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## **Board of directors and firm performance: a dynamic approach**

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**Abstract:** This paper analyses how board structure influences firm performance, considering the effect of dynamic endogeneity. For a sample of listed Spanish firms, the study did not find that board structure had any effect on the value of the firm, when controlling for dynamic endogeneity. The research results show the need to use appropriate econometric techniques (dynamic models) to avoid obtaining incorrect or biased results. They also show that each firm must determine the size and structure of the board given its own advice and control needs.

**Keywords:** board of directors; firm performance; dynamic endogeneity; generalised method of moments; GMM; Spain.

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## 1 Introduction

The board of directors has been widely studied in recent years and numerous studies have analysed the influence of board structure on the effectiveness with which the board performs its advisory and control functions and, therefore, on corporate performance (Nguyen et al., 2017; Zhou et al., 2018; Merendino and Melville, 2019; Kao et al., 2019; Pucheta-Martínez and Gallego-Álvarez, 2020; Fernández-Temprano and Tejerina-Gaite, 2020; García-Ramos and Díaz, 2021; Ozdemir and Kilincarslan, 2021; Bonini et al., 2022; García-Ramos et al., 2023). Likewise, the importance of good governance for companies is also reflected in the large number of codes of good governance that have been published in recent decades, both nationally and internationally.

Generally speaking, good governance codes argue for boards that are not very large and have a sizeable majority of external directors. There are no clear recommendations as to whether or not the positions of Chairperson of the board and Chief Executive Officer (CEO) should be unified. However, the empirical evidence on the influence of board size, composition and leadership structure on firm value varies widely and is inconclusive (see, for example, the meta-analyses conducted by Dalton et al., 1998, 1999; Rhoades et al., 2000, among others, or the comparison done by Rodríguez-Fernández et al., 2014, Schwartz and Leal, 2018 or Ozdemir and Kilincarslan, 2021).

Some authors (Boone et al., 2007; Coles et al., 2008; Guest, 2008; Linck et al., 2008; Lehn et al., 2009; Acero and Alcalde, 2012a; García-Ramos and Díaz, 2021) argue that each firm adapts the size, composition and leadership structure of its board to reflect its own unique characteristics and needs. Therefore, the diversity of results observed in the literature is a consequence of possible methodological problems arising from ignoring this issue and considering the configuration of boards of directors to be an element that is exogenous to the firm. The argument employed in this field of research reasons that if firms configure their boards with a view to maximising the value of the firm, and the model that relates business performance to board configuration is specified to take into account the endogenous nature of the latter (i.e., each firm chooses the size, composition and leadership structure of the board that allows it to maximise its value) and the appropriate control variables are used, then no empirical relationship between board structure and firm performance should emerge in aggregate studies. However, the publications included in this line of research, despite using methodological tools that correct for the problem of endogeneity of the variables (primarily instrumental variables, two stage least squares [2SLS] and three stage least squares [3SLS]) fail to yield conclusive results.

To understand the reason for the range of results observed in studies analysing the relationship between board configuration and firm performance, Wintoki et al. (2012) propose a new and more comprehensive approach using the generalised method of moments (GMM), since they believe that this econometric method allows them to control for the different sources of endogeneity.

In this context, this paper analyses the influence of board size, independence and leadership structure on firm performance, as measured by Tobin's Q ratio, for a panel of Spanish listed firms. First, we estimate a static model to test the influence of these variables on firm performance in Spain, for which existing evidence is scarce. We then test whether the results remain the same or change when controlling for different sources of endogeneity. For this purpose, we use the GMM to address in detail the problem of dynamic endogeneity, as well as simultaneity and unobservable heterogeneity.

Most of the empirical evidence on the influence of board structure on firm performance comes from Anglo-Saxon countries. In common with most continental European countries, but unlike in Anglo-Saxon ones, Spanish firms have a concentrated ownership structure. For example, in the UK and US, the average combined holdings of a listed firm's three largest owners add up to around 25% of the equity, whereas in most continental European countries, the three largest shareholders account for a significant combined share of about 60% of the equity (De La Cruz et al., 2019). Shareholders with significant stakes have incentives to directly supervise the behaviour of the management team (Faccio and Lang, 2002). Therefore, the relative importance of the two functions performed by the board (advisory and control functions) and their contribution to firm performance could differ from that found in Anglo-Saxon countries. It is useful, then, to analyse the Spanish case and provide evidence on whether, in this context, the configuration of the board has any significant influence on firm performance and whether this influence remains when controlling for the problem of dynamic endogeneity in the econometric models.

