsilon_i \qquad [1]$$

where $DIND_i$ is the declared proportion of independent directors in firm "i" over board size, $SIND_i$ is that of strictly independent directors, and $NSIND_i$ is that of non-strictly independent directors. The term ε_i accounts for the deviation from the target level of one third.

When there is no deviation (ε_i is null) the variance of the proportion of declared independent directors across firms may be decomposed in the following way:

$$\sigma_d^2 = \sigma_s^2 + \sigma_{ns}^2 + 2 \cdot \sigma_s \cdot \sigma_{ns} \cdot \rho_{s,ns}$$

where σ_d^2 is the variance of the proportion of declared independent directors, "*s*" refers to strictly independent directors, "*ns*" captures the non-strictly independent directors, and $\rho_{s,ns}$ is the correlation coefficient between the proportion of strictly and non-strictly independent directors.

With no deviations in equation [1], the variance of the declared proportion of independent directors is zero, the variances of the proportion of strictly and non-strictly independent directors are equal (since the latter is just the first less a constant term), and consequently their correlation coefficient is -1:

$$\sigma_d^2 = \sigma_s^2 + \sigma_s^2 + 2 \cdot \sigma_s \cdot \sigma_s \cdot \rho_{s,ns} = 2 \cdot \sigma_s^2 + 2 \cdot \sigma_s^2 \cdot (-1) = 0$$

When there are deviations (ε_i is not null), the variance of the declared proportion of independent directors can be decomposed as follows:

$$\sigma_d^2 = \sigma_s^2 + \left(\sigma_s^2 + \sigma_\varepsilon^2 - 2 \cdot \sigma_s \sigma_\varepsilon \cdot \rho_{s,\varepsilon}\right) + 2 \cdot \sigma_s \cdot \sqrt{\left(\sigma_s^2 + \sigma_\varepsilon^2 - 2 \cdot \sigma_s \sigma_\varepsilon \cdot \rho_{s,\varepsilon}\right)} \cdot \rho_{s,ns}$$

Since the variance of the declared proportion of independent directors must be the variance of the deviation (σ_ε^2), we can compute the value of the correlation coefficient between strictly and non-strictly independent directors needed to reach this value:

$$\rho_{s,ns} = \frac{\sigma_\varepsilon^2 - \sigma_s^2 - \left(\sigma_s^2 + \sigma_\varepsilon^2 - 2 \cdot \sigma_s \sigma_\varepsilon \cdot \rho_{s,\varepsilon}\right)}{2 \cdot \sigma_s \cdot \sqrt{\left(\sigma_s^2 + \sigma_\varepsilon^2 - 2 \cdot \sigma_s \sigma_\varepsilon \cdot \rho_{s,\varepsilon}\right)}} \qquad [2]$$

The correlation coefficient only reaches -1 when there are no deviations from the recommended level of declared independence. Otherwise it is higher and may even become positive if the variance of the deviation is high enough.[2] Regarding the variance terms, from equation [1] we know that as the variance of the deviation becomes lower, two consequences emerge. The first is that the variances of the proportion of strictly and non-strictly independent directors are closer.[3] The second is that both variances are higher than the variance of the declared proportion of independent directors.

The empirical model of the optimal board independence theory, assuming zero mean deviations from the optimal level of board independence generated by frictions, such as the number of independent directors being an integer, may be written as:

$$IND_i = X_i \cdot \beta + e_i \qquad [3]$$

where IND_i is the proportion of independent directors of firm "i", X_i is a row vector of determinants of optimal board independence for firm "i", β is a column vector with the weights of the explanatory determinants, and e_i the deviation with respect to the optimal level of independence for firm "i". If we assume that $SIND_i$ in equation [1] is fixed, in accordance with equation [3] we can obtain the expected relation between $NSIND_i$ and the determinants of board independence. The parameters or weights are exactly the same as for $SIND_i$ but with the opposite sign:

$$NSIND_i = \left(\frac{1}{3} - SIND_i + \varepsilon_i\right) = \left(\frac{1}{3} - \left(\beta \cdot X_i + e_i\right) + \varepsilon_i\right) = \frac{1}{3} - \beta \cdot X_i + \left(e_i + \varepsilon_i\right)$$

Moreover, as a consequence of equation [1], the determinants of board independence should have no relation with $DIND_i$, since it is exactly one third plus the deviation (ε_i).

In sum, if firms adjust strictly independent directors in accordance with the optimal board independence theory and use non-strictly independent directors to fill the gap between strictly independent directors and the recommended level of one third, we

[2] The correlation coefficient between strictly independents and the deviation must also be considered. This term becomes more relevant the higher the variance of the deviation term is, and the higher this deviation is, the lower the value of equation [1] will be to reflect the behavior of firms.

[3] Non-strictly independent directors are 1/3 minus the proportion of strictly independent directors plus one deviation.

should expect: i) A high negative correlation coefficient between the proportion of strictly and non-strictly independent directors, approaching a value of -1; ii) The variance of strictly and non-strictly independent directors should be similar and higher than the variance of the declared proportion of independent directors; iii) The coefficients of the determinants of optimal board independence should show the same value with the opposite sign to explain strictly and non-strictly independent directors. The sign of the parameters predicted by the optimal board independence theory should apply to strictly independent directors; and iv) The determinants of optimal board independence should have no explanatory power for the declared proportion of board independence (that is one third plus an error term).

3. Institutions, data and methodology

3.1. Institutional background

The Spanish institutional context differs from that of the USA and UK in two main aspects: the high level of ownership concentration and the typology in the definition of outside directors. The average listed Spanish firm has a number of large controlling shareholders, the floating stock being lower than 50% for many firms. Regulators consistently distinguish the outside directors representing the interests of specific significant large shareholders (proprietary directors) from independent directors, representing minority shareholders. Firms have to report who the independent and the proprietary directors are separately. This structure brings higher precision to the measurement of board independence than that reported in papers like Linck et al. (2008), Coles et al. (2008), or Wintoki et al. (2012), which take board independence as the percentage of outside directors. Nguyen and Nielsen (2010) proved that independence is valuable, and that not all outside directors provide the same independence and therefore the same value to the firm.[4]

It is also worth mentioning that in Spain the mandatory definition of independent director, enforceable since 2007, compels formal independence requirements, such as being appointed by the nomination committee of the board of directors, or not having any kind of relationships (apart from the directorship) with the firm, its managers, or its significant shareholders. Firms are free to decide the level of board independence, although directors declared as independent directors should meet this definition. There is no explicit enforcement or punishment in case of misclassification.

Since 2004 firms listed on the Spanish Stock Exchange have to disclose a standardized Annual Report on Corporate Governance (ARCG), available at the website of the *Comisión Nacional del Mercado de Valores* (CNMV – the Spanish Securities and

[4] Boone et al. (2007) also analyzed optimal board independence with a more accurate measure than the percentage of outsiders.

Exchange Commission), which allows corporate governance practices among firms to be compared in a homogenous manner.[5]

3.2. Data sources and sample selection

We obtain the data on corporate governance from the ARCG filed by firms. Our sample includes all firms registered on the main trading platform of the Spanish Stock Exchange, called SIBE, which also disclose the standardized ARCG. Our sample time period goes from 2004 to 2012. This generates an initial non-balanced panel data set with 1,107 observations, ranging from 116 to 135 firms per year, representing 165 unique firms (see Table 1, column 1). After applying several filters, however, our final sample is based on 952 observations belonging to 140 different firms (Table 1, column 3). We drop 78 observations due to the lack of one-year-lagged stock return volatility or two-year-lagged accounting performance, which are necessary for our analysis. Observations with missing lagged stock returns are due to new listings on the Spanish Stock Exchange (41 observations), and to forced trading suspensions by the CNMV (8 observations, for example when a firm declares solvency problems). Missing lagged accounting performance observations are due to newly created firms (26 observations), and to firms reporting non-comparable accounting performance measures (3 observations).[6] Whenever a firm changes its name, we check its files in the CNMV (available at www.cnmv.es) and whenever this is due to mergers and acquisitions the resulting firm is analyzed as a new firm.[7] We also drop 2 observations from a bank in crisis that is being managed by the Spanish regulator, generating a special corporate governance situation beyond the scope of our research. This generates the sample in column 2 of Table 1 with 1,020 observations. Finally, 13 of the remaining firms have at least one year with a negative book value of shares. These are firms in crisis and we delete them since their corporate governance is determined by different fundamentals, other than the arguments of the main variables of the optimal board independence theory. Almost 50% of these firms belong to the real estate industry, one of the most affected by the crisis in Spain.

[5] Some foreign firms are allowed to disclose the ARCG following the rules of their home country, with a different format.

[6] For example, changes in the reporting of accounts generating accounting periods shorter or longer than one year generate performance measures for periods longer or shorter than one year.

[7] This generates 20 of the 26 missing values due to newly created firms. We repeated our analysis without this adjustment and results remain robust. Available on request.

Table 1. Sample of firms

This table shows the number of observations included in the analysis for each year analyzed. The first column shows the number of firms which release the standardized Annual Report of Corporate Governance and are listed on the main trading platform of the Spanish Stock Exchange, called SIBE. Column 2 shows the number of firms once non-usable observations have been deleted. Non-usable observations are those with no stock return data for the previous year, with no accounting performance for the previous two years, or with no valid corporate governance data. Finally, in column 3, all observations of firms with a negative book value of shares in any year of the time sample are also deleted. Our sample is a non-balanced panel data set and the last row shows the number of unique firms.

	(1)	(2)	(3)
Year	# Firms SIBE & ARCG	# Firms SIBE & ARCG & one year lagged stock returns & two year lagged accounting performance & valid Corporate Governance data	# Firms SIBE & ARCG & one year lagged stock returns & two year lagged accounting performance & valid Corporate Governance data & Book value of shares>0
2004	118	115	110
2005	119	118	113
2006	126	115	109
2007	135	112	104
2008	130	117	106
2009	124	119	107
2010	120	115	105
2011	119	109	100
2012	116	107	98
Total	1,107	1,027	952
# Unique firms	165	153	140

Stock market data and accounting information is obtained from the Thomson Financial database. The industrial sector classification is obtained from the Spanish Stock Exchange (http://www.bolsamadrid.es).

3.3. The structure of the board, and non-strictly independent directors

In our final sample of 952 firm/year observations we apply the eight formal independence criteria used by Crespí-Cladera and Pascual-Fuster (2014) to classify the independent directors declared by firms as strictly independent and non-strictly independent directors (Table 2, Panel C).[8] Our sample uncovers three years more than the above-mentioned paper and confirms the decreasing proportion of non-strictly independent directors over time (Table 2, Panel A). The reported board composition is stable over time. There is a slight increase in the percentage of declared independent directors (from 33.3% in 2004 to 35.7% in 2012) and a slight decrease in the percentage of executives (from 20.7% in 2004 to 16.9% in 2012). Proprietary directors remain at around 43% of board size. Directors qualified as "Others" are outside directors not representing large shareholders and not qualified as independent directors by firms, and remain stable at around 5% of board size. The overall information in Table 2 Panel A shows that firms tend to replace non-strictly independent directors by strictly

[8] However, compared to Crespí-Cladera and Pascual-Fuster (2014) we additionally require not being executive director in the previous four years, not only in the previous year. This is consistent with the mandatory definition of an independent director released by the CNMV and in force since 2007.

independent directors. This may be due to tighter supervision by the CNMV since several of our independence criteria are included in the mandatory definition of independent directors (criteria 1, 3, 4, 5, 7, 8 and partially 6, since a directorship in a subsidiary is admitted for qualification as independent). The average size of the board, close to eleven directors, remains stable, as it is the percentage of firms with the CEO chairing the board (over half of the firms) which is higher among larger firms (Table 2, Panels A and B). The size of the board is usually higher for larger firms, where the composition is slightly different. In large firms, the proportion of declared independent directors is higher than for small firms, as the proportion of proprietary directors is lower, consistent with a lower ownership concentration among these large firms.

