

**WOMEN ON THE BOARD: A CONFIGURATIONAL APPROACH FROM THE  
CODES OF GOOD GOVERNANCE**

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## **ABSTRACT**

The study of the determinants of the presence of women on boards has been one of the key topics of corporate governance. This paper aims to contribute to the lack of studies based on complementary and substitute factors affecting board diversity. Based on a configurational approach, we seek to understand whether there are groups of factors related to corporate governance provisions whose combination may lead to making boards diverse in excess of the norm, which is usually driven by regulation demands. We employ a qualitative comparative methodology to study possible joint casual relations paving the way to diversity in Spanish listed firms. Thus, we found different patterns in terms of firm size, board size, board independence, ownership structure, and public scrutiny that might be considered by code of good governance issuers and firms' diversity programs.

**KEYWORDS:** Gender Diversity, Board of Directors, Configurational Approach, Qualitative Comparative Analysis

## INTRODUCTION

Over the last decades, there have been a great number of studies aiming to address gender diversity issues in various disciplines. In the arena of corporate governance, diversity has also been at the core of the research agenda (Canyon & Mallin, 1997; Hillman, 2015; Terjesen, Sealy, & Val, 2009), addressing different issues like the roles in strategic decisions (Arfken, Bellar, & Helms, 2004a), or the link to financial performance (Post & Byron, 2015).

We think that the understanding of this phenomenon demands an approach that could learn from the interaction of a set of factors instead of considering just ‘net individual effects’ (Huang, Rey-Martí, & Miquel-Romero, 2018; Ragin, 2008). Consequently, our analysis seeks to find conjunction, equifinality, and asymmetry while considering elements in a causal complexity (Furnari et al., 2016) as it is the case of the subject of study.

Following this approach, several studies have already investigated the bundles of the corporate governance (García-Castro, Aguilera, & Ariño, 2013), the board involvement in intergovernmental organizations (Federo & Saz-Carranza, 2018) or the institutional context that has an effect on board diversity (Iannotta, Gatti, & Huse, 2016).

In our study, we consider the information that is provided by listed firms when reporting the degree of compliance of codes of good governance recommendations. Based on that information, we analyze whether the combination of some of those elements helps to determine a more diverse board. The study of the determinants of diversity at the board is not new (Hillman, Shropshire, & Cannella, 2007), but we differ in the methodology and/or the elements to be considered in the analysis.

Qualitative Comparative Analysis (QCA) serves as a bridge between qualitative and quantitative analysis, and, therefore, it requires a deep understanding of the field of study. The configurational analysis allows combining conditions (variables) acting jointly toward the same outcome. These causal factors may be multiple, not isolated, and give effects based on

the context (Greckhamer, Misangyi, Elms, & Lacey, 2008). Thus, we utilized this methodology to analyze factors the research literature consider as key to determine diverse boards. The current state of the art suggests that gender diversity on board of directors might be the result of the interaction of a variety of interacting institutional domains that are closely related one each other (Iannotta et al., 2016). But, is there a difference among firms under the same institutional configuration? This leads us to consider companies belonging to the same context to analyze the elements the research literature commonly pointed as associated with the topic.

In the following sections of this article, we review the relevant literature, depict the methodology we followed, and bring results for discussion and conclusions.

## **LITERATURE REVIEW**

The analysis of gender diversity experienced remarkable growth over the past few decades. Research literature adopts multiple approaches and conceptualizations (Harrison & Klein, 2007). Some researches focused in the inequality issues (Stamarski & Son Hing, 2015): gender wage gap (Petersen & Morgan, 1995), becoming leaders (Alice H Eagly, 2016; Alice H Eagly & Chin, 2010; Alice Hendrickson Eagly, Eagly, & Carli, 2007), or career development (Blau & Devaro, 2007; Roth, Purvis, & Bobko, 2010). Internationalization (Barkema & Shvyrkov, 2007), human resource diversity management practices (B D'Netto & Sohal, 1999; Brian D'Netto, Shen, Chelliah, & Monga, 2014; Shen, D'Netto, & Tang, 2010), the impact of organizational diversity programs on absenteeism and innovation (Peretz, Levi, & Fried, 2015) or the link to business performance (De Abreu Dos Reis, Sastre Castillo, & Roig Dobón, 2007) were among the different subtopics connected to diversity.