The results obtained show that board size and board independence positively affect the performance of Spanish listed firms. Nevertheless, when the problem of dynamic endogeneity is controlled for, these effects are no longer significant. In this way, and in keeping with the evidence found by Schultz et al. (2010) and Wintoki et al. (2012), we find that in Spain, board structure has no significant effect on firm performance when the different sources of endogeneity are taken into consideration.

The paper therefore contributes to the corporate governance literature by providing new evidence from research in a non-Anglo-Saxon context, since this has already been widely analysed. More specifically, the results obtained highlight the need to control for the problem of dynamic endogeneity when analysing the causal relationships between board configuration and firm performance.

As for practical implications, the evidence obtained on the absence of a causal relationship between board structure and firm value should be considered by firms and investors, but also by regulators who develop rules or recommendations regarding the structure of this governing body. In this respect, imposing common board structures on all organisations would be suboptimal, since it is clear that board size, independence and leadership structure do not influence firm performance if the endogenous nature of these relationships is considered.

The next section reviews the literature and defines the research hypotheses. The primary characteristics of the sample and the variables used are then discussed, followed by the description of the model, the approach used and a discussion of the results. Finally, the main conclusions of the study are highlighted.

## **2 Theoretical review and formulation of hypotheses**

The board of directors is a key governance tool. As Koltiro and Toshiro (2018) point out, it is the responsibility of the board of directors to improve corporate governance, particularly in markets where external control is weaker, such as in the Spanish one.

With regards to boards of directors, there is some consensus in the corporate governance literature that the two core functions performed by them are the advisory function and the control function (Adams and Ferreira, 2007; Coles et al., 2008; Lehn et al., 2009; Linck et al., 2008; among others). According to agency theory (Jensen and

Meckling, 1976), the board of directors acts as an instrument of control by monitoring the management activity of the firm's executives with a view to minimising the agency problem and any conflicts of interest that may arise between managers and owners as a result of the separation of ownership from control. Other theoretical approaches, such as the resource dependence theory perspective (Pfeffer and Salancik, 1978), highlight the important advisory role played by the board of directors. Management manages the firm, while board members serve as sources of advice and counsel for the management. Moreover, it is argued that directors contribute critical resources to the firm since they are the link between the firm and its environment (Zahra and Pearce, 1989; Hillman et al., 2000; Rivas et al., 2021).

Focusing first on the *size of the board*, and from the point of view of the control function (emphasised by Agency Theory and employed in most of the literature), a smaller board is considered to have a positive influence on the proper functioning of the firm, since with a small board, problems of coordination and free-rider behaviour by its members can be avoided.

However, it has been argued, for example by García-Ramos and Díaz (2021), that there might not be only one optimal board structure that fits all listed firms. As a result, and considering the specific characteristics of the Spanish context, with its high degree of ownership concentration, it is argued that the function of controlling managers can be performed directly by significant shareholders. As stated by Ozdemir and Kilincarslan (2021), large shareholders have more motivation and ability to act as an effective management monitoring mechanism due to their commitment and marginal dependence on the return on investment. Therefore, the existence of such large shareholders can mitigate the free-rider problem of monitoring managers and reduce any principal-agent conflicts. As a result, of all that, when there is a high concentration of ownership, as in the Spanish case, there is particular interest in the advisory function (emphasised by resource dependence theory). According to this theory, it is preferable for boards to be large, since diversity of opinion enriches debate and improves the advisory function carried out by the board. When considering the role of the board as a resource provider, an additional director brings more human and social capital to the firm (Pfeffer, 1972) and increases board information and specific knowledge about the business, thus improving the quality of the strategic decisions that ultimately affect firm performance (Hillman and Dalziel, 2003; García-Ramos and Díaz, 2021).

All this leads us to state the first hypothesis:

H1 The size of the board positively influences firm performance.

Turning now to the *independence of the board* and its influence on performance, the most widespread thesis – also included in the recommendations on corporate governance – predicts that the percentage of outsiders on the board of directors will have a positive influence on firm value. The underlying assumption is that external directors bring knowledge and skills that improve the advisory function (Hillman and Dalziel, 2003), while at the same time exercising the control function more effectively since they do not have close ties with the organisation (Jensen, 1993; Core et al., 1999; Bugeja et al., 2012; De Oliveira et al., 2020). Similarly, Codes of Good Governance recommend appointing a significant proportion of independent directors as this improves the quality of the board of directors, which leads us to state the second hypothesis:

H2 The percentage of independent board members positively influences firm performance.