Firms of all sizes do appoint non-strictly independent directors; however the proportion is slightly higher in large firms and in small caps. Regarding the eight independence criteria used to classify independent directors as strictly and non-strictly independent directors, criterion 1, which checks whether the director has been proposed by the Nomination Committee, was the most relevant to generate non-strictly independent directors in 2004, but it is among the least relevant in 2012 (Table 2, Panel C). These data show that firms do care about compliance with the recommendation that independent directors should be proposed by the Nomination Committee. However, the excess of tenure of independent directors is almost as relevant in 2012 as it was in 2004. There is no explicit reference to tenure in the mandatory definition of an independent director, although the same code recommends short tenure for independent directors. Criterion number 6, holding relevant positions in subsidiaries, is among the ones that contribute most to classifying independent directors as non-strictly. This criterion is only partially reflected in the mandatory definition of an independent director. The overall combined effect of these eight criteria is that firms declare 33.51% of independent directors when only 17.36% of directors meet all eight criteria for the whole period.

Table 2 Board structure

Percentage of firms where the CEO is also the chair of the board of directors, the average number of board members, and the mean percentage of independent directors declared by firms over total board size, strictly independent directors (do meet our eight independence criteria), non-strictly independent directors (do not meet any of the eight independence criteria), executive directors, proprietary directors representing significant shareholders, and other directors (outsiders not representing any significant shareholders and not being qualified as independent directors). Panel A shows this information by years, and panel B by quartiles of firms according to market capitalization. Quartiles are recomputed every year. Panel C describes the eight independence criteria we use to classify independent directors as strictly and non-strictly independent, and the mean percentage over board size of independent directors meeting each criterion. This information is provided every two years and for the overall sample. This information is for the 952 firm/year observations of column 3 in Table 1.

Panel A: by Year			% type of directors over board size					
Year	CEO-Chair	Board Size	Declared independents	Strictly independents	Non-Strictly independents	Executives	Proprietary	Others
2004	51.8%	11.10	33.30%	8.54%	24.77%	20.68%	42.92%	3.10%
2005	50.4%	11.09	33.65%	10.91%	22.75%	19.43%	43.93%	2.98%
2006	57.8%	11.12	32.73%	11.57%	21.16%	19.98%	43.94%	3.35%
2007	58.7%	11.44	31.46%	14.86%	16.60%	19.02%	45.27%	4.25%
2008	60.4%	11.85	33.33%	18.88%	14.45%	18.09%	44.46%	4.13%
2009	60.7%	11.57	32.92%	20.13%	12.79%	18.23%	44.55%	4.30%
2010	56.2%	11.58	34.15%	22.99%	11.16%	17.46%	43.79%	9.10%
2011	55.0%	11.57	34.54%	24.44%	10.09%	16.66%	43.52%	10.90%
2012	50.0%	11.26	35.74%	25.93%	9.81%	16.88%	42.75%	4.63%
Panel B: by Market Capitalization								
First quartile - largest	67.1%	14.63	39.40%	22.98%	16.42%	17.62%	37.48%	7.04%
Second quartile	63.9%	12.18	31.69%	16.07%	15.62%	18.43%	45.65%	5.19%
Third quatile	47.7%	10.18	29.65%	14.69%	14.96%	19.44%	47.66%	4.45%
Fourth quartile	44.1%	8.59	33.35%	15.75%	17.60%	18.67%	44.80%	3.85%
Overall	55.7%	11.39	33.51%	17.36%	16.15%	18.54%	43.91%	5.13%

Panel C: % Independent directors over board size meeting each independence criteria						
	Year					
Independence criteria	2004	2006	2008	2010	2012	Overall
Declared % Independent directors	*33.30%*	*32.73%*	*33.33%*	*34.15%*	*35.74%*	*33.51%*
[1] Proposed for appointment or renewal by the Nomination Committee [a]	12.84%	17.55%	26.93%	32.75%	35.46%	24.89%
[2] Tenure as independent director for up to twelve years	29.03%	27.79%	27.88%	28.66%	29.84%	28.20%
[3] Not having a significant business relationship with the company	31.71%	30.26%	31.21%	31.90%	34.47%	31.56%
[4] Not holding a directorship, being a manager or an employee of significant shareholder or a shareholder with board representation	32.58%	32.34%	33.01%	33.84%	35.63%	33.09%
[5] Not having other relevant relationship (other than those in point 4) with a significant shareholder or a shareholder with board representation	32.82%	32.39%	32.93%	33.96%	35.74%	33.18%
[6] Not being a director or executive in subsidiaries or associated companies	27.23%	28.14%	29.23%	29.87%	31.71%	29.05%
[7] Not being in a company as board director	32.64%	31.87%	32.44%	33.19%	34.77%	32.68%
[8] Not being executive director of the firm in the previous four years [b]	33.30%	32.64%	33.22%	33.93%	35.74%	33.42%

[a] In 2007 the CNMV modified the information requirements regarding director proposals. Firms must communicate who proposed each director, except for independent directors. Since 2007 we assume that all independent directors have been proposed by the nomination committee, except when this committee does not exist, or if the director has not been formally renewed and was not promoted by this committee before 2007.

[b] Our corporate governance data begin in 2004, therefore this criterion is affected till 2007.

3.4. The empirical model of optimal board structure

The proxies for the determinants of the optimal board structure models are taken from the information available in our database. The approaches to firm complexity are firm size, the relevance of debt in the capital structure, the number of business segments, and firm age. To proxy the costs of monitoring and advising, we use the market-to-book value of equity, and the spending on research and development to account for growth opportunities, and the stock return volatility for information asymmetry between insiders and outsiders. The proxy for potential private benefits is the free cash flow (Jensen, 1986). Regarding the ownership incentives, we measure the ownership by directors directly and proxy ownership concentration through ownership by the three largest shareholders, which are highly correlated (above 0.91) with the ownership by the largest shareholder and the five largest shareholders. CEO's ability is measured with the firm's past performance, computed as the average of the last two years' industry-adjusted return on assets, and with tenure, since successful CEOs remain CEOs longer. The succession process is approached with a dummy variable identifying when CEOs' tenure is over 30 years.[9] We are able to obtain proxies of CEOs' tenure and of the succession process only for firms with executives on the board, which reduces the sample by 66 observations. We also estimate models without these proxies and with bigger samples. Following Linck et al. (2008), we use a dummy variable identifying CEOs that also chair the board as a proxy of CEO power, which is a measure of power that is not related to her/his abilities, or at least not directly so.

Since there are two types of outside directors (proprietary directors representing large shareholders, and independent directors) in our sample of Spanish firms, the expected positive relation between the outsider ownership and optimal board independence, due to the monitoring benefits of ownership, needs to be revised. A higher proportion of outsiders might mean a higher proportion of independent directors (higher board independence) or a higher proportion of proprietary directors (lower board independence). We conjecture that board independence is positively related with the ownership by independent directors and negatively related with the ownership by proprietary directors.

Finally, we also correct by year and industry fixed effects. Board independence is measured as the percentage of declared independent directors, strictly independent directors, and non-strictly independent directors over the total number of directors, and board size as the log of the number of directors. The empirical models explaining board independence and board size are:

[9] The CEO is not directly identified in the ARCG. We identify CEOs indirectly with the CEO-chair duality, as the top executive on the board of directors, since they are the executive director of the executive committee. There are 76 firm/year observations out of 1,107 belonging to 21 firms with no executives on their boards. In firms with multiple CEOs (35 firm/year observations), we compute their average tenure to proxy the CEOs' tenure.

$$IND = \alpha + \beta_1 LogFirmSize + \beta_2 Debt + \beta_3 LogSegments + \beta_4 LogFirmAge + \beta_5 MTB + \beta_6 R\&D + \\ + \beta_7 RETSTD_{t-1} + \beta_8 FCF + \beta_9 SAPerformance + \beta_{10} CEO\_Chair + \beta_{11} ExDirectors\_Own + \\ + \beta_{12} IndDirectors\_Own + \beta_{13} \Pr opDirectors\_Own + \beta_{14} C3 + \lambda \cdot IndustryDum\min es + \gamma \cdot YearDummies + \varepsilon \quad [4]$$

$$LogBoardSize = \alpha + \beta_1 LogFirmSize + \beta_2 Debt + \beta_3 LogSegments + \beta_4 LogFirmAge + \beta_5 MTB + \beta_6 R\&D + \\ + \beta_7 RETSTD_{t-1} + \beta_8 ExDirectors\_Own + \beta_9 IndDirectors\_Own + \beta_{10} \Pr opDirectors\_Own + \beta_{11} C3 + \\ + \lambda \cdot IndustryDum\min es + \gamma \cdot YearDummies + \varepsilon \quad [5]$$

where:

- *LogFirmSize* = Log of market capitalization.
- *Debt* = Long-term debt / Total assets.
- *LogSegments* = Log of the number of geographical segments.
- *LogFirmAge* = Log of the number of years since incorporation into the Thomson financial database.
- *MTB* = Market value of equity / Book value of equity.
- *R&D* = R&D expenditures / Total assets.
- $RETSTD_{t-1}$ = Standard deviation of monthly stock return over 12 months in the preceding year.
- *ExDirectors_Own, IndDirector_Own, PropDirector_Own* = Percentage of firm's shares held by executive directors, independent directors, and proprietary directors, respectively.
- *FCF* = Free cash flow computed as operating income before depreciation minus total income taxes, interest expense, preferred dividends, and dividends on common stock, all divided by total assets (see Jensen, 1986, and Lehn and Poulsen, 1989).
- *SAPerformance* = Average annual industry-adjusted return on assets over two preceding years. Return on assets is the net income plus interest payments, net of tax effects, over the previous year's total Assets.
- *CEO_Chair* = A dummy variable for CEOs chairing the board of directors.

In the subsample of firms with executive directors we also estimate the independence model by adding the log of CEO's tenure (*LogCEOTenure*) and a dummy variable identifying whenever CEO's tenure is over 30 years (*Retirement*).

Table 3 summarizes the statistics of the variables by quartiles of market capitalization over years.[10] The mean of the market capitalization is considerably higher than that reported in the sample of Linck et al. (2008), which included approximately 7,000 firms in the USA from 1990 to 2004, and was also used in Wintocki et al. (2012). Firms in the second quartile, by market capitalization, do have a similar mean size than the average firm in Linck et al. (2008). Comparing the ownership structure, even with bigger firms, the mean ownership of all block holders in our sample is 57%, while it is

[10] Given that any tendency in stock prices might distort these capitalization-based subsamples, quartiles are computed every year.

40% in the US sample of Linck et al. (2008). Ownership by board directors is also larger in our sample; its mean is 8.6% for executives, 0.32% for independent directors, and 13% for proprietary directors. Linck et al. (2008) reported 1.7% aggregated ownership by non-executive directors, and 6% ownership by the CEO. Regarding the remaining characteristics of firms, panel C in Table 3 shows the effect of the crisis; Return-on-assets decreases over time, as does the market-to-book ratio. Our measure of free cash flow is around 3% of total assets, lower than the median 6% in the sample of Linck et al. (2008), but bigger than their average (-1.4%).

Table 3. Descriptive statistics

Firm characteristics are its stock market capitalization, long-term debt over total assets, the number of geographical segments, firms' age (years since their incorporation into the Thomson financial database), market value over book value of equity, investments in research and development, the yearly standard deviation of monthly stock return (RETSTD), free cash flow over total assets, and return on assets. Firms' characteristics come from the Thomson Financial database. Ownership structure variables come from the ARCG and are the ownership by the largest shareholder (C1), the three largest shareholders (C3), the fifth largest shareholders (C5), all large shareholders (those with an ownership larger than 3% and board directors), executive directors, independent directors, proprietary directors, and the ownership by the CEO for firms with executives on the board of directors (ARCG do not provide information on the ownership by non-director executives). Tenure data also come from the ARCG and are available just for firms with executives on their boards. Panel A provides descriptive statistics of all variables for the overall sample. Panel B provides the mean value of the variables by quartiles of the firms ordered by market capitalization. Quartiles are recomputed each year. Panel C provides the mean value by years every two years.