In the discipline of corporate governance, already considered as an independent field of study (Durisin & Puzone, 2009), board diversity has also been addressed analyzing different

industries such as banking (de Cabo, Gimeno, & Escot, 2011; García-Meca, García-Sánchez, & Martínez-Ferrero, 2015; Mateos de Cabo, Gimeno, & Nieto, 2012), trying to understand the impact (Adams & Ferreira, 2009; Arfken, Bellar, & Helms, 2004b; Bilimoria, 2008; Terjesen, Sealy, & Singh, 2009), or establishing links to firm performance (Conyon & He, 2017; Joecks, Pull, & Vetter, 2013; Praveen Kumar & Zattoni, 2016; Low, Roberts, & Whiting, 2015). Besides, some authors centered their studies in particular geographies such as Netherlands and Denmark (Marinova, Plantenga, & Remery, 2016), Italy (Gordini & Rancati, 2017), Spain (Pilar & Joaquina, 2017), Hong Kong and South Korea (Low et al., 2015), Europe (Mateos de Cabo et al., 2012), or emerging markets (Saeed, Belghitar, & Yousaf, 2016). Intending to solve this issue, other problems appeared, and tokenism or problems related to the quotas became new topics of research (Ahern & Dittmar, 2012; Hillman, 2015; Torchia, Calabrò, & Huse, 2011).

Gender diversity issues configured their own research agenda (Nielsen & Huse, 2010; Terjesen, Sealy, & Singh, 2009) or, from a different perspective, some studies aimed to understand the determinants or predictors of diversity (Adams & Ferreira, 2004; Francoeur, Labelle, & Sinclair-Desgagné, 2008; Hillman et al., 2007).

In the arena of corporate governance, pluralism in methods (P Kumar & Zattoni, 2015) led to the introduction of qualitative methods (McNulty, Zattoni, & Douglas, 2013; Zattoni, Douglas, & Judge, 2013) and corporate governance benefit for a variety of techniques (Judge, 2008). Among these techniques, we chose for this article the qualitative comparative analysis, which properly supports a configurational approach that relies on the complementarities of conditions. After being employed sociology and political science, this approach has been in place for decades in the case of organizational analysis (A. D. Meyer, Tsui, & Hinings, 1993) or financial markets (Amable, Ernst, & Palombarini, 2005; J. L. Campbell, 2011) and it refers to interacting factors grouped into bundles which originate a certain outcome (García-Castro

et al., 2013). Configurational approaches to boards have been highlighted as a proper way to explore the nature of the topic and the factors involved (Filatotchev & Wright, 2017).

Existing empirical research drove to different paths of combining human resource practices to obtain high financial performance (Delery & Doty, 1996; Macduffie, 1995), to be applied in organizational theory (Etzioni, 1961; Perrow, 1979), corporate strategy (Fiss, 2011), corporate governance mechanisms (Misangyi & Acharya, 2014), industrial relations and corporate governance (Höpner, 2005), corporate social responsibility and corporate governance (Kang & Moon, 2012), firm-level governance practices (García-Castro et al., 2013), independent directors and family firm performance (Samara & Berbegal-Mirabent, 2018) or codes of good governance (Haxhi & Aguilera, 2017). (Aguilera, Filatotchev, Gospel, & Jackson, 2008) (Jackson, 2005)

In the context of studying the presence of women on boards, this approach was utilized to analyze the role of institutional complementarities like gender quotas or market incentives in board gender diversity (Iannotta et al., 2016). But, to our knowledge, the analysis of potential factors interacting to yield and excel in board diversity under the same institutional environment has not been produced yet.