The third aspect to consider regarding board structure is the *firm's leadership structure*, i.e., whether the positions of Chairperson of the board and CEO should be unified or kept separate, since this configuration creates conflicting effects that the board should evaluate. From the point of view of agency theory, Fama and Jensen (1983) postulate that when both positions are held by the same person, the ability of the board of directors to carry out its control function efficiently is diminished, since a greater concentration of power in the hands of the CEO may lead to CEO entrenchment. Therefore, a separation of the two positions is advisable to reinforce the control function of the board. However, from the Resource Dependence view, duality may have important advantages for the firm, in particular regarding the role of the board as resource provider. As Adams and Ferreira (2007) suggest, if the CEO is also the Chairperson of the board, they will make their knowledge available to the directors, allowing them to provide resources more effectively. Otherwise, splitting the CEO and Chairperson of the board positions would lead to CEO-Chair information asymmetries (García-Ramos et al., 2023). Considering that in Spanish listed firms, large shareholders can supervise managers, so the advisory function of the board prevails over its control function, the third hypothesis is defined as follows:

H3 The separation of the positions of Chairperson of the board and CEO negatively influences firm performance.

Empirical studies to date show significant relationships between board structure (size, composition and leadership structure) and firm performance, although the results are inconclusive and at times contradictory. Thus, with respect to board size, the results of the research by Conyon and Peck (1998), O'Connell and Cramer (2010), Arosa et al. (2013), Elmghaame and Akintoye (2021) and Ozdemir and Kilincarslan (2021), have shown board size to have a negative effect on firm performance. However, the results of other studies, such as those of Adams and Mehran (2005), Beiner et al. (2006) or Allam (2018), show a positive influence. Finally, there are also other studies such as those by Baglioni and Colombo (2009) and García-Ramos et al. (2023) that show a nonlinear relationship.

Regarding board independence, as indicated by Acero and Alcalde (2012b), the empirical findings are inconclusive as well. Some studies find the influence of board independence on firm performance to be positive (Yermack, 1996; Anderson et al., 2004; De Andrés and Rodríguez, 2009; Muhammad et al., 2021; Ozdemir and Kilincarslan, 2021; etc.), while others (Bhagat and Bolton, 2008; Kumar and Singh, 2013, Elmghaame and Akintoye, 2021; etc.) find the opposite. There are also some, such as García-Ramos et al. (2023), which find a nonlinear relationship.

Finally, the evidence found in the literature on the relationship between leadership structure and firm performance is also mixed, as reflected in the studies by Dalton et al. (1998), Faleye (2007), Salloum et al. (2013), Tang (2017), Hsu et al. (2021), and García-Ramos et al. (2023), among many others.

Nevertheless, we should point out that many of these studies do not take into account the problem of dynamic endogeneity between the variables related to the board and firm performance, and may therefore be generating 'misleading' results, since, as shown by Barnhart and Rosenstein (1998), Mak and Li (2001), Lehn et al. (2009), Schultz et al.

(2010), or Wintoki et al. (2012), the effect of board structure on firm value loses its significance on many occasions when an endogeneity approach is adopted. As De Andrés and Rodríguez (2009) point out, if the endogenous nature of the relationship between board and performance is not considered, the results may be difficult to interpret or even be erroneous.

Boone et al. (2007), Coles et al. (2008), Lehn et al. (2009), Acero and Alcalde (2012a) and García-Ramos and Díaz (2021), state that board size, composition and leadership are determined endogenously within each organisation, considering the influence of elements both internal and external to the firm. Consequently, it would not be appropriate to impose common governance structures on all organisations, since each firm will define the nature of its board taking into consideration only its own unique characteristics. Moreover, if each firm endogenously chooses its board structure based on the objective of maximising its profits, and there are no transaction costs preventing it from adopting such a structure, as Coles et al. (2008) point out, board size, composition and leadership structure should not be expected to have an influence on firm performance.

Wintoki et al. (2012) point out that while researchers have used diverse methods to deal with endogeneity, they have sometimes failed to consider the fact that the endogeneity relationship can be dynamic. According to Wintoki et al. (2012), a firm's activities in the present will affect its future performance and corporate governance, which in turn will influence the firm's future activities, thus giving rise to the concept of dynamic endogeneity.