	Panel A: Overall sample					Panel B: Means by market capitalization quartiles				Panel C: Means by Year				
	# Obs	Mean	Std. Dev.	Min	Max	First (largest)	Second	Thirdth	Fourth	2004	2006	2008	2010	2012
Firms' characteristics														
Market Capitalization (mill €)	952	4,827.20	12,250.98	7.95	104,544.90	16,819.08	1,925.17	515.69	117.35	4,089.41	6,261.24	4,239.23	4,305.65	4,025.24
Debt/Total Assets	952	0.20	0.17	0.00	1.22	0.27	0.21	0.20	0.14	0.17	0.21	0.21	0.20	0.22
# Geographical Segments	952	3.30	2.28	1.00	10.00	4.01	3.44	3.00	2.77	2.49	2.88	3.28	3.76	4.15
Firm age (# years)	952	16.04	5.20	5.00	25.00	17.66	16.37	15.41	14.75	13.28	15.04	15.75	17.33	19.07
MTB	952	2.68	3.59	0.11	47.41	3.75	2.94	2.38	1.66	3.03	4.28	2.08	1.84	1.86
R&D (thousand €)	952	2.35	22.96	0.00	322.01	0.01	3.95	5.05	0.35	1.66	3.01	2.82	1.86	1.87
RETSTD	952	0.09	0.05	0.01	0.74	0.08	0.09	0.10	0.10	0.06	0.08	0.11	0.09	0.12
Free Cash Flow/Total Assets	952	0.03	0.07	-0.97	0.38	0.04	0.04	0.03	0.02	0.04	0.04	0.03	0.03	0.03
ROA	952	4.42	7.35	-33.42	42.73	6.78	5.62	3.60	1.69	5.12	6.32	4.36	3.73	1.48
Ownership structure (%)														
C1	952	34.91	25.55	0.04	99.50	33.44	41.28	36.94	27.98	34.48	38.52	35.43	34.16	31.37
C3	952	48.86	24.42	0.04	99.50	46.78	53.67	50.79	44.20	47.59	51.46	49.56	48.80	46.46
C5	952	53.91	23.81	0.04	99.50	49.70	58.02	56.51	51.37	52.00	55.54	54.85	54.38	52.39
All large shareholders	952	56.89	23.95	0.04	99.81	51.01	61.07	59.84	55.61	54.03	57.28	58.57	58.23	55.56
Executive directors	952	8.65	19.46	0.00	96.91	3.73	8.62	13.22	9.01	10.82	12.45	6.45	7.50	5.42
Independents directors	952	0.32	1.03	0.00	12.31	0.26	0.34	0.30	0.38	0.32	0.33	0.31	0.35	0.28
Proprietary directors	952	13.38	20.17	0.00	99.50	8.04	13.94	14.45	17.06	10.52	10.69	15.01	14.67	15.81
CEO's ownership	886	7.33	18.56	0.00	96.91	2.93	5.36	12.35	9.19	9.58	11.44	4.68	5.58	3.92
Tenure (# years)														
Average of executive directors	886	9.26	7.35	0.00	43.50	8.74	9.57	9.73	8.95	8.55	8.44	9.16	10.05	9.89
CEO's tenure	886	11.36	10.31	0.00	52.42	11.68	11.71	11.12	10.84	10.16	10.46	11.41	12.21	12.02

4. Empirical results

4.1. Descriptive statistics and the recommended level of board independence

The behavior of firms achieving the recommended level of independence above their optimal level by filling the gap with non-strictly independent directors only concerns the firms in the sample that declare independent directors as accounting for one third of their directors. Approximately half of the firm/year observations in the sample meet the recommendation (see Table 4, Panel A). Nevertheless, almost all firms (91.5% of observations) appoint non-strictly independent directors, which include 63 firms that do not meet the recommended level of independence, representing 46.5% of our observations.

Firms that do meet the recommendation have a statistically significant higher level of declared board independence than the non-compliers (46.6% versus 21%; Table 4, Panel B). This higher level of board independence is based on non-strictly independent directors since the declared proportion of independent directors is larger for firms with non-strictly independent directors than for firms without (34.2% and 25.7%, respectively, which is a statistically significant difference; Table 4, Panel B). Furthermore, among the 464 observations belonging to firms that reach the recommended level of independence of one third, 303 would not have reached that level unless they had appointed non-strictly independent directors. This descriptive data supports our conjecture that the appointment of non-strictly independent directors is used to reach the recommended level of independence by complying firms.

Table 4. Firms with non-strictly independent directors and firms meeting the recommended level of independence

Firms are classified as meeting the recommended level of board independence whenever their average declared proportion of independent directors reaches one third of the board. Firms are classified as having non-strictly independent directors whenever they present non-strictly independent directors in any one year. Panel A shows, by year and market capitalization quartiles, the number of firms analyzed, and the number and the percentage of observations belonging to each type of firm. The last two columns show the number of observations belonging to firms meeting the recommended level of board independence only with strictly independent directors, and those who need non-strictly independent directors to reach the recommended level. Panel B shows, by year and market capitalization quartiles, the average percentage of independent directors declared in all the firms analyzed, in firms with non-strictly independent directors, in firms without non-strictly independent directors, in firms meeting the recommended level of board independence, and in firms not meeting it. Coefficients in bold show rejection of the null hypothesis of equal mean proportion of independent directors among firms having and not having non-strictly independent directors, and among firms meeting and not meeting the recommended level of independence with a significance level of 5%. The hypothesis is analyzed with the t test of means comparison (see Hamilton, 2013).

Panel A

		# Firms	Firms with non-strictly		Firms meeting recommended independence			
			# Obs	%	# Obs	%	# just with strictly indep	# with non-strictly indep
Years	2004	110	103	93.6%	53	48.2%	15	38
	2006	109	102	93.6%	50	45.9%	15	35
	2008	106	97	91.5%	51	48.1%	18	33
	2010	105	94	89.5%	54	51.4%	21	33
	2012	98	86	87.8%	51	52.0%	21	30
Market Capitalization quartiles								
	First - largest	237	223	94.1%	151	63.7%	77	74
	Second	238	222	93.3%	102	42.9%	19	83
	Third	239	203	84.9%	89	37.2%	37	52
	Fourth	238	223	93.7%	122	51.3%	28	94
All		952	871	91.5%	464	48.7%	161	303

Panel B

Mean % of declared independent directors

		Non-Strictly independents		Recommended level of	
	All firms	Firms with	Firms without	Firms meeting	Firms not meeting
Years					
2004	33.3%	**35.0%**	**8.0%**	**48.5%**	**19.1%**
2006	32.7%	**34.4%**	**8.3%**	**48.5%**	**19.4%**
2008	33.3%	34.0%	25.6%	**45.6%**	**22.0%**
2010	34.1%	34.2%	33.6%	**45.0%**	**22.7%**
2012	35.7%	34.8%	42.2%	**46.6%**	**23.9%**
Market Capitalization quartiles					
First - largest	39.4%	39.4%	39.7%	**49.9%**	**21.0%**
Second	31.7%	32.2%	24.5%	**44.1%**	**22.3%**
Third	29.6%	**31.3%**	**20.3%**	**45.9%**	**20.0%**
Fourth	33.3%	33.8%	27.0%	**45.3%**	**20.7%**
All	33.5%	**34.2%**	**25.7%**	**46.6%**	**21.0%**

Furthermore, consistently with our predictions in section 2.3, the variance of strictly and of non-strictly independent directors is higher than the variance of the declared proportion of independent directors in the subsample of firms that meet the recommended level of board independence, although the difference is not statistically significant from 2008 (see Table 5, Panel A). The null hypothesis of equal standard deviation of strictly and non-strictly independent directors is rejected only in the samples considering all firms (coefficients in bold in Table 5, Panel A). In addition, the correlation coefficient between strictly and non-strictly independent directors is negative in all samples and subsamples, and it is closer to -1 in firms that meet the

recommended independence level, although this difference decreases over time (Table 5, Panel B). Finally, firm size seems to be relevant. Smaller firms that meet the recommendation show the highest difference between the variance of strictly and non-strictly independent directors and the variance of declared independent directors (also statistically significant), and the correlation coefficient between strictly and non-strictly is closer to -1. Since optimal board independence is positively related with firm size (positively related with board size), and the number of independent directors is a positive integer, it could be more difficult to meet the recommended level of board independence among smaller firms.

Table 5. Variability and correlation of independent directors

Firms are classified as meeting the recommended level of board independence whenever their average declared proportion of independent directors reaches one third of the board. Panel A shows, by years and market capitalization quartiles, for all firms and for firms meeting the recommended level of board independence, the standard deviation of the percentage of independent directors over board size as declared by firms, with just strictly independent directors, and with only non-strictly independent directors. Panel B presents the correlation coefficient between the percentage of strictly independent directors and the percentage of non-strictly independent directors, taking into account all observations and only observations belonging to firms meeting the recommended independence. The correlation is also computed by year and by market capitalization quartile subsamples. Coefficients in bold identify when the null hypothesis of equal standard deviation of strictly and non-strictly independent directors is rejected with a statistical significance of 5%. * identifies when the null hypothesis of equal standard deviation among non-strictly (strictly) and declared independent directors is rejected with a statistical significance of 5%. The hypothesis is analyzed with the F test of standard deviation comparison (see Armitage et al., 2002, 149-153).

Panel A: Standard deviation of the % of independent directors

	All fims			Firms achieving recommended independence		
Years	Declared	Strictly	Non-strictly	Declared	Strictly	Non-strictly
2004	20.2%	**13.3%***	**20.2%**	14.0%	16.0%	20.8%*
2006	20.0%	**15.5%***	**19.0%**	15.3%	18.1%	22.8%*
2008	16.9%	15.8%	15.4%	13.3%	17.6%	17.3%
2010	16.7%	**16.6%**	**13.3%***	13.7%	17.2%	15.3%
2012	17.7%	**17.2%**	**11.6%***	15.5%	15.9%	13.0%
Market Capitalization quartiles						
First - largest	18.7%	**18.0%**	**15.1%***	14.2%	16.3%	17.0%*
Second	16.9%	15.0%	16.1%	14.4%	16.9%	18.1%*
Third	18.4%	16.5%	17.4%	14.5%	20.0%*	21.9%*
Fourth	17.6%	17.1%	18.9%	12.7%	18.9%*	22.1%*
All	18.2%	17.0%*	17.0%*	14.1%	18.3%*	19.7%*

Panel B: Correlation coefficient between the percentage of strictly and non-strictly independent directors

Years	All firms	Firms meeting recommended independence
2004	-0.3254	-0.7388
2006	-0.3445	-0.7434
2008	-0.4147	-0.708
2010	-0.3916	-0.6493
2012	-0.2922	-0.4412
Market Capitalization quartiles		
First - largest	-0.3769	-0.6359
Second	-0.4087	-0.665
Third	-0.4162	-0.7624
Fourth	-0.5249	-0.8175

4.2. The empirical model of optimal board independence

All firms in sample

The empirical models of board independence and board size are estimated with firm fixed effects (equations [4] and [5]).[11] Inference is based on robust standard errors clustered by firm (Huber, 1967; White, 1980, 1982; Petersen, 2009).