Listed firms are requested to follow codes of good governance as a way to channel the best practices and provide guidance to stakeholders on a group of nonfinancial issues. Therefore, codes become a key tool in corporate governance and the topics it is related such as diversity. Reporting on Codes of Good Governance compliance provides useful information to perform studies due to its publicity, reliability, and accuracy. Companies adopting the practices gain legitimation and also pursue efficiency for their corporate governance layouts (Aguilera & Cuervo-Cazurra, 2004; Tolbert & Zucker, 1983; Zattoni & Cuomo, 2008). Listed companies provide information that is usually structured according to the requirements of

recommendations. Therefore, it is easier to identify data and explanation on compliance linked to meaningful units and principles.

Following the existing literature, we considered a set of various conditions (elements) such as ownership structure, board size, or the level of market scrutiny. Social actors like the government agencies, interest groups or institutional actors push to introduce some normative values, as it is the case of diversity. These actors are relevant depending on the size of the organization. Big companies are more visible when they try to face and meet social expectations (Adams & Ferreira, 2004; Hillman et al., 2007), and want to avoid being noticed or singled out because of the lack of compliance of such values (J. W. Meyer & Rowan, 1977). Although they are more vulnerable to public exposition, these companies have better capabilities to cope with those demands (Zahra & Pearce, 1990). Additionally, a positive relationship between organizational size and diversity has been found in many empirical studies (Agrawal & Knoeber, 2001; Burke, 2000; Carter, Simkins, & Simpson, 2003; Esteban-Salvador, 2011).

State-owned ownership provides firms with special traits. On one hand, it reinforces the need of accountability since they are under more pressure to comply with all regulations and recommendations (Grosvold & Brammer, 2011). By providing a balanced board, i.e. diverse board, they offer a positive signal to the markets, set a benchmark example and increase their credibility since they follow the rules they are trying to bring to the society as a whole (Saeed, Belghitar, & Clark, 2016). But regarding ownership structure, family ownership has been considered a key factor in a various set of governance issues (Mahadeo & Soobaroyen, 2012), also in the case of board diversity (Gordini & Rancati, 2017), and since they are posed to provide continuity (K. Campbell & Mínguez-vera, 2007), they might play a relevant role.

Some authors give the size of the board a relevant role to the size of the board and female employment in the industry (Adams&Kirchmaier, 2016, Burke, 1999, De Jonge, 2014,

Geiger&Marlin, 2012, Harrigan, 1981, Martín-Ugedo&Mínguez-Vera, 2014, Mateos De Cabo, Gimeno,&Escot, 2011, Mínguez-Vera&Martin, 2011, Nekhili&Gatfaoui, 2013, Oehmichen, Rapp,&Wolff, 2012, Singh, Vinnicombe,&Johnson, 2001 (Kirsch, 2018)).

As regards public scrutiny, although it is hard to capture a complex reality through an index of any kind (Bhagat, Bolton, & Romano, 2008), firms belonging to indices are continuously in the spotlight since investors use them as a reference or pre-established portfolio for various reasons. Therefore, those firms included in a certain index have additional pressure to comply with regulation and, broadly speaking, social demands and expectations (Hillman et al., 2007).

## **METHODOLOGY**

In our study, we utilized a qualitative comparative analysis (QCA). Based on Boolean algebra, this method allows assessing causal conditions individually or combined (Ragin, 2000, 2009), and addresses the main aspects of causal complexity: equifinality, conjunction, and asymmetry (Short, Payne, & Ketchen Jr, 2008). Equifinality refers to the potential existence of multiple paths that lead to the same outcome. The conjunction of factors implies that a given condition might have different types of impact depending on the conditions it is combined with. Causal asymmetry drives different analyses and interpretations for the presence and the absence of the same phenomenon, both in the outcome and the conditions.

This kind of analysis has already been used in corporate governance (García-Castro et al., 2013; Iannotta et al., 2016; Madanoglu, Kizildag, & Ozdemir, 2018; Misangyi & Acharya, 2014), or different management fields of study (Aversa, Furnari, & Haefliger, 2015; Beynon, Jones, & Pickernell, 2016; Furnari et al., 2016; Greckhamer et al., 2008). This method is suitable to identify the result of the combination of different conditions, potentially drawing paths that lead to the same outcome. Besides it helps to see how the cases configure joint

conditions producing outcomes as opposed to consider isolated variables, as it occurs in linear regressions (García-Castro et al., 2013; Ragin, 2009).