Therefore, if dynamic endogeneity is considered, meaning that it is accepted that the firm's current decisions will, at some point in the future, affect its performance and governance structure, which will then in turn influence the firm's future activities, corporate governance variables are not expected to affect firm performance. If organisations define board size, composition and leadership structure endogenously, with the objective of maximising firm value, then the configuration of the board should have no effect on the organisation's performance, which gives rise to the following research hypothesis:

H4 Controlling for dynamic endogeneity, the configuration of the board (size, composition and leadership structure) has no effect on firm performance.

### **3 Sample and variables**

#### *3.1 Sample*

To analyse the relationship between the board structure and the value of firms, a sample of 170 listed Spanish firms has been analysed, forming an unbalanced panel for the period 2004–2017. The firms included in the Annual Corporate Governance Report of entities issuing securities admitted to trading on official securities markets prepared by the Comisión Nacional del Mercado de Valores [National Securities Market Commission (CNMV), 2020], were taken as a reference. Banks were excluded from the sample. The year 2004 was taken as the starting point for the panel since it was the first year for which Annual Corporate Governance Reports were available in Spain in a standardised format that allows the data to be compared.

### 3.2 *Dependent variable*

To analyse firm performance, the Tobin's Q ratio has been calculated as the ratio between the sum of the market value of equity and the book value of debt, divided by the book value of total assets, for each year of the analysis (Q). Tobin's Q is a market-based measure of performance. Tobin's Q is considered to be the most suitable measure of a firm's financial performance for this research since it involves listed firms. Moreover, Tobin's Q is the most frequently used dependent variable in research on board effectiveness and, in a broader sense, in research on the effectiveness of corporate governance mechanisms for both financial and non-financial firms (Bonini et al., 2021; García-Ramos and Díaz, 2021; García-Ramos et al., 2023; Ozdemir and Kilincarslan, 2021).

### 3.3 *Independent variables*

As mentioned in the previous sections, the variables of interest are board size, composition and leadership structure, variables that are commonly used in the literature following other authors such as Andrés et al., 2005; García-Ramos and Díaz, 2021; García-Ramos et al., 2023; Ozdemir and Kilincarslan, 2021).

- Board size (BSIZE): the logarithm of the total number of directors sitting on the board of directors of each firm for each year was used.
- Board composition (IND): the percentage accounted for by independent board members for each firm in each year has been used as a variable. Although other authors in the international context represent board composition through the proportion of non-executive members, in this study the percentage of independent directors is used since the role of non-executive board member in Spain is not comparable to the role of external directors in other countries. This is because the role played by so-called 'proprietary' directors in Spain, who represent the majority of shareholders, is particularly relevant in this country. Moreover, as García and Gil de Albornoz (2005) also point out, independent directors in Spain are the equivalent of non-executive members in countries such as the UK and the USA.

Separation of the positions of Chairperson of the board and CEO (SEP): a dummy variable has been included that takes the value of 1 when these positions are separated, and 0 if the Chairperson is also the CEO.

### 3.4 *Control variables*

In addition to the explanatory variables described above, the models also incorporate other variables traditionally used in the corporate governance literature (Andrés et al., 2005; García-Ramos and Díaz, 2021; García-Ramos et al., 2023; Ozdemir and Kilincarslan, 2021). These control variables relate to the ownership structure and other characteristics of the firm:

- Capital owned by board members (BOARD\_OWN): the percentage of the capital owned by the directors has been used as a variable for each of the years of the analysis.

- Concentration of capital (CONC): the percentage of capital held by significant shareholders has been used as a measure of the level of ownership concentration.
- Level of indebtedness (DEBT): the ratio of total debt divided by total assets has been used for each of the years of analysis.
- Firm size (FSIZE): the logarithm of total assets for each of the years analysed has been taken as the measurement for the variable.
- Diversification (DIV): the number of business sectors in which the entity operates. A dummy variable that takes the value 1 when the entity operates in more than one sector, and zero otherwise, has been used for this purpose.
- Age of the firm (AGE): the number of years elapsed from the organisation's date of incorporation to 31st December of each year analysed.

Dummy variables representing the industry and the year have also been included in the models since in panel data models, some of the key aspects deal with the 'unobservable effects'. Time and industry dummies are often useful in uncovering some of the unobservable effects: time dummies account for the trend effects common to all the analysed businesses (e.g., economic shocks), while industry dummies take into consideration industry-specific effects (e.g., responsiveness to events of interest in high-tech, low-tech, manufacturing industries). For these reasons, Dummy Industry and Dummy Year variables have been included in the models.