Our third prediction is to find the expected signs of board structure determinants when the dependent variable is the proportion of strictly independent directors and the opposite sign when it is the proportion of non-strictly independent directors. Columns 1 to 6 of Table 6 present the estimation of the empirical models of board independence. Although several coefficients show the opposite sign (e.g., firm size or business segments) this does not hold for the statistically significant coefficients of the model. The model shows the expected sign in agreement with the optimal board independence theory for most explanatory variables and for both dependent variables, the proportion of strictly and of non-strictly independent directors. Firm age is the only explanatory variable showing statistically significant coefficients with the opposite sign, having the expected sign for strictly independent directors. A potential explanation is that firms replace non-strictly by strictly independent directors over time, as suggested by the descriptive statistics in Table 2. The ownership by the largest shareholders is also statistically significant with both dependent variables and presents the same expected sign in both cases. The models in columns 2 and 5 of Table 6 have the strictly independent directors as the dependent variable, and only firm age and ownership by the largest shareholders are statistically significant, both with the expected sign. Contrary to the optimal board theory as the origin of non-strictly independent directors, the models in columns 3 and 6, with non-strictly independent directors as the dependent variable, present an even better fit. Only for the model in column 3 are there statistically significant coefficients with the unexpected sign: performance and firm age, both with low statistical significance. When we aggregate both dependent variables, as the declared level of board independence (columns 1 and 4 of Table 6), our fourth prediction was that no explanatory power of board structure determinants would be found; the overall fit in terms of R^2 is lower, but there are seven statistically significant coefficients and only one of them presents an unexpected sign (MTB in column 4), with low statistical significance. Overall, these results shed some light in the sense that the explanation of optimal board independence exceeds the governance recommendations plus optimal independence conjecture as the origin of the appointment of non-strictly independent directors. Our results do not seem to be driven by poor specification of the empirical model of board independence. The overall fit is substantial (R^2 higher than 18% in all models, it is 17% in Linck et al., 2008, with a much bigger sample: 8,840 observations) and the sign of the statistically significant variables is in general the expected one, in accordance with the optimal board independence theory. Furthermore, a broad analysis of our determinants of board structure, analyzing their explanatory

[11] Therefore, industrial sector dummy variables are omitted.

power when board size is the dependent variable, shows a reasonable fit. Although R^2 is only 11% (column 7 in Table 6, it is 44% in Linck et al., 2008, with 10,636 observations), all statistically significant coefficients present the expected sign and the statistical significance is just 10% in one of the seven statistically significant coefficients. Our overall results provide evidence that firms tend to avoid the costs of not reaching optimal board independence even if they achieve the recommended level of board independence with non-strictly independent directors.[12] Firms behave as if non-strictly independent directors provided real board independence.

[12] We control for the effect of any possible outlier (e.g., due to measurement error) by winsorizing all explanatory variables (with percentiles 1% and 99%, and with percentiles 5% and 95%), and obtain qualitatively equivalent results, available on request.

Table 6. Board structure

The empirical models of optimal board independence (equation [4]) and of board size (log of # directors, equation [5]) are estimated with firm fixed effects. t statistics are in parenthesis and are computed with robust standard errors clustered by firm (Huber, 1967; White, 1980, 1982; Petersen, 2009). Declared board independence (models 1 and 4) is decomposed into strictly board independence (models 2 and 5) and non-strictly independence (models 3 and 6). Debt is long-term debt over total assets, LogSegments is the log of the number of geographical segments, MTB is the market value over book value of equity, R&D is R&D expenses over total assets, $RETSTD_{t-1}$ is the standard deviation of the previous year's monthly returns, FCF is the free cash flow scaled by total assets, SAPerformance is the two previous years' average industry-adjusted return on assets, CEO_Chair identifies when the CEO chairs the board of directors, ExDirectors_Own (IndDirectors_Own, PropDirectors_Own) is the percent of shares held by executive directors (independent and proprietary directors, respectively), C3 is the percent of shares held by the three largest shareholders, LogCEOTenure is the CEO's tenure, Retirement is a dummy variable to detect CEOs with more than 30 years' tenure. F is a test of the joint statistical significance of all explanatory variables. *** denotes significance at the 1% level; ** denotes significance at the 5% level; * denotes significance at the 10% level.

	% Independent directors							Board size	
	Prediction	Declared	Strictly	Non-Strictly	Declared	Strictly	Non-Strictly	Prediction	
		(1)	(2)	(3)	(4)	(5)	(6)		(7)
Log(Market Capitalization)	(+)	0.0033	-0.0063	0.0096	0.0048	-0.0039	0.0087	(+)	0.0538***
		(0.2909)	(-0.4931)	(0.6563)	(0.4533)	(-0.2948)	(0.5925)		(4.1605)
Debt	(+)	0.031	0.0021	0.0289	0.0273	0.005	0.0223	(+)	0.1844***
		(0.6459)	(0.0402)	(0.5248)	(0.5413)	(0.0903)	(0.372)		(2.6251)
LogSegments	(+)	0.014	-0.0165	0.0305***	0.0118	-0.0142	0.026**	(+)	0.0017
		(1.5165)	(-1.4483)	(2.6502)	(1.2647)	(-1.1903)	(2.0963)		(0.1008)
LogFirmAge	(+)	0.1061	0.3076***	-0.2016*	0.1398*	0.2767**	-0.1369	(+)	0.3199**
		(1.2496)	(2.8904)	(-1.6754)	(1.7234)	(2.5742)	(-1.2317)		(2.5326)
MTB	(-)	0.0027	0.0019	0.0008	0.0032*	0.002	0.0012	(-)	-0.0048
		(1.6029)	(0.9896)	(0.3168)	(1.9133)	(1.104)	(0.4832)		(-1.263)
R&D	(-)	-0.1523	-0.1321	-0.0202	-0.1227	-0.1069	-0.0158	(-)	-1.0307***
		(-0.4129)	(-0.2266)	(-0.0678)	(-0.3057)	(-0.1879)	(-0.0603)		(-6.5569)
$RETSTD_{t-1}$	(-)	-0.0013	0.0492	-0.0505	0.0296	-0.0023	0.0319	(-)	-0.0682
		(-0.014)	(0.3305)	(-0.3891)	(0.3044)	(-0.0141)	(0.2283)		(-0.5171)
FCF	(+)	0.0162	-0.0346	0.0509	0.0321	0.0031	0.0289		
		(0.1635)	(-0.5009)	(0.5106)	(0.3098)	(0.047)	(0.2944)		
SAPerformance	(-)	0.0013	-0.0004	0.0018*	0.0011	-0.0004	0.0015		
		(1.4534)	(-0.3889)	(1.853)	(1.3673)	(-0.3434)	(1.4668)		
CEO_Chair	(+)	0.0172	0.0149	0.0023	0.0155	0.0202	-0.0048		
		(0.8014)	(0.7897)	(0.1127)	(0.6464)	(1.0108)	(-0.2231)		
ExDirectors_Own	(-)	-0.0003	0.0002	-0.0005	0.0001	0.0003	-0.0002	(-)	0.0013
		(-0.6358)	(0.2172)	(-0.4825)	(0.264)	(0.3366)	(-0.1998)		(1.2485)
IndDirectors_Own	(+)	0.0401***	-0.0015	0.0415***	0.0405***	-0.0016	0.0421***	(+)	0.0087**
		(8.986)	(-0.3227)	(7.0307)	(9.0449)	(-0.3552)	(6.9598)		(2.4721)
PropDirectors_Own	(-)	-0.0006	0.0006	-0.0012**	-0.0004	0.0009	-0.0012**	(+)	0.0013**
		(-1.6184)	(1.0892)	(-2.2071)	(-0.9528)	(1.4068)	(-2.136)		(2.1952)
C3	(-)	-0.0023***	-0.001*	-0.0013*	-0.0025***	-0.001*	-0.0015**	(-)	-0.0018*
		(-3.5737)	(-1.8818)	(-1.7179)	(-3.9818)	(-1.9283)	(-1.9955)		(-1.753)
LogCEOTenure	(-)				-0.0016	0.0008	-0.0024		
					(-0.2327)	(0.1405)	(-0.3265)		
Retirement	(-)				-0.0575***	-0.0661	0.0086		
					(-3.0681)	(-1.2339)	(0.1468)		
Constant		0.124	-0.5856**	0.7096**	0.0327	-0.5266*	0.5594*		1.2656***
		(0.5877)	(-2.0669)	(2.3551)	(0.1618)	(-1.8506)	(1.9285)		(3.778)
Year fixed effects		Yes	Yes	Yes	Yes	Yes	Yes		Yes
# Obs		952	952	952	886	886	886		952
R^2		0.182	0.2603	0.2819	0.2105	0.2444	0.2686		0.1103
R^2 Adjusted		0.1626	0.2427	0.2649	0.1889	0.2226	0.2484		0.0921
F		6.4713***	4.4929***	7.7387***	7.9986***	4.0677***	7.4821***		7.0193***

Firms meeting the recommended level of board independence

We replicate the analysis allowing a different coefficient of board structure determinants in firms that meet the recommended level of board independence. For this purpose we interact a dummy variable that identifies firms meeting the recommendation (MeetIR) with the determinants of board independence. Overall results, in Table 7, show that the relation with the determinants of the optimal board independence theory does not depend on whether firms comply or not with the recommended proportion of independent directors on the board. Furthermore, strictly and non-strictly independent directors react to these determinants with the expected sign. Wald tests of the joint statistical significance of the new variables are relevant only when the dependent variable is the declared proportion of independent directors (at the 5% level). For the individual significance of explanatory variables in firms meeting the independence recommendation, there is no difference among the proportion of strictly and non-strictly independent directors in the models in columns 2 and 3. Only when the retirement and CEO's tenure variables are considered, and strictly independent directors is the dependent variable (column 5, Table 7), is there a statistically significant different coefficient, i.e., ownership by executives, that has the expected sign for firms meeting the recommendation (0.0013-0.0033 = -0.002), although a Wald test does not reject a value of zero. When the dependent variable is the proportion of declared independent directors (columns 1 and 4), there are three determinants (R&D, the ownership by proprietary directors, and C3 just in the model in column 4) with a statistically significant different coefficient in firms meeting the recommendation, but only R&D presents an overall unexpected sign in those firms (-4.128 + 4.1508 = 0.0228) in column 1, but not in column 4 (-4.019 + 4.0068 = -0.0122). However, a Wald test of the statistical significance of these sums is unable to reject a value of zero in both cases.

In sum, even in a specific analysis for firms that meet the recommended level of board independence, board structure determinants present the statistically significant expected sign for all measures of board independence, except the retirement proxy in column 6 (non-strictly independents) and executive directors' ownership in column 2 (strictly independent directors). Furthermore, the overall fit of the model is better when the dependent is the proportion of non-strictly independent directors (in terms of R^2 and of statistically significant coefficients with the expected sign).[13]

[13] We also estimated the models of board independence in Table 7 with just the observations of firms wanting to meet the recommendation, and also after winsorizing all the explanatory variables (with percentiles 1% and 99%, and 5% and 95%), and the overall results remain in both cases. Results omitted to save space.

Table 7. Board structure and the recommended independence level

The empirical models of optimal board independence (equation [4]) are estimated with firm fixed effects. t statistics are in parenthesis and are computed with robust standard errors clustered by firm (Huber, 1967; White, 1980, 1982; Petersen, 2009). MeetIR is a dummy variable identifying firms classified as meeting the recommendation for board independence (those with an average percentage of declared independent directors reaching one third). See Table 6 for a description of explanatory and dependent variables. Wald F (xMeetIR) is a test of the joint statistical significance of all variables multiplied by MeetIR. *** denotes significance at the 1% level; ** denotes significance at the 5% level; * denotes significance at the 10% level.