This methodology is deployed in different steps: identification of cases, calibration, analysis of necessity, elaboration of the truth table, analysis of the truth table, evaluation and interpretation of results, and robustness tests. These steps are presented in **Figure 1**

[Figure 1 Here: Methodology steps]

In the calibration step, this method requires the transformation of the variables into sets: fuzzy or crisp. When dealing with fuzzy sets, we specify the levels for full membership, full non-membership and a crossover point of maximum ambiguity in each one of the sets.

### **Sample and data collection**

Our sample data was retrieved from the 2017 annual reporting to the Comisión Nacional del Mercado de Valores (CNMV), the regulatory agency supervising stock markets and companies listed in them. This is a document requested to those companies issuing Corporate Governance annual surveys. Providing the legal supervisor requires it and it is open to further legal disclosure, we avoid the common method bias. State ownership information was obtained from the Sociedad Española de Participaciones Industriales (SEPI) official website. We obtained data from 139 companies. Despite the majority of them were created in Spain, there is a significant part of the companies' business activities being performed in many countries (in the case of the indexed companies, international revenues reached 67.7% of the total amount). These firms operate in 7 sectors (Petrol and Power; Basic Materials, industry and construction; Consumer Goods; Consumer Services; Financial Services; Technology and Telecommunications; and Real Estate). This classification was obtained from Bolsas y Mercados Españoles (BME), the organization conducting stock market operations in Spain.

As regards to the labor market information, we used data from Instituto Nacional de Estadística (INE), the Spanish Statistics Office.

### **Measurements**

We defined different ways to measure both the outcome and the conditions. Regarding the outcome, there are several ways to measure diversity in the board composition. For the purpose of this article, we used the ratio female directors to total directors (Adams & Ferreira, 2009; Cabeza-García, Del Brio, & Rueda, 2018; Carter et al., 2003).

To capture de organizational size, we utilized the market capitalization in Euros, which helps to classify listed companies in all reports. Board independence was measured by dividing the number of independent directors into the total size of the board. The size of the board was measured in terms of the number of directors. Belonging to the index (IBEX) is a characteristic that is previously determined by the stock market. To measure the female labor force majority, we divided the number of women into the total number of workers in each industry, classified each company by industry, and assigned the values. To measure the prevalence of female managers, we used the ratio number of female top managers divided into the total number of top managers.

### **Calibration**

The importance of meaningful and theoretical knowledge when it comes to performing this step in the methodology is key to code properly the set membership scores (Haxhi & Aguilera, 2017; Ragin, 2000). Thus, based on the extant theoretical frameworks, previous knowledge and research, we set the thresholds for each calibration. We utilized the “direct method” provided for that purpose in the fsQCA software in order to transform each measure into set memberships (Fiss, 2011; Misangyi & Acharya, 2014; Ragin & Fiss, 2008). Dealing

with fuzzy sets, instead of using a binary logic that would apply to crisp sets (“0” in the case of absence, “1” in the case of presence), fsQCA utilizes fuzzy logic, specifying values for three threshold values: full membership to the set, full non-membership to the set and crossover point. Our analysis has been computed using fsQCA software package version 3.0 (Ragin & Davey, 2014). We summarized the calibration in **Table 1**.

[Insert Table 1 here Calibration]

The calibration of the outcome took into account the average gender diversity ratio (0.18). Since we are trying to explain the contribution over the average compliance we took that threshold to assign 1 to those that were over it and 0 otherwise. This is congruent with the aim of identifying those companies that go beyond the recommendation range or merely driven by standing regulation.

As for the conditions, some of them were treated as crisp sets. For the organizational size calibration (SIZO500), following the distinction made by the regulatory agency, we computed 1 in those companies with a market capitalization of over 500 million Euros and 0 otherwise. In the case of the public scrutiny or visibility (INDEX), we computed 1 in those firms included in the main index (IBEX) and 0 otherwise. In order to consider family ownership (FAMOWN), we used the ownership percentage: companies with family shareholder participation over 24% were classified with 1, and 0 otherwise.