In relation to industry, the codes of the CNAE 2009 (National Classification of Economic Activities), a classification commonly used in Spain, have been used, giving rise to 8 sector-based categories that have been included in the models through the incorporation of 7 dummies. In order to control for the time period, 13 time dummies have also been included in the models and these refer to each of the years of study (eliminating one of the periods to avoid perfect multicollinearity).

#### 4 Methodology: consideration of dynamic endogeneity

The models used to test the hypotheses formulated above, analysing the effect of board structure on firm performance in Spain, are defined in this section.

##### 4.1 Static model

First, to test the relationship between board configuration and the performance of Spanish firms, a fixed effects panel data model was defined, which corresponds to the estimation of the following equation (the individual and year subscripts have been omitted to simplify the presentation of the model):

$$\begin{aligned}
 Q = & \alpha + \beta_1 BSIZE + \beta_2 IND + \beta_3 SEP + \beta_4 BOARD\_OWN + \beta_5 CONC \\
 & + \beta_6 DEBT + \beta_7 FSIZE + \beta_8 DIV + \beta_9 AGE + \sum_{i=1}^7 \delta_i DummyInd \\
 & + \sum_{i=1}^{13} \gamma_i DummyYear + \varepsilon
 \end{aligned} \tag{1}$$

#### 4.2 *Dynamic model*

As Wintoki et al. (2012) point out, many of the studies that examine the impact of board configuration on firm performance specify models in which the performance for the period depends on the firm's corporate governance structure in place during that same period. However, according to the authors of this study, this approach is not appropriate in the context of corporate governance since it ignores the problem of dynamic endogeneity: the current performance of the firm affects both its future performance and its future governance structure. Although including the lags of the variables in the model is appropriate, it is not sufficient, since it is also necessary to examine other causes of endogeneity, such as simultaneity and unobservable heterogeneity.

Schultz et al. (2010) point out that dynamic endogeneity refers to the value of a variable in the previous period influencing its current value. In the specific case of the governance-performance relationship, dynamic endogeneity occurs when current corporate governance structure, firm characteristics and performance are determined by previous performance. As Hermalin and Weisbach (1988) point out, it is possible, for example, that after poor performance, shareholders decide to replace board members in an attempt to ensure stricter corporate governance controls, which in turn will affect the current governance structure, some aspects of the firm and the performance itself. Unobservable heterogeneity arises when there is an unobservable factor that affects the relationship between the variables. In the relationship, board structure-performance refers to those specific characteristics of the firm that can affect the structure of the board, other characteristics of the firm and performance, but which may not be observable to the researcher and therefore are difficult to quantify (for example managers' skills). Finally, when two variables are co-determined in such a way that they can alter each other simultaneously (board structure influences performance, and vice versa), simultaneity arises.

These reasons explain why the use of static models may lead to biased results. For example, the use of a fixed effects model may eliminate unobservable heterogeneity but may still be biased since it does not control for dynamic endogeneity. Therefore, when these sources of endogeneity are present, methodologies such as fixed effects panel estimations may corroborate what appears to be a relationship between corporate governance and performance when this relation does not actually exist. As pointed out by Schultz et al. (2010) and Hill et al. (2021), the existence of at least one source of endogeneity in the data generating process will lead to estimations that may be biased and inefficient and give spurious results when these methodologies are used.

Therefore, in order to obtain consistent and unbiased estimations, Wintoki et al. (2012) propose the use of a dynamic unobserved effects model, using a GMM estimator for dynamic panel data models with the objective of integrating a comprehensive treatment of endogeneity in the model. This estimator, originally developed in the works of Holtz-Eakin et al. (1988) and Arellano and Bond (1991), and subsequently refined by Arellano and Bover (1995) and Blundell and Bond (1998), provides an econometric specification that is suitable for addressing endogeneity issues when estimating the relationship between corporate governance and firm performance.