	Prediction	Declared	Strictly	Non-Strictly	Declared	Strictly	Non-Strictly
		(1)	(2)	(3)	(4)	(5)	(6)
Log(Market Capitalization)	(+)	-0.0019	-0.012	0.0101	0	-0.0126	0.0125
		(-0.1503)	(-1.0299)	(0.8074)	(-0.0037)	(-1.0474)	(1.0823)
Debt	(+)	0.0356	0.0323	0.0032	0.0354	0.0252	0.0102
		(0.6893)	(0.6287)	(0.0716)	(0.6262)	(0.4433)	(0.217)
LogSegments	(+)	0.0045	-0.0133	0.0178	0.0004	-0.0156	0.016
		(0.4143)	(-1.2056)	(1.6413)	(0.038)	(-1.3926)	(1.4418)
LogFirmAge	(+)	0.0814	0.2358**	-0.1544	0.1038	0.209**	-0.1052
		(0.8915)	(2.309)	(-1.4435)	(1.1123)	(2.0059)	(-0.9762)
MTB	(-)	0.0018	0.0007	0.0011	0.0021	0.0014	0.0007
		(1.2691)	(0.3813)	(0.488)	(1.3494)	(0.8562)	(0.2903)
R&D	(-)	-4.128*	-0.0584	-4.0696	-4.019**	0.1389	-4.1579
		(-1.9433)	(-0.0172)	(-1.4106)	(-2.4257)	(0.0399)	(-1.3594)
$RETSTD_{t-1}$	(-)	0.0615	0.0354	0.0261	0.0912	0.0206	0.0706
		(0.5759)	(0.2536)	(0.2597)	(0.8074)	(0.1437)	(0.638)
FCF	(+)	-0.0559	-0.1153	0.0595	-0.0085	-0.0769	0.0684
		(-0.5329)	(-1.5097)	(0.4321)	(-0.0716)	(-1.3007)	(0.4656)
SAPerformance	(-)	-0.0001	-0.0018	0.0017	0.0006	-0.0015	0.002
		(-0.1113)	(-1.4314)	(1.3291)	(0.5676)	(-1.1124)	(1.5049)
CEO_Chair	(+)	0.0306	0.0011	0.0295	0.0313	0.0096	0.0218
		(1.6137)	(0.0566)	(1.4007)	(1.5151)	(0.4903)	(1.0655)
ExDirectors_Own	(-)	-0.0003	0.0011*	-0.0013***	-0.0002	0.0013**	-0.0015***
		(-0.5239)	(1.8252)	(-2.8248)	(-0.3357)	(2.3283)	(-3.3716)
IndDirectors_Own	(+)	0.0406***	0.0024	0.0383***	0.0398***	0.0021	0.0376***
		(20.4738)	(1.1639)	(14.5836)	(17.4653)	(0.9866)	(12.4914)
PropDirectors_Own	(-)	0	0.0006	-0.0006	0.0001	0.001	-0.0008*
		(0.0101)	(1.189)	(-1.5743)	(0.3164)	(1.6006)	(-1.9325)
C3	(-)	-0.0014***	-0.0006	-0.0009	-0.0013**	-0.0007	-0.0007
		(-3.0059)	(-0.9064)	(-1.285)	(-2.4728)	(-0.9917)	(-0.9193)
LogCEOTenure	(-)				0.0028	-0.0007	0.0035
					(0.4371)	(-0.1253)	(0.5616)
Retirement	(-)				-0.0226	-0.074***	0.0514***
					(-1.213)	(-2.7325)	(2.7155)
Log(Market Capitalization) x MeetIR		0.0141	-0.002	0.0161	0.0091	0.0059	0.0032
		(0.7269)	(-0.0733)	(0.5261)	(0.4965)	(0.2125)	(0.1055)
Debt x MeetIR		-0.0055	-0.0446	0.0391	0.0017	-0.0207	0.0224
		(-0.0575)	(-0.3728)	(0.2872)	(0.017)	(-0.1618)	(0.1614)
LogSegments x MeetIR		0.0199	0	0.0199	0.0219	0.0095	0.0124
		(1.0896)	(0)	(0.7648)	(1.1875)	(0.3404)	(0.4656)
LogFirmAge x MeetIR		-0.0355	0.1038	-0.1393	-0.0108	0.0636	-0.0744
		(-0.545)	(1.3441)	(-1.535)	(-0.1605)	(0.7944)	(-0.8406)
MTB x MeetIR		0.0054	0.0016	0.0038	0.0043	0.0003	0.004
		(1.3936)	(0.3061)	(0.6751)	(1.1175)	(0.0574)	(0.7676)
R&D x MeetIR		4.1508*	0.164	3.9868	4.0068**	0.0284	3.9784
		(1.9008)	(0.047)	(1.3778)	(2.2941)	(0.008)	(1.2978)
$RETSTD_{t-1}$ x MeetIR		-0.1015	0.0553	-0.1567	-0.1041	-0.0037	-0.1004
		(-0.6313)	(0.2037)	(-0.6647)	(-0.6138)	(-0.0124)	(-0.3953)
FCF x MeetIR		0.2583	0.2146	0.0436	0.1664	0.2567	-0.0903
		(1.3482)	(1.1926)	(0.2038)	(0.795)	(1.1991)	(-0.4108)
SAPerformance x MeetIR		0.0024	0.0022	0.0002	0.001	0.0016	-0.0006
		(1.3586)	(1.1253)	(0.0926)	(0.5086)	(0.707)	(-0.2913)
CEO_Chair x MeetIR		-0.0257	0.0317	-0.0574	-0.0376	0.0222	-0.0599
		(-0.5522)	(0.8583)	(-1.4968)	(-0.6971)	(0.5476)	(-1.4026)
ExDirectors_Own x MeetIR		-0.001	-0.0025	0.0015	-0.0008	-0.0033*	0.0025
		(-0.8246)	(-1.3544)	(0.7438)	(-0.635)	(-1.8223)	(1.3238)
IndDirectors_Own x MeetIR		-0.0043	-0.0267	0.0225	0	-0.0259	0.0259
		(-0.1477)	(-1.5947)	(0.653)	(-0.0015)	(-1.4252)	(0.6868)
PropDirectors_Own x MeetIR		-0.0023**	-0.0008	-0.0015	-0.0023**	-0.0015	-0.0007
		(-2.5403)	(-0.7273)	(-1.1062)	(-2.2646)	(-1.2397)	(-0.5132)
C3 x MeetIR		-0.0015	-0.0007	-0.0008	-0.0019*	-0.0004	-0.0015
		(-1.4194)	(-0.6961)	(-0.5471)	(-1.8377)	(-0.4222)	(-1.1065)
LogCEOTenure x MeetIR					-0.0051	0.0043	-0.0094
					(-0.3506)	(0.3515)	(-0.6326)
Retirement x MeetIR					-0.057	0.004	-0.061
					(-1.4519)	(0.0391)	(-0.6326)
Constant		0.2006	-0.4922	0.6928	0.121	-0.4013	0.5223*
		(0.9332)	(-1.6866)	(2.288)	(0.5871)	(-1.3624)	(1.7739)
Year fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
N		952	952	952	886	886	886
R^2		0.2292	0.2815	0.316	0.2502	0.2657	0.2967
R^2 Adjusted		0.1989	0.2532	0.2891	0.2147	0.231	0.2634
F		37.9463***	5.1037***	16.7342***	36.8442***	4.9634***	13.1417***
Wald F (xMeetIR)		1.77**	1.01	0.98	1.75**	0.91	0.99

Firm performance and optimal board independence

Since optimal board structures should have no effect on firm performance (e.g., Coles et al., 2008; Lehn et al., 2009; Dutchin et al., 2010), we analyze the effect of our different board independence measures on firm performance to provide further evidence on the optimality of declared board independence and its decomposition among strictly and non-strictly independent directors.

Firm performance may affect corporate governance settings (e.g., it is optimal for successful CEOs with positive past performance records to be allowed a less independent board; Hermalin and Weisbach, 1998). Therefore, firm fixed effects estimators may be biased when performance is the dependent variable explained by corporate governance variables, and a control for endogeneity is required. Indeed, Wintoki et al. (2012) found that firm fixed effects provide correct estimations of board structure models, but not of performance models, and propose the Dynamic System panel GMM estimator developed by Holtz-Eakin et al. (1988), Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). With this econometric technique we address endogeneity in several ways: fixed unobserved heterogeneity, simultaneity, and the dependence of current board structure on past realizations of performance. However, although this technique is superior to both OLS and panel data firm fixed effects for generating non-biased estimates due to endogeneity, it can still generate biased estimations in the presence of time-varying unobserved heterogeneity. Unfortunately, statistical tests may not detect potential misspecifications if the coefficient bias introduced by the misspecification falls below a certain threshold, namely around 25% as claimed in Wintoki et al. (2012). Furthermore, the power of these tests is weaker in smaller samples.

The performance dependent variable is measured by the return on assets, and our key explanatory variables are our measures of board independence. Since the Dynamic System GMM estimator is biased in the presence of time-varying heterogeneity, our control variables are time-varying variables that may affect board independence and also firm performance. We follow Wintoki et al. (2012) to select those variables adding the log of board size to a subset of variables used in equation [4] as follows:

$$\begin{aligned} Performance_t = {} & \alpha + \delta_1 Performance_{t-1} + ... + \delta_p Performance_{t-p} + \beta_1 IND + \beta_2 LogBoardSize + \\ & + \beta_3 LogFirmSize + \beta_4 Debt + \beta_5 LogSegments + \beta_6 LogFirmAge + \beta_7 MTB + \beta_8 RETSTD_{t-1} + \\ & + \beta_7 CEO\_Chair + \gamma \cdot YearDummies + \varepsilon \end{aligned} \qquad [6]$$

where the definition of the control variables is as set out in equation [4]. However, we also estimate the model of equation [6] by adding the other determinants of board independence considered in equation [4]. In the Dynamic System panel GMM estimations all explanatory variables are analyzed as non-strictly exogenous variables except firm age and the year dummy variables (strictly exogenous). One lag of firm performance is introduced to obtain its dynamics, based on OLS estimation of the

performance models with different lag structure specifications including industrial sector fixed effects. This methodology obtains the coefficients of the performance model with the simultaneous estimation of the model in differences and in levels. Instruments in the differenced equation are lags 2 to 6 of return on assets and of all non-strictly exogenous variables, and the first difference in the strictly exogenous variables. Instruments of the equation in levels are lag 1 of the first difference of return on assets and of all non-strictly exogenous variables, and the level of the strictly exogenous variables.[14]

[14] Our regressions are executed using xtabond2 in Stata, with the two-step estimator and the collapse option. This option reduces the number of instruments, since it creates one for each variable and lag distance instead of one for each variable, lag distance, and time period. Standard errors are modified with the Windmeijer (2005) small sample correction.

Table 8. Firm performance and board structure

Empirical models of firm performance are estimated with the Dynamic System GMM estimator (Holtz-Eakin et al., 1988; Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998). This is estimated in two steps and all instruments are collapsed. Standard errors are modified with the Windmeijer (2005) finite-sample correction. Performance (the dependent variable) is measured by return on assets (calculated as the net income plus interest payments, net of tax effects, over the amount of the previous year's total assets), LogBoardSize is the log of the number of board directors, see Table 6 for the rest of the explanatory variables. Log(FirmAge) and year dummy variables are assumed to be strictly exogenous. AR(1) and AR(2) are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test of over-identification is under the null that all instruments are valid. The Diff-in-Hansen test of exogeneity is under the null that instruments are exogenous (GMM refers to all non-strictly exogenous variables, and Exogenous instruments to strictly exogenous variables). The instruments used in the GMM estimation are: in the differenced equation: lags 2-6 of ROA and of all non-strictly exogenous variables, and the first difference of the strictly exogenous variable; in the level equations: lag 1 of the first difference of ROA and of all non-strictly exogenous variables, and the level of the strictly exogenous variables. *** denotes significance at the 1% level; ** denotes significance at the 5% level; * denotes significance at the 10% level.