Considering board independence, we assumed full membership when the ratio was over 0.7. The cross-over point was set at the average (0.439), and we computed full non-membership for those boards below the recommended minimum (0.3). Thus, we take into account both recommendations and the ownership structure of Spanish listed companies.

In the case of board size, we gave full membership to those at the top (average plus std. deviation), which is 13. The cross-over point was defined in the average (9.83), and, finally, we gave full non-membership to those firms below 6. This congruent with the advice of the

Corporate Governance Code, which sets the recommended size in the range between 5 to 15 directors.

In **Table 2** we summarize the measure descriptive statistics.

[Insert Table 2 here Measure Descriptive Statistics]

## RESULTS AND DISCUSSION

We reported the intermediate solution produced by the fsQCA software (Fiss, 2011). The solutions we provide consist of a series of different configurations, showing the data on consistency and coverage.

The analysis of necessary conditions (see **Table 3**) shows that given the values of consistency, we can't consider the conditions of our analysis as necessary by themselves.

[Insert Table 3: Analysis of Necessary Conditions]

In **Table 4** we show the truth table.

[Insert Table 4: Truth Table]

Once we obtained the truth table, we performed the analysis. We used a layout to present the results analogous to previous studies (Crilly, 2011; Crilly, Zollo, & Hansen, 2012; Fiss, 2011; Greckhamer, 2011; Ragin & Fiss, 2008). (See **Table 5**)

[Insert Table 5: Truth Table Analysis]

**Table 5** shows the different patterns we have identified, leading to excel in diversity at the board of listed firms. Both, the solution consistency and the solution coverage, suggest they are valid in a configurational analysis approach. According to previous literature, we set the consistency cutoff at 0.74 to keep the possibility of identifying a subset relation (Ragin, 1997, 2004, 2006).

The calculation of fuzzy set consistency was performed this way (Kosko & Toms, 1993; Ragin, 2006; Smithson & Verkuilen, 2006):

$$\text{Consistency } (X_i \leq Y_i) = \frac{\sum(\min(X_i, Y_i))}{\sum X_i}$$

Where “Min” indicates the lower of the two values. When X takes a value less or equal to its corresponding Y, it scores 1. When there are many inconsistent values, consistency drops below 0.5. When this formula is applied to crisp-set data, it returns the simple proportion of consistent cases, so the formula can be applied to both types of sets (Ragin, 2006).

The calculation of fuzzy set coverage was performed this way:

$$\text{Coverage } (X_i \leq Y_i) = \frac{\sum(\min(X_i, Y_i))}{\sum Y_i}$$

The different patterns we identified presented interesting information for analysis and discussion. First of all, in the appearance of family ownership, board independence and the proportion of women among managers combine to define various tracks, no matters the size of the company, and the presence or absence of the condition of proprietary directors. The absence of the condition of board size points to a strong determination in achieving the outcome, given the limitation of room. It also shows the way of introduction of women through independent directors upon the presence of female top executives (5, 6).

Also, we may notice that the joint presence of firm size, board size, and public scrutiny would suggest the intention of providing enough diversity, which is not consistent with an adequate ratio of women among their top managers, no matters the presence or absence of a significant proportion of female managers. Proprietary directors and independent directors seem to substitute each other in those cases (2, 3, 4).

Moreover, the mere existence of room at the board of big firms - in the absence of public scrutiny, family owners, proprietary directors or women among top executives, is a path that is scarcely followed by listed firms (1).

Following the research literature, firm size is among the present conditions in most of the combinations of conditions resulting from the analysis of the truth table (1, 2, 3, 4, 5). The absence of a significant stake in the hands of a family is a common condition in half of the paths we found (1, 2, 3). All these findings are consistent with the result of the table showing the analysis of consistency for every set and subset of conditions involved (See **Appendix Table 1**).