Therefore, to test hypothesis H4, in this section the approach of Wintoki et al. (2012) is followed. The ensuing model, estimated using GMM, is defined as follows (the individual and year subscripts have been omitted to simplify the presentation):

$$\begin{aligned}
Q = & \alpha + \beta_1 Q_{t-1} + \beta_2 SIZE + \beta_3 IND + \beta_4 SEP + \beta_5 BOARD\_OWN + \beta_6 CONC \\
& + \beta_7 DEBT + \beta_8 FSIZE + \beta_9 DIV + \beta_{10} AGE + \sum_{i=1}^7 \delta_i DummyInd \\
& + \sum_{i=1}^{13} \gamma_i DummyYear + \varepsilon
\end{aligned} \tag{2}$$

In order to introduce dynamicity into the models, the lagged dependent variable  $Q$  has been introduced while the rest of the explanatory variables have been maintained. In addition, the explanatory variables of interest are instrumented through their lags, which allows the different sources of endogeneity to be corrected for. Likewise, the dummy variables relating to industry and time period have been included, since, as indicated by De Andrés and Rodríguez (2009), it is advisable to include variables representing sector and year in the estimation model to avoid multicollinearity problems.

## 5 Results and discussion

Before presenting the results of the econometric models, the following tables show the main descriptive statistics for the research variables, as well as the correlation matrix where it can be seen that the correlations are below the 0.7 limit, which is the threshold commonly used to identify problems of multicollinearity.

**Table 1** Descriptive statistics

<i>Variable</i>	<i>Mean</i>	<i>Median</i>	<i>Standard deviation</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Number observations</i>
Q	1.54	1.18	1.57	0.11	32.16	1,452
BFSIZE (number of directors)	9.94	10	3.93	3	24	1,840
IND	32.25	33.33	19.35	0	100	1,841
SEP	0.51	1	0.50	0	1	1,845
BOARD_OWN	27.31	19.96	27.46	0	100	1,829
CONC	60.27	62.15	24.07	0	100	1,860
DEBT	66.14	63.32	70.03	0.01	1842.89	1,875
FSIZE	13.43	13.37	2.28	6.15	19.76	1,921
DIV	0.47	0	0.50	0	1	2,380
AGE	47.00	41.61	27.48	0.09	125.89	2,377

Note: N = 170 T = 14.

The results of the econometric models are presented below. First, the results of the estimation of the static model are presented under the heading fixed effects model in the second column of Table 3.

Table 2 Correlation matrix

Variable	Q	BSIZE	IND	SEP	BOARD_OWN	CONC	DEBT	FSIZE	DIV	AGE
Q	1									
BSIZE	-0.135***	1								
IND	0.040	-0.003	1							
SEP	0.037	-0.064***	-0.109***	1						
BOARD_OWN	-0.054**	-0.183***	-0.259***	-0.022	1					
CONC	-0.054**	-0.171***	-0.349***	0.187***	0.406***	1				
DEBT	0.359***	-0.020	-0.031	-0.043*	-0.046*	-0.108***	1			
FSIZE	-0.165***	0.705***	0.142***	-0.111***	-0.275***	-0.148***	0.048**	1		
DIV	-0.054**	-0.018	0.043*	0.008	0.012	-0.026	0.013	0.022	1	
AGE	-0.027	0.149***	-0.124***	-0.070***	-0.1442***	-0.106***	0.024	0.172***	-0.095***	1

Notes: N = 170 T = 14. Asterisks represent the significance levels of the coefficients: \*\*\* for 1%, \*\* for 5% and \* for 10%.

**Table 3** Fixed effects model and GMM (N=170, T = 14)

<i>Variable</i>	<i>Q</i>	
	<i>Fixed effects model</i>	<i>GMM model</i>
(constant)	1.017***	1.509
$Q_{t-1}$	-----	0.593***
BSIZE	0.147***	0.166
IND	0.001*	-0.004
SEP	0.021	0.078
BOARD_OWN	-0.001*	-0.009*
CONC	0.001	-0.002
DEBT	0.011***	0.009***
FSIZE	-0.080***	-0.081
DIV	0.045	0.359
AGE	0.000	0.002
Dummy industry	Yes***	Yes
dummy year	Yes***	Yes***
Wald Chi2	2511.29 (29)	2327.07 (29)
Prob > chi2	0.0000	0.0000
R2	0.2352	-----
AR (1) (p-value)	-----	-2.61 (0.009)
AR (2) (p-value)	-----	0.24 (0.809)
Hansen test (p-value)	-----	110.28 (0.501)
Number of observations	1,356	1,211

Notes: 1 – Asterisks represent the significance levels of the coefficients: \*\*\* for 1%, \*\* for 5% and \* for 10%.

2 – The models include dummies to identify the different industrial sectors observed in the sample as well as time-related dummies.