	Determinants of Equation [4]				Determinants of Equation [4] plus CEO tenure and Retirement				Model of Wintoki et al. (2012) - Equation [6]			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ROA_{t-1}	0.3502***	0.3239***	0.3047***	0.3171***	0.4569***	0.4554***	0.4637***	0.4536***	0.556***	0.5267***	0.5006***	0.5157***
	(3.1284)	(2.852)	(2.7337)	(2.6113)	(4.3047)	(4.0428)	(4.478)	(4.4501)	(3.7513)	(4.4875)	(4.0809)	(4.626)
Declared Independents	-0.9559				-1.655				-1.4405			
	(-0.2687)				(-0.389)				(-0.469)			
Strictly Independents		-4.3856		-3.3958		-2.5537		-3.2888		-6.3803		-4.2242
		(-1.289)		(-0.8477)		(-0.7369)		(-0.7615)		(-1.481)		(-0.9401)
Non-strictly Independents			1.6767	1.2877			-0.0417	-1.4096			3.5608	1.701
			(0.404)	(0.2741)			(-0.0131)	(-0.2658)			(1.166)	(0.4841)
LogBoardSize									-2.7464	-0.9245	-0.3551	1.1135
									(-0.6778)	(-0.2779)	(-0.1182)	(0.3582)
Log(Market Capitalization)	1.453**	1.417**	1.3426***	1.4508***	2.0605***	2.0976***	2.0897***	2.0965***	2.3976***	2.2769***	2.2369***	2.1944***
	(2.5926)	(2.4631)	(2.3579)	(2.7443)	(3.4396)	(3.501)	(3.5022)	(3.8025)	(5.3799)	(4.2149)	(4.1717)	(3.9508)
Debt	3.5505	4.892	4.1564	4.786	4.2175	3.4297	2.6072	3.474	-4.3927	-3.6545	-4.5616	-4.8531
	(0.9873)	(1.3746)	(1.1007)	(1.2318)	(1.0166)	(0.7999)	(0.5832)	(0.7619)	(-0.9482)	(-0.6819)	(-0.9475)	(-0.9338)
LogSegments	0.713	0.5561	0.92	0.624	0.2885	0.3298	0.3401	0.2855	0.0415	-0.2181	-0.1453	-0.7517
	(1.0023)	(0.5395)	(0.8525)	(0.6825)	(0.2953)	(0.2811)	(0.2763)	(0.2694)	(0.029)	(-0.1738)	(-0.1026)	(-0.6065)
LogFirmAge	-1.2022	-0.7968	-0.6618	-0.6845	-0.7892	-0.7857	-0.6648	-0.8814	-2.0764*	-2.3023**	-2.056*	-1.9945**
	(-0.9167)	(-0.621)	(-0.4608)	(-0.4837)	(-0.6204)	(-0.6443)	(-0.5313)	(-0.671)	(-1.831)	(-2.1077)	(-1.7825)	(-1.9839)
MTB	0.422*	0.4373	0.4395*	0.4236	0.3664*	0.3727	0.3543*	0.3702	0.0456	0.054	0.1252	0.1169
	(1.6721)	(1.6408)	(1.6789)	(1.5799)	(1.7128)	(1.6494)	(1.7455)	(1.6413)	(0.1411)	(0.2153)	(0.546)	(0.537)
R&D	10.0596	11.9303	13.9466	12.3396	-0.46	0.0772	-2.6908	1.1331				
	(0.6179)	(0.7088)	(0.8858)	(0.7629)	(-0.0288)	(0.0038)	(-0.1424)	(0.0616)				
$RETSTD_{t-1}$	1.313	-2.0924	-0.6457	-0.3217	7.1699	1.7173	3.6065	3.6414	26.6753**	20.8498*	20.3465*	22.9217*
	(0.1257)	(-0.2133)	(-0.0638)	(-0.0301)	(0.5851)	(0.1477)	(0.3141)	(0.319)	(2.0417)	(1.6999)	(1.7362)	(1.9529)
FCF	74.0635***	77.0344***	76.7053***	76.4388***	59.9697***	61.5801***	58.3244***	61.7551***				
	(4.9036)	(4.688)	(4.8677)	(4.5693)	(4.6578)	(3.7827)	(4.1893)	(4.8283)				
SAPerformance	-0.046	-0.0449	-0.0238	-0.0353	-0.1008	-0.1189	-0.1148	-0.1131				
	(-0.4831)	(-0.4771)	(-0.249)	(-0.3808)	(-0.9141)	(-1.1093)	(-1.0248)	(-1.031)				
CEO_Chair	-0.9274	-0.5774	-0.5928	-0.5405	-0.6669	-0.7908	-0.8393	-0.8696	-0.1655	-1.2493	-0.8284	-1.1947
	(-0.7561)	(-0.4908)	(-0.4807)	(-0.4348)	(-0.5225)	(-0.6058)	(-0.6156)	(-0.6776)	(-0.1143)	(-0.8184)	(-0.5362)	(-0.7705)
ExDirectors_Own	-0.0081	-0.0034	-0.0021	-0.0014	0.0318	0.0357	0.036	0.0308				
	(-0.1356)	(-0.0526)	(-0.0404)	(-0.021)	(0.8067)	(0.7891)	(0.8848)	(0.7992)				
IndDirectors_Own	-0.2265	-0.2605	-0.297	-0.297	-0.4385	-0.4996	-0.4262	-0.4455				
	(-0.5321)	(-0.6803)	(-0.7681)	(-0.7319)	(-0.8915)	(-1.2689)	(-0.9612)	(-0.9049)				
PropDirectors_Own	-0.0282	-0.0138	-0.0195	-0.0135	0.0037	0.0055	0.0007	0.0056				
	(-0.8378)	(-0.3715)	(-0.5315)	(-0.3678)	(0.1373)	(0.1924)	(0.0229)	(0.2612)				
C3	0.0115	-0.0022	0.0161	-0.0012	-0.0265	-0.022	-0.0218	-0.0233				
	(0.3171)	(-0.061)	(0.3989)	(-0.0286)	(-0.5371)	(-0.4421)	(-0.4498)	(-0.4786)				
LogCEOTenure					-0.1591	-0.0686	-0.0903	0.0139				
					(-0.2755)	(-0.1078)	(-0.1515)	(0.0219)				
Retirement					3.31	3.9108	4.6407	3.6969				
					(1.014)	(1.0356)	(1.2652)	(1.0691)				
Constant	-7.8427*	-7.9961**	-9.6616**	-9.0356*	-12.028**	-12.2906***	-12.6145***	-11.8982**	-2.5089	-4.2493	-7.2878	-9.5204
	(-1.7605)	(-2.0475)	(-2.1822)	(-1.7912)	(-2.355)	(-3.2863)	(-2.8279)	(-2.3013)	(-0.3113)	(-0.6311)	(-1.2679)	(-1.4741)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Obs	952	952	952	952	886	886	886	886	952	952	952	952
F	30.8752***	34.1892***	29.4733***	29.7128***	35.646***	29.4119***	27.0545***	29.308***	17.9414***	24.2775***	18.3888***	21.8279***
AR(1) test (p-value)	0.0003	0.0003	0.0005	0.0005	0.0003	0.0003	0.0002	0.0003	0.001	0.0007	0.0008	0.0005
AR(2) test (p-value)	0.4769	0.4573	0.433	0.4591	0.6965	0.764	0.7384	0.7619	0.2462	0.2775	0.2484	0.2712
Hansen test of over-indentification (p-value)	0.516	0.585	0.525	0.53	0.369	0.369	0.429	0.449	0.711	0.492	0.484	0.449
Diff -in-Hansen test of exogeneity of GMM instuments (p-value)	0.815	0.909	0.94	0.891	0.396	0.621	0.569	0.505	0.605	0.558	0.579	0.292
Diff -in-Hansen test of exogeneity of Exogenous instruments (p-value)	0.662	0.515	0.516	0.578	0.608	0.525	0.581	0.621	0.957	0.251	0.302	0.271

Table 8 shows the estimation of the performance models when the explanatory variables of equation [4] (models 1-4) are included as controls, with the addition of CEO tenure and the CEO retirement proxy (models 5-8), and when only the explanatory

variables in Wintoki et al. (2012), equation [6], are considered (models 9-12). In each case board independence is measured as the percentage of declared independent, strictly independent, and non-strictly independent directors. In models 4, 8, and 12 the proportion of strictly and non-strictly independent directors are included simultaneously. Results in Table 8 show that all our board independence measures do not affect firm performance, in line with the optimal board structure assumption (and consistent with the results in Wintoki et al., 2012). Only when firm fixed effects are used (omitted to save space) are statistically significant effects of board independence detected, although these estimations are probably biased due to the endogeneity problem and manifest the need for the GMM estimation. The GMM estimations in Table 8 exhibit correct values in all diagnostic tests: statistically significant autocorrelation of order one only for the difference model, no over-identification, and exogenous instruments. We also winsorized all explanatory variables (with percentiles 1% and 99%, and 5% and 95%) to control for outliers, used return on sales as the performance measure to evaluate the dependence of our results on the performance measure, and used just one observation every two years to control for persistence in corporate governance measures (Wintoki et al., 2012); robust results were obtained: board independence measures do not affect firm performance. Just with winsorized variables the proportion of strictly independents presents a statistically significant coefficient (negative) in model 2 of Table 8, not in models 4, 6, 8, 10 and 12. Non-tabulated results available on request, not shown for space restrictions.

5. Robustness checks

The robustness tests we perform include the use of alternative proxies for the determinants of optimal board independence. For ownership structure we replace C3 by C5 and by the ownership of the largest shareholder, and we also dropped this variable, since it is not among the explanatory variables of Linck et al. (2008). Firm age has been dropped and alternatively its square has been added to account for its relation with firm complexity among mature firms. The number of geographical segments has been replaced by the number of different business activities and the sum of both. Firm size has been measured by sales instead of market capitalization, and performance by return on sales instead of return on assets; furthermore the industry adjustment of performance has also been carried out at subsector level instead of at sector level. Finally, CEO tenure has been measured by the average tenure of executive directors, the CEO retirement situation has been identified whenever CEOs' tenure is longer than 20 years instead of 30, and as in Linck et al. (2008) we replace the CEO_Chair variable by its lagged value (losing the first year of observations). There are slight differences regarding the statistically significant variables, but the overall conclusions remain the same. The R^2 statistics are also similar, the highest value being achieved when the dependent variable is the portion of non-strictly independent directors and the lowest when it is the declared portion.

Ownership structure seems to be a relevant determinant of board independence, especially for non-strictly independent directors (Tables 6 and 7). Therefore a second

robustness check has consisted in the re-classification of independent directors as strict and non-strict regarding their relationship with significant shareholders. Specifically directors that are directors, managers, employees or have any other relevant relationship with a significant shareholder or a shareholder with board representation are allowed to be classified as strictly independent. Dropping criteria 4 and 5 in Table 2, the results of the new estimations of the models of board independence do not change.

A third set of robustness checks consist in simplifying the set of explanatory variables, using a different sampling frequency and excluding the firms of some industries. Following Linck et al. (2008), we use principal components analysis to extract a common factor from the proxies of complexity and cost of monitoring and advising.[15] The results do not change. Again following Linck et al. (2008) and Wintoki et al. (2012), we estimate our models of board independence with just one observation every two years (thereby increasing the variability of board independence and ownership measures over time). We also estimate the models for the period 2008-2012, where a new mandatory definition of independent directors was in force. In both cases, results leave our conclusions unaltered; ownership determinants are the most relevant ones, and all three measures of board independence seem to react to board independence determinants with the expected sign. We also perform the estimations excluding financial firms (banks and insurance companies), due to their specific regulation and supervision. Furthermore, because of the main role of the real estate industrial sector in the recent crisis and their relationship with banks, we also drop real estate firms. In both cases, our results remain robust.