We may find how the conditions we examined configured different patterns in the target of excel in gender diversity at the board. Public scrutiny becomes a principal driver but it is also complemented by the size of the firm and the board. We should point out that this could be partially caused by a very recent implementation path of adoption of diversity among Spanish listed firms. That would explain how types of directors are, in a way, interchangeable for this purpose.

Besides, since we observed codes of good governance recommendations information, the results of this study expect to enlighten their contribution to pursue diversity at the board by providing varied ways to achieve higher levels of it. Accordingly, it might help code issuers to configure future changes on recommendations that address this concern. In this regard, splitting those regarding different policies, diversity implementation programs may help differentiate the effort the firms are enacting. Then, the introduction of an index-like set of recommendations could be continuously perceived by markets and make a difference. We think that it could help to implement governance systems that are not driven by law enforcement but by the values and mission of the firms.

### **Limitations and future research**

Although our study incorporates firm level (Rediker & Seth, 1995), market level (Index) contingencies, it lacks from industry level ones. We acknowledge that our study provides

some conclusions that have to be tested over a broader period. Besides, since some studies that pointed out that risk is also a determinant, it might be necessary to include it as a condition (Adams & Ferreira, 2004; Mateos de Cabo et al., 2012; Saeed, Belghitar, & Clark, 2016). However, given the weight, presence, and regulation of companies in the financial and real estate sectors, it would be harder to isolate values not related to special regulation. This situation also applies to the case of leverage. The age of the firm wasn't included as a condition to study how experience in the market may impact, and it'll be significant to cover it in further research.

Since many companies of the data sample perform their activities internationally, it'd be interesting to include the country of origin of the directors as well as the country where the companies have the headquarters as conditions of future analyses. Besides, it would be also important to broaden the study by including companies from different international contexts. Finally, including the results of paths leading to the opposed outcome could enhance the conclusions.