3 – The panel data model used is a fixed effects model using the feasible generalised least squares (FGLS) methodology to solve autocorrelation and heteroscedasticity problems.

4 – With regards to the Wald Chi2 test, its value is shown and the degrees of freedom are in parentheses. Significance is shown below.

5 – The results of the GMM model correspond to the two-stage and robust estimation, since, as pointed out by De Andrés and Rodríguez (2009), the two-stage estimation provides estimators that are robust to autocorrelation and heteroscedasticity. Likewise, the lags of the dependent variable, as well as those of the board size, percentage of independents and leadership structure of the company, have been used as instruments to build the GMM model. As Wintoki et al. (2012) indicate, the company's past provides the only justifiable instruments to identify the relationship between governance and performance.

6 – AR (1) and AR (2) are the tests used to check for the existence of first and second order serial correlation. The null hypothesis indicates the absence of serial correlation. As in the GMM model, first-order correlation is found to exist, but not second-order correlation. The table shows the p-values in parentheses.

7 – The Hansen test checks whether the over-identification restrictions of the model are correct or not. In this sense, a p-value greater than 0.10 indicates that the null hypothesis cannot be rejected and therefore the over-identification restrictions are valid. The Hansen test is used as a measure of goodness-of-fit since it is robust in two-step estimations and with a reduced number of instruments.

The results of this model indicate that board size has a positive and significant influence on the firm's performance, confirming hypothesis H1. In this regard it can be observed that the size of the board has a positive and significant influence on the Q ratio. This result is in line with the evidence found in Adams and Mehran (2005), Beiner et al. (2006) and Choi et al. (2007), which found that board size had a positive and significant effect on firm performance, thereby supporting the argument put forward in Resource Dependence Theory. By contrast, postulates of Agency Theory, which suggest that small boards are more effective in controlling managers and contributing to improved performance, are not confirmed in the Spanish context, where control of managers can be performed directly by significant shareholders.

With regards to the percentage of independent directors, the results obtained support H2, as the coefficient of this variable is positive and statistically significant. This finding coincides with that encountered in Fernández et al. (1998), who found that outsiders are positively related to the organisation's results, and also with that in Acero and Alcalde (2012b), García-Ramos et al. (2023) and Ozdemir and Kilincarslan (2021), where a positive and significant effect for independent directors was found when static models were used. Furthermore, this evidence would also be in line with the trend found in many of the recommendations on corporate governance developed at the international level, which encourage the inclusion of independent members on boards of directors, since it is believed that their presence has a positive impact on firm value.

The leadership structure of the firm, however, turned out not to be significant in this model, so that hypothesis is not supported by our results. Leadership structure seems to have no significant effect on firm performance, and this was also the result found in the works of Salloum et al. (2013), Bonini et al. (2022), García-Ramos et al. (2023) and Ozdemir and Kilincarslan (2021). This finding is consistent with the lack of a clear recommendation on CEO duality in the Spanish Code of Good Governance. More precisely, the most recent Spanish Good Governance Code of Listed Companies (2020) states that 'the criterion of issuing no opinion on the advisability or otherwise of separating the two positions' is maintained.

Concerning the remaining explanatory variables, only firm size, debt ratio and the percentage of capital held by the board were found to be significant. Firm size has a negative and significant effect on performance, as was found in the works of García-Ramos et al. (2023) and Ozdemir and Kilincarslan (2021). On the other hand, the percentage of capital held by the board had a negative and significant effect on performance, while a positive and significant effect was found for the debt ratio, as in Ozdemir and Kilincarslan (2021). In relation to Dummy Industry and Dummy Year, it can be observed that these variables are also significant.

Therefore, by analysing the effect of board structure on organisational performance through the estimation of a static model, the existence of an effect of board structure on Q is confirmed. Large and more independent boards positively influence firm performance. These results would support the arguments of those authors who believe that certain corporate governance structures are optimal and should therefore be adopted by all firms.

However, to check whether the previous results still stand when controlling for dynamic endogeneity, we have estimated the GMM Model, as can be seen in the third column of Table 3. As indicated at the bottom of the table (notes 6 and 7), the tests performed to check for goodness of fit indicate that the model specification is correct. In this sense, as shown by the p-value of AR(1) test (0.009), the null hypothesis of no first-order autocorrelation is rejected, confirming, therefore, that such correlation does exist.