As a fourth robustness check we take into account the special behavior of small firms regarding the structure of the board of directors, even after controlling for firm size (Linck et al., 2008). We take firms that meet the recommended level of board independence in the lowest quartile in market capitalization, where the correlation coefficient between strictly and non-strictly independent directors is closest to -1 (recall Table 5). We measure whether determinants of board independence have different coefficients in these firms (122 observations, belonging to 21 firms) adding as new variables the interaction with a dummy variable identifying them (MeetIRSC) – see Table 9. In this case, Wald tests show the joint statistical significance of the new variables. The coefficients of board independence determinants are of the expected sign also for the case when the proportion of non-strictly independent directors is the dependent variable. Although performance (for all firms) and the market-to-book ratio (just for small compliance firms) present the unexpected sign, the rest of the statistically significant variables show the expected sign (Table 9, columns 3 and 6). When the dependent variable is the declared proportion of independent directors, only the market-to-book ratio for all firms and research and development expenses for small compliant firms present an unexpected sign. Firm age has a positive but statistically insignificant

[15] In line with Linck et al. (2008) we do not include firm size in this common factor analysis. It may detect other aspects such as visibility to investors and shareholders advocates.

coefficient in small compliant firms (column 1, 0.1332-0.0894=0.0438, p-value of Wald test 0.6), and the rest of the statistically significant variables present the expected sign. Finally, when the dependent variable is the proportion of strictly independent directors, the coefficients present the unexpected sign for most of the statistically significant variables that are different in small compliant firms. These results are inconsistent with the optimal board independence theory (fixing the level of strictly independent directors) together with independence recommendations in order to generate non-strictly independent directors, although they confirm the special characteristics of boards in small firms.

Table 9. Small firms wanting to meet the recommended level of board independence

This table shows the estimations of empirical models of optimal board independence (equation [4]) with firm fixed effects. t statistics are in parenthesis and are computed with robust standard errors clustered by firm (Huber, 1967; White, 1980, 1982; Petersen, 2009). MeetIRSC is a dummy variable identifying firms in the lowest quartile of market capitalization classified as meeting the recommended level of board independence (those with an average percentage of declared independent directors reaching one third). See Table 6 for a description of explanatory and dependent variables. Wald F (xMeetIRSC) is a test of the joint statistical significance of all variables multiplied by MeetIRSC. *** denotes significance at the 1% level; ** denotes significance at the 5% level; * denotes significance at the 10% level.

	Prediction	Declared	Strictly	Non-Strictly	Declared	Strictly	Non-Strictly
		(1)	(2)	(3)	(4)	(5)	(6)
Log(Market Capitalization)	(+)	-0.002	-0.0047	0.0027	0.0033	-0.007	0.0103
		(-0.1836)	(-0.4023)	(0.2189)	(0.3228)	(-0.6047)	(0.852)
Debt	(+)	0.0157	-0.0159	0.0316	0.0107	-0.0244	0.035
		(0.3197)	(-0.297)	(0.5846)	(0.2033)	(-0.4351)	(0.6034)
LogSegments	(+)	0.018*	-0.0191	0.0371***	0.0152	-0.0209	0.0361**
		(1.7808)	(-1.5597)	(2.8738)	(1.4394)	(-1.645)	(2.4855)
LogFirmAge	(+)	0.1332*	0.2939***	-0.1607	0.1246	0.2642**	-0.1396
		(1.7222)	(2.8719)	(-1.4624)	(1.575)	(2.5115)	(-1.2312)
MTB	(-)	0.0034**	0.0014	0.002	0.0034*	0.0019	0.0015
		(2.0827)	(0.8555)	(0.8472)	(1.9343)	(1.2129)	(0.6501)
R&D	(-)	-0.4933***	-0.679***	0.1857	-0.4326**	-0.6176***	0.185
		(-3.1211)	(-4.8335)	(1.0321)	(-2.4981)	(-4.6729)	(0.9977)
$RETSTD_{t-1}$	(-)	0.0223	0.0308	-0.0085	0.0214	0.0118	0.0096
		(0.2358)	(0.1985)	(-0.0691)	(0.2202)	(0.0724)	(0.0724)
FCF	(+)	-0.0337	-0.0729	0.0392	0.015	-0.0232	0.0382
		(-0.3657)	(-1.0931)	(0.4138)	(0.1415)	(-0.4054)	(0.373)
SAPerformance	(-)	0.0013	-0.0016	0.0029***	0.0012	-0.0019*	0.0031***
		(1.5293)	(-1.4469)	(2.9942)	(1.3193)	(-1.7628)	(2.7892)
CEO_Chair	(+)	0.0067	0.0007	0.006	0.0058	0.007	-0.0012
		(0.3279)	(0.0424)	(0.3065)	(0.2471)	(0.4061)	(-0.0588)
ExDirectors_Own	(-)	-0.0002	0.0012**	-0.0013***	0	0.0016***	-0.0016***
		(-0.3382)	(2.1651)	(-2.7546)	(-0.0093)	(2.9012)	(-3.1494)
IndDirectors_Own	(+)	0.0409***	-0.0012	0.0421***	0.0407***	-0.0004	0.0411***
		(9.8214)	(-0.2719)	(8.7921)	(9.867)	(-0.1077)	(9.1206)
PropDirectors_Own	(-)	-0.0003	-0.0001	-0.0002	-0.0002	0.0002	-0.0004
		(-0.8245)	(-0.2014)	(-0.5415)	(-0.4004)	(0.3826)	(-0.9121)
C3	(-)	-0.0029***	-0.0014***	-0.0015**	-0.0029***	-0.0015***	-0.0014**
		(-5.2236)	(-2.9721)	(-2.4003)	(-5.1536)	(-3.0677)	(-2.1276)
LogExTenure	(-)				0.0025	-0.0006	0.0032
					(0.3564)	(-0.1219)	(0.4269)
Retirement	(-)				-0.0579***	-0.075	0.0171
					(-3.0647)	(-1.3946)	(0.2896)
Log(Market Capitalization) x MeetIRSC		0.0235	-0.0089	0.0324	0.0176	0.0141	0.0036
		(1.3348)	(-0.3528)	(1.1752)	(0.8177)	(0.5122)	(0.1128)
Debt x MeetIRSC		0.0049	0.0492	-0.0443	0.0429	0.1072	-0.0643
		(0.032)	(0.3396)	(-0.2876)	(0.2717)	(0.621)	(-0.3914)
LogSegments x MeetIRSC		-0.0115	0.0102	-0.0218	-0.0043	0.0364	-0.0408
		(-0.5708)	(0.3666)	(-0.722)	(-0.2168)	(1.4068)	(-1.3903)
LogFirmAge x MeetIRSC		-0.0894**	-0.0354	-0.0539	-0.0555	-0.0902	0.0347
		(-2.4826)	(-0.5875)	(-0.8278)	(-1.4763)	(-1.5762)	(0.6421)
MTB x MeetIRSC		0.0187*	-0.0181**	0.0369***	0.0174*	-0.0124	0.0298**
		(1.9764)	(-1.9935)	(2.7065)	(1.7793)	(-1.5068)	(2.0393)
R&D x MeetIRSC		4.5524***	9.0345***	-4.4821***	5.1699***	8.1541***	-2.9841*
		(6.1931)	(9.5966)	(-3.3777)	(4.3829)	(6.4654)	(-1.6725)
$RETSTD_{t-1}$ x MeetIRSC		-0.5434***	0.1591	-0.7025**	-0.6029**	-0.275	-0.3279
		(-2.7194)	(0.4162)	(-2.0572)	(-2.5003)	(-0.5786)	(-0.6974)
FCF x MeetIRSC		-0.0006	0.1681	-0.1687	-0.2693	0.1982	-0.4675
		(-0.0022)	(0.7921)	(-0.4876)	(-1.0513)	(0.5404)	(-1.4132)
SAPerformance x MeetIRSC		-0.0002	0.0038*	-0.004	0.0003	0.0044**	-0.004
		(-0.1246)	(2.3545)	(-1.567)	(0.1573)	(2.001)	(-1.5472)
CEO_Chair x MeetIRSC		0.1236**	0.0682	0.0555	0.1115**	0.0995*	0.012
		(2.3969)	(1.2606)	(0.9466)	(1.9949)	(1.7807)	(0.2272)
ExDirectors_Own x MeetIRSC		-0.0001	-0.0021**	0.002	0.0005	-0.0022*	0.0027
		(-0.1304)	(-2.2324)	(1.4831)	(0.4719)	(-1.7069)	(1.5875)
IndDirectors_Own x MeetIRSC		0.1017***	-0.0037	0.1054**	0.1048***	-0.0077	0.1124***
		(3.781)	(-0.0689)	(2.0955)	(4.425)	(-0.1745)	(2.8642)
PropDirectors_Own x MeetIRSC		-0.0007	0.0033***	-0.004***	-0.0003	0.0042***	-0.0046***
		(-0.8695)	(3.0044)	(-2.8555)	(-0.3388)	(3.1617)	(-3.0793)
C3 x MeetIRSC		0.0022	0.0025**	-0.0003	0.0016	0.0026*	-0.001
		(1.4916)	(1.9816)	(-0.1537)	(1.0691)	(1.9641)	(-0.6235)
LogExTenure x MeetIRSC					-0.0182*	-0.0052	-0.013
					(-1.7513)	(-0.2492)	(-0.5873)
Constant		0.1107	-0.5288*	0.6394**	0.0875	-0.4353	0.5228*
		(0.5805)	(-1.9497)	(2.2037)	(0.4607)	(-1.5892)	(1.7943)
Year fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
N		952	952	952	886	886	886
R^2		0.2683	0.3273	0.3693	0.2811	0.3291	0.3466
R^2 Adjusted		0.2395	0.3008	0.3445	0.2479	0.2982	0.3165
F		743753.9494	982124.3762	1048.5157	432179.3739	2321712.604	1598.5638
Walf F (xMeetIRSC)		25.1***	45.99***	14.15***	24.69***	33.79***	6.39***

Our fifth and last set of robustness checks includes changes in the estimation techniques. First, we estimate the models of board independence simultaneously when the dependent variable is the proportion of strictly independent directors and the proportion of non-strictly independent directors with the Seemingly Unrelated Regression (SURE) methodology (Zellner, 1962). This allows us to compute a Wald test under the null hypothesis that all the coefficients of board independence determinants in the non-strictly and strictly independent models are equal but with the opposite sign. This null hypothesis is always rejected with a significance level higher than 1%. The models are estimated with feasible least squares allowing correlation between the error terms of both models.[16] Firm and year fixed effects are also considered. Although the estimated SURE models show some differences with respect to Tables 6 and 7 in terms of statistical significance, the overall conclusions remain the same; ownership determinants are the most relevant, and non-strictly independent directors tend to react with the expected sign. Finally we also estimate our board independence models with the Dynamic System panel GMM estimator, which accounts for any potential effect of past board independence on current values of the determinants of board independence. Based on different specifications of the lag structure of the dependent variable in the models of Table 6 estimated with OLS (also including industrial sector fixed effects), we find that one lag is sufficient to obtain the dynamics of board independence. As instruments in the difference equation we use lags 2 to 6 of non-strictly exogenous explanatory variables, and the first difference of the strictly exogenous variables (firm age and year dummy variables). In the levels equation, instruments are the one period lagged difference of all non-strictly exogenous variables, and the level of the strictly exogenous variables. Ownership by independent board members remains as a main determinant of the proportion of independent directors, and only the proportion of declared and strictly independent directors shows statistically significant determinants with the unexpected sign. However, there are fewer statistically significant coefficients than in Table 6. This is consistent with the inclusion of lagged board independence as an additional determinant of current board independence. However, this may also be related to the fact that our sample was smaller than that used by Wintoki et al. (2012) (952 versus 20,003 observations). Our overall conclusions remain the same with this alternative methodology.

Given the number of robustness checks, in order to save space, we omit tables for most of the results in this section, although they are available on request.