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**TABLES AND FIGURES**

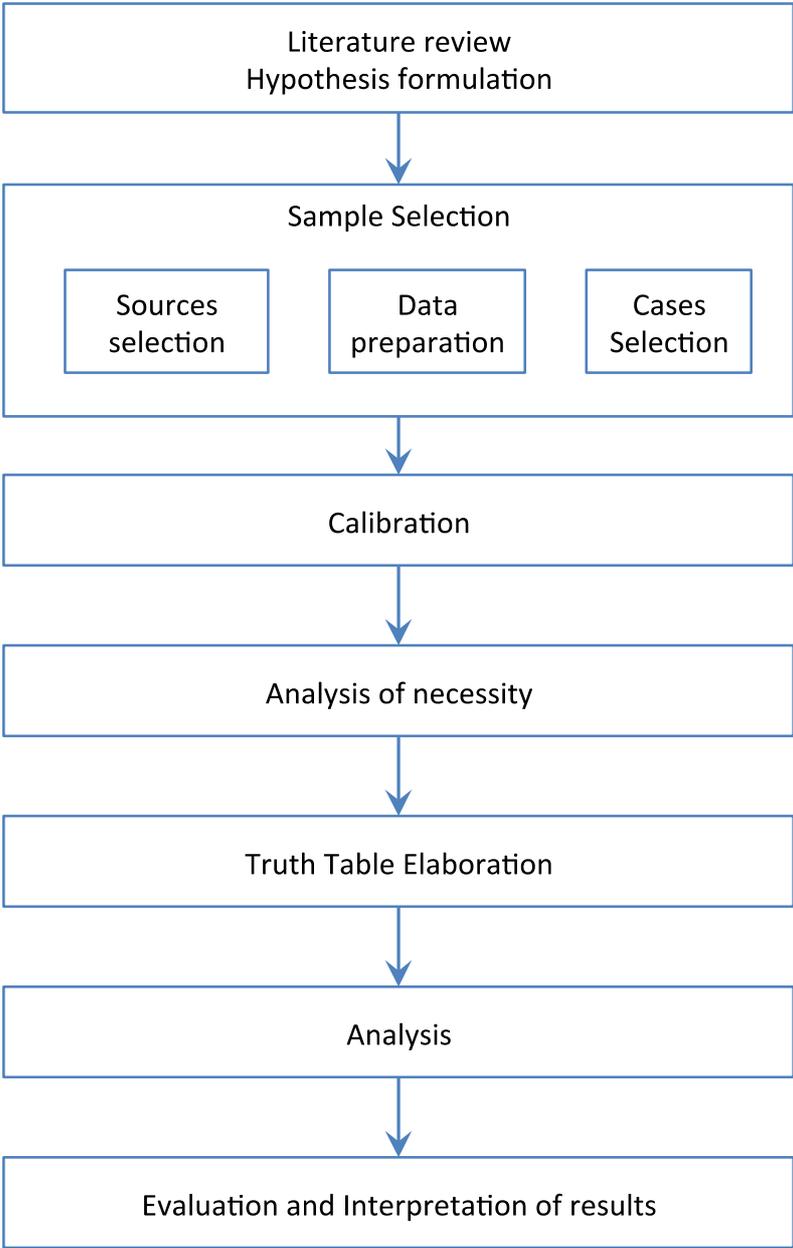


Figure 1: Methodology Steps

Table 1: Calibration

	<b>Measure</b>	<b>Calibration</b>
Diversity	Number of Women at the Board / Size of Board	<ul style="list-style-type: none"> <li>• 1 over 0.18 (average)</li> <li>• 0 below 0.18</li> </ul>
Firm Size (SIZO500)	Market capitalization	<ul style="list-style-type: none"> <li>• 1 over 500m</li> <li>• 0 below 500m</li> </ul>
Public Scrutiny (INDEX)	Belonging to IBEX35	<ul style="list-style-type: none"> <li>• 1 if it is the case</li> <li>• 0 otherwise</li> </ul>
Family Ownership (FAMOWN)	Ownership percentage	<ul style="list-style-type: none"> <li>• 1 if it is over 24%</li> <li>• 0 otherwise</li> </ul>
Board Independence	Number of Independent Directors / Size of the Board	<ul style="list-style-type: none"> <li>• 1 over 0.7</li> <li>• 0.5 at 0.439 (average)</li> <li>• 0 below 0.3 (recommended minimum mark)</li> </ul>
Board Size	Total number of Directors	<ul style="list-style-type: none"> <li>• 1 over 13 (top range)</li> <li>• 0.5 at 9.83 (average)</li> <li>• 0 below 6 (low range)</li> </ul>

Table 2: Measures Descriptive Statistics

<b>Measure</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Minimum</b>	<b>Maximum</b>
Board Size	9.834532	3.398258	4	18
Female Managers	0.1337534	0.1490631	0	0.66667
Public Scrutiny	0.2517986	0.4340461	0	1
Firm Size	0.5539568	0.4970801	0	1
Family Owners	0.1726619	0.3779547	0	1
Board Diversity	0.1836472	0.1202209	0	0.57143
Board Independence	0.4329469	0.1632631	0.125	1
Proprietary Directors	0.3239568	0.2077028	0	0.77

Table 3: Analysis of Necessary Conditions

	Consistency	Coverage
SIZEO500	0.605081	0.467013
~SIZEO500	0.394918	0.378548
fsBSIZE	0.633518	0.542351
~fsBSIZEa	0.547366	0.464117
fsTMTFP	0.344607	0.495524
~fsTMTFP	0.804644	0.489608
fsINDEPa	0.603567	0.500349
~fsINDEPa	0.550563	0.486109
fsPROPD	0.589769	0.478629
~fsPROPD	0.531550	0.480310
INDEX	0.329631	0.559714
~INDEX	0.670368	0.383077
FAMOWN25	0.175332	0.434167

Outcome variable: Diversity

SIZEO500: Firm Size; fsBSIZE: Board Size; fsTMTFP: Proportion of Female Managers; fsINDEPa: Board Independence; fsPROPD: Proportion of Proprietary Directors; INDEX: Public Scrutiny; FAMOWN25: Family Owners.