In contrast, in the case of AR(2), the null hypothesis of no autocorrelation (0.809) cannot be rejected, as expected from these estimates. This is the case since it is desirable for there to be a first-order correlation (AR(1)), since otherwise it would be indicating that there are no dynamic effects and the GMM estimator would not be adequate; but there can be no second order correlation (AR(2)). In relation to the Hansen test, as the p-value is greater than 0.1 (0.501), the null hypothesis of the validity of the instruments cannot be rejected, thus confirming the validity of the overidentification restrictions.

As can be seen in Table 3, the effect of board size, percentage of independent members and leadership structure on performance is not significant, thus confirming hypothesis H4. When the treatment of dynamic endogeneity is included in the estimations, the relationship between board composition and the Q ratio disappears (confirming hypothesis H4). This corroborates the evidence obtained in studies such as Wintoki et al. (2012) and Acero and Alcalde (2012b) and highlights the need to address the problem of dynamic endogeneity in research on corporate governance and firm value to avoid obtaining biased results.

In the GMM model estimated, it can be seen that previous performance has a positive and significant effect on the Q ratio and only the effect of the percentage of the capital owned by the board and the debt ratio remain.

Consequently, we can conclude that it is necessary to consider dynamic endogeneity in the models, since it can be observed from the estimations of the dynamic model that the effect of the corporate governance variables (board size, percentage of independent directors and leadership structure) on firm performance disappears.

## **6 Conclusions**

On numerous occasions, the literature on corporate governance, and especially that focusing on boards of directors, has analysed the relationship between the composition of the board and firm performance. However, the findings have not been conclusive, which makes it necessary to explore this field further.

As some authors indicate, the cause of the heterogeneity in the results may be due to the failure to take endogeneity, and more specifically dynamic endogeneity, into consideration when analysing the relationship between corporate governance and firm performance. The previous performance of the firm has a clear influence on both current corporate governance structure and current performance, and therefore should be considered as an explanatory factor in research models.

This paper is a contribution to the literature on corporate governance. First, based on the study of a sample of Spanish listed firms, it corroborates that the size, composition and leadership structure of the board of directors has no impact on firm performance once dynamic endogeneity is taken into consideration. This issue should therefore be considered by all researchers wanting to analyse any relationship between corporate governance and firm performance, since ignoring the dynamic structure of the model could lead to biased results.

Furthermore, and as a practical implication of the findings, it should be pointed out that if firms determine the configuration of their boards based on the firm's unique characteristics and its ecosystem – with the aim of maximising the value of the organisation – no relationship between corporate governance structure and performance should be expected, as this study has shown. All this implies that each organisation must

determine its own corporate governance structure according to its own nature and needs and those of its environment, and that ‘one size does not fit all’. Therefore, policies developed in the field of corporate governance aimed at determining ‘optimal’ board structures common to all organisations may be counterproductive. In this sense, and as also noted by García-Ramos and Díaz (2021) and García-Ramos et al. (2023), general corporate governance recommendations must be rethought. It may be advisable to generate more specific regulations (Andrés and Santamaría, 2018; García-Ramos and Díaz, 2021; García-Ramos et al., 2023), that is, Codes of Good Governance that contemplate key variables for the firm such as its size, ownership structure, listed or unlisted status, sector of activity, as well as an integrated consideration of all governance variables. In this sense, as Aguilera and Cuervo-Cazurra (2004) point out, reforms of corporate governance being discussed in civil law countries have been based on those developed in common law countries, without recognising that the separation of ownership and control only affects a very small number of firms in Europe. This fact has resulted in recommendations that are not appropriate for European firms with a concentrated ownership structure. As also noted by García-Ramos et al. (2023), there is a need to assess the effectiveness of corporate governance recommendations in order to develop future policy actions.

A limitation of this paper is that it focuses exclusively on Spanish listed firms, so the results may not be directly applicable to other countries where the institutional context and corporate governance characteristics differ. Nevertheless, focusing on the Spanish context allows us to obtain a homogeneous sample of firms that share the same institutional context and are subject to the same legislation and good governance recommendations.

The results obtained demonstrate the need to pay attention to the specific characteristics of each organisation, as well as use the appropriate econometric techniques. It has been demonstrated that once dynamic endogeneity is controlled for, there is no significant relationship between the variables relating to the structure of the board of directors (board size, board independence and leadership structure) and firm performance. This leads us to conclude that there is no optimal corporate governance model for all firms. Instead, to maximise the value of the firm, each firm should determine the composition of its board of directors endogenously based on the nature of the organisation itself and its environment.

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