6. Discussion

Two critical points regarding our estimation of the empirical models of board independence are worth discussing at this point. The first is that in Spain, given the high level of ownership concentration, the agency conflict between large and minority shareholders is especially relevant. We in fact address this concern in our empirical

[16] See Greene (2003), Chapter 14, for a description of the Seemingly Unrelated Regressions model and its estimation.

analysis since we increase the accuracy of the measure of board independence leaving proprietary directors, who represent the interests of large shareholders, out of this measure. Even ownership by outside directors is divided into independent and proprietary directors, and our results are consistent with our prediction that only ownership by independent directors increases optimal independence. Contrary to Linck et al. (2008), we find the expected sign of independent (positive) and proprietary directors' ownership (negative) in the model of board structure compared with their joint measure of ownership and outsiders. The second point is related with the power of executives and of large shareholders as a potential alternative explanation for some of the results. The theory predicts a negative effect of large shareholders' and of executives' ownership on optimal board independence. An alternative interpretation is that the negative effect reflects the abuse of power of large shareholders (managers) against the interests of minority shareholders (shareholders). Our empirical evidence regarding the board independence models, as in Linck et al. (2008), does not allow us to discard the abuse of power interpretation, although in our case the null effect of board independence measures on firms' performance does not support this interpretation. Furthermore, previous empirical evidence in a shorter version of the same Spanish sample in Crespí-Cladera and Pascual-Fuster (2014) discards the appointment of non-strictly independent directors as the result of power abuse. The fact that non-strictly independent board members are not driven by poor corporate governance practices increases the confidence in the interpretation of our results in terms of arguing for optimal board independence. However, we cannot discard the power abuse explanation and our conclusions have to be taken with some caution.

Finally, some implications of our research are worth discussing. Our empirical methodology is designed to detect the effect of firms including non-strictly independent directors as declared independent board members to better achieve the recommended level whenever the optimum level of real independence is lower. Our empirical evidence does not give support to this behavior. Consequently the question that remains is why do Spanish firms have non-strictly independent directors among their declared directors? The presence of non-strictly independent directors was especially relevant at the beginning of our sample period and decreased over time (in 2004, on average 74.3% of declared independent directors were non-strictly independent). Although we do not provide strong evidence, we conjecture that the traditional corporate governance practices and lack of enforcement in Spain, together with a low value generated by formal independence requirements, can explain such behavior. If firms consider other director characteristics as being more valuable than formal independence requirements, and those characteristics are scarce, the replacement costs may be higher than the benefits of this formal independence. A higher pressure on firms to meet formal independence criteria imposed by regulators since 2007, with the mandatory definition of independent directors, is consistent with the replacement of non-strictly independent directors by strictly independent ones over the years found in Table 2.

In sum, our research highlights the relevance of firm-specific mechanisms when deciding on the appointment of independent directors. The results suggest that formal independence requirements are not so relevant for firms as to represent the most plausible explanation for the presence of non-strictly independent directors when they try to meet the independence requirements. Future steps planned by the European Central Bank seem to give support to our conjecture. Indeed, the Single Supervisory Mechanism is discussing the proposition to appoint external directors on the boards of supervised banks in order to have the best knowledge about the tasks and decisions of the boards and the expertise of their directors, and whether they control the banks' risk properly. This decision opens up a discussion about the role of independent directors and whether their expertise is more relevant than their independence. However, further empirical research is needed to test our explanation, left for future research. This may consist in analyzing the personal and professional characteristics of independent directors, whether there are significant differences between strictly and non-strictly independent directors, and checking whether these are valuable characteristics from the point of view of firms, and their shareholders.

7. Conclusions

Our research confirms the widespread presence of non-strictly independent directors in terms of formal independence requirements in Spain. The lack of compliance of the recommended regulation on board independence, with one size fits all rules, pushes some firms to appoint non-strictly independents according to our empirical measure. This behavior occurs because firms tend to avoid the potential costs of having lower levels of independence than recommended by the codes.

On the other hand, recent advances in corporate governance suggest that different levels of optimal board independence exist as a function of firm characteristics. This endogenous nature of the board structure and board independence results in an optimal level of board independence for each firm, which goes against the "one size fits all" of the recommendations of corporate governance codes. In this context, firms have to settle for the tradeoff: optimal independence versus regulators' recommended level.

Our results indicate that, indeed, the appointment of non-strictly independent directors is relevant among firms that comply with the one third rule of independent board members in Spain to achieve the recommended level. Nevertheless, both strictly and non-strictly independent directors are used to achieve the optimal level of independence, since our overall empirical evidence suggests that both react to the determinants of optimal board independence with the expected sign, as if both provided the benefits of real independence. Moreover, firms tend to adjust to their optimal board structure regardless of whether they comply or not with the independence level recommendation, in both cases they react to the determinants of optimal board independence with the expected sign. The interpretation is that for some firms deviation from the optimal level of independence is costlier that deviation from compliance.

These findings are relevant for other countries, where there is an apparent inconsistency in theory about board structure and corporate governance regulation. In the discussion section we propose an alternative explanation for the presence of the formally non-strictly independent directors, although further research is needed.

However, the analysis of the relation between our measures of board independence and the determinants of optimal board independence contributes to the literature on corporate governance with a sample of firms with highly concentrated ownership structures, common in continental European countries. We find that ownership structure determinants of optimal independence are the most relevant ones, specifically ownership by independent directors. Finally, the results seem to suggest that characteristics other than the formal independence requirements are the main source of value provided by independent directors.

References

Adams, R., Ferreira, D., (2007) A theory of friendly boards. Journal of Finance 62, 217-250.

Agrawal, A., Knoeber, C., (1996) Firm performance and mechanisms to control agency problems between managers and shareholders. Journal of Financial and Quantitative Analysis 31, 377-396.

Aguilera, R., Cuervo-Cazurra, A., (2009) Codes of Good Governance. Corporate Governance: An International Review 17, 376–387.

Arellano, M. and Bover, O., (1995) Another look at the instrumental variable estimation of error-components models. Journal of Econometrics 68, 29-51.

Arellano, M., Bond, S., (1991) Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies 58, 277–297.

Armitage, P., Berry, G., Matthews, J., (2002) Statistical Methods in Medical Research. 4th ed. Oxford; Blackwell.

Bhagat, S., Black, B., (2002) The non-correlation between board independence and long-term firm performance. Journal of Corporation Law 27, 1231–73.

Blundell, R., and Bond, S., (1998) Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics 87, 115-43.

Boone, A., Field, L., Karpoff, J., Raheja, C., (2007) The determinants of corporate board size and composition: An empirical analysis. Journal of Financial Economics 85, 66-101.

Byrd, J., Hickman, K., (1992) Do Outside Directors Monitor Managers? Evidence from Tender Offer Bids. Journal of Financial Economics 32, 195-207.

Cohen, L., Frazzini, A., Malloy, C., (2012) Hiring cheerleaders: Board appointments of "independent" directors. Management Science 58, 1039-1058.

Coles, J., Daniel, N., Naveen, L., (2008) Boards: Does one size fit all? Journal of Financial Economics 87, 329-356.

Coles, J., Daniel, N., Naveen, L., (2014) Co-opted boards. Review of Financial Studies 27, 1751-1796.

Coles, J., Lemmon, M., Meschke, J., (2012) Structural models and endogeneity in corporate finance: the link between managerial ownership and corporate performance. Journal of Financial Economics 103, 149-168.

Core, J., Holthausen, R., Larcker, D.F., (1999) Corporate governance, chief executive officer compensation, and firm performance. Journal of Financial Economics 51, 371-406.

Cotter, J., Shivdasani, A., Zenner, M., (1997) Do Independent Directors Enhance Target Shareholder Wealth During Tender Offers? Journal of Financial Economics 43, 195-218.

Crespí-Cladera, R., Pascual-Fuster, B., (2014) Does the independence of independent directors matter? Journal of Corporate Finance 28, 116-134.

Duchin, R., Matsusaka, J., Ozbas, O., (2010) When are outside directors effective? Journal of Financial Economics 96, 195-214.

Ferris, S., Yan, X., (2007) Do independent directors and chairmen matter? The role of boards of directors in mutual fund governance. Journal of Corporate Finance 13, 392-420.

Fracassi, C., Tata, G., (2012) External Networking and Internal Firm Governance. Journal of Finance 67, 153-194.

Gordon, J., (2007) The rise of independent directors in the United States, 1950-2005: Of shareholder value and stock market prices. Stanford Law Review 59, 1465-1568.

Greene, W., (2003) Econometric analysis. Fifth edition. Prentice Hall, New Jersey.

Hamilton, L., (2013) Statistics with Stata: Updated for Version 12. 8th ed. Boston: Brooks/Cole.

Harris, M, Raviv, A., (2008) A Theory of Board Control and Size. Review of Financial Studies 21, 1797-1832.

Hermalin, E., Weisbach, M., (1991) The effects of board composition and direct incentives on firm performance. Financial Management 20, 101-112.

Hermalin, E., Weisbach, M., (1998) Endogenously chosen boards of directors and their monitoring of the CEO. American Economic Review 88, 96-118.

Holtz-Eakin, D., Newey, W., Rosen, H.S., (1988) Estimating vector auto-regressions with panel data. Econometrica 56, 1371–1395.

Huber, P., (1967) The behaviour of maximum likelihood estimates under non-standard conditions. In Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability. Berkeley. CA: University of California Press 1, 221-233.

Hwang, B., Kim, S., (2009) It pays to have friends. Journal of Financial Economics 93, 138–158.

Jensen, M., (1986) Agency costs of free cash flow, corporate finance, and takeovers. American Economic Review 75, 323-329.

Kim, K., Kitsabunnarat-Chatjuthamard, P., Nofsinger, J., (2007) Large shareholders, board independence, and minority shareholder rights: Evidence from Europe. Journal of Corporate Finance 13, 859-880.

Klein, A., (1998) Firm performance and board committee structure. Journal of Law and Economics 41, 275-303.

Kumarand, P., Sivaramakrishnan, K., (2008) Who Monitorst heMonitor? The Effect of Board Independence on Executive Compensation and Firm Value. Review of Financial Studies 21, 1371-1401.

Lehn, K., Patro., S., Zhao, M., (2009) Determinants of the size and composition of US corporate boards: 1935-2000. Financial Management 38, 747-780.

Lehn, K., Poulsen, A., (1989) Free cash flow and stockholder gains in going private transactions. Journal of finance 44, 771-787.

Linck, J., Netter, J., Yang, T., (2008) The determinants of board structure. Journal of Financial Economics 87, 308-328.

Mehran, H., (1995) Executive compensation structure, ownership, and firm performance. Journal of Financial Economics 38, 163-184.

Nguyen, B., Nielsen, K., (2010) The value of independent directors: Evidence from sudden deaths. Journal of Financial Economics 98, 550-567.

Petersen, M., (2009) Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. Review of Financial Studies 22, 435-480.

Raheja, C., (2005) Determinants of board size and composition: A theory of corporate boards. Journal of Financial and Quantitative Analysis 40, 283-306.

Santella, P., Drago, C., Paone, G., (2007) Who Cares About Director Independence? Mimeo. MPRA Working Paper No 2288, http://mpra.ub.uni-muenchen.de/2288/.

Santella, P., Paone, G., Drago, C., (2006) How independent are independent directors? The case of Italy. German Working Papers in Law and Economics No 15.

White, H., (1980) A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. Econometrica 48, 817-830.

White, H., (1982) Maximum likelihood estimation of misspecified models. Econometrica 50, 1-25.

Windmeijer, F., (2005) A finite sample correction for the variance of linear efficient two step GMM estimators. Journal of Econometrics 126, 25-51.

Wintoki, M., Linck, J., Netter, J., (2012) Endogeneity and the dynamics of internal corporate governance. Journal of Financial Economics 105, 581-606.

Wu, L., (2004) The impact of public opinion on board structure changes, director career progression, and CEO turnover: Evidence from CalPERS' corporate governance program. Journal of Corporate Finance 10, 199-277.

Zellner, A., (1962) An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias. Journal of the American Statistical Association 57, 348-368.