Table 4: Truth Table

Board Size	Board Independence	Proprietary Directors	Public Scrutiny	Firm Size	Family Ownership	Female Managers	Number of cases	Diversity Excel	raw consist.	PRI consist.	SYM consist
0	1	0	0	0	1	1	3	1	0.995745	0.994318	1
0	1	1	1	1	1	1	1	1	0.968085	0.857143	0.857143
1	0	1	1	1	1	1	1	1	0.907692	0.25	1
0	1	1	0	1	1	1	1	1	0.892157	0.784314	0.784314
1	1	1	1	1	0	0	7	1	0.838519	0.730864	0.81768
1	1	0	1	1	0	0	5	1	0.802299	0.622807	0.713568
1	0	0	0	1	0	0	1	1	0.77193	0.465753	0.472222
1	1	0	0	1	0	0	1	1	0.769759	0.355769	0.355769
1	0	1	1	1	0	0	2	1	0.764835	0.557851	0.557851
1	0	1	1	1	0	1	2	1	0.754032	0.371134	0.395604
1	1	0	1	1	0	1	9	1	0.742404	0.564732	0.582949
1	1	1	1	1	0	1	2	0	0.736695	0.483516	0.483516
1	0	0	0	1	0	1	1	0	0.732143	0.451219	0.451219
1	1	1	0	1	0	0	1	0	0.725	0.398438	0.401575
0	1	1	0	0	0	1	1	0	0.698225	0.451613	0.451613

Board Size	Board Independence	Proprietary Directors	Public Scrutiny	Firm Size	Family Ownership	Female Managers	Number of cases	Diversity Excel	raw consist.	PRI consist.	SYM consist
1	0	0	1	1	0	0	2	0	0.693069	0.162162	0.2
1	1	0	0	1	1	0	2	0	0.678947	0.383838	0.383838
0	0	0	0	1	1	0	1	0	0.657143	0.5	0.504202
0	0	1	0	1	0	0	1	0	0.65109	0.381215	0.381215
0	1	1	0	1	1	0	1	0	0.635468	0.339286	0.339286
1	1	1	0	1	1	0	2	0	0.632997	0.31875	0.375
1	1	0	0	0	0	0	1	0	0.630996	0.107143	0.136364
1	0	1	0	1	0	0	7	0	0.608108	0.382978	0.470309
1	1	0	1	1	1	0	3	0	0.606218	0.410853	0.410853
1	0	1	0	1	0	1	3	0	0.587007	0.335821	0.344827
0	0	1	0	0	0	0	17	0	0.576167	0.402597	0.430555
1	0	1	0	1	1	0	3	0	0.55414	0.378698	0.405063
0	1	0	0	0	1	0	1	0	0.536765	0	0
1	0	1	0	0	0	0	4	0	0.521951	0.144105	0.163772
0	0	1	0	0	0	1	3	0	0.514563	0.206349	0.236364
0	0	0	0	0	0	0	9	0	0.51369	0.339823	0.340426
0	1	0	0	0	0	0	10	0	0.505008	0.306433	0.347942
1	0	0	0	1	1	0	1	0	0.495	0.136752	0.136752
0	1	0	0	1	0	1	2	0	0.491749	0.153846	0.155556

Board Size	Board Independence	Proprietary Directors	Public Scrutiny	Firm Size	Family Ownership	Female Managers	Number of cases	Diversity Excel	raw consist.	PRI consist.	SYM consist
0	1	1	0	0	0	0	2	0	0.481013	0.150888	0.150888
0	1	0	0	1	1	1	1	0	0.464567	0.190476	0.190476
1	1	0	0	1	0	1	1	0	0.457913	0	0
0	0	1	0	1	0	1	3	0	0.41779	0.172414	0.172414
1	1	0	0	0	1	0	1	0	0.414634	0	0
1	0	1	0	1	1	1	1	0	0.412214	0.197917	0.197917
1	1	1	0	1	0	1	1	0	0.401361	0.0382514	0.0382514
0	1	0	0	1	0	0	4	0	0.363636	0.0895954	0.0922619
1	0	0	0	0	1	0	1	0	0.357143	0	0
0	1	1	0	1	0	1	2	0	0.336842	0.027027	0.027027
0	0	0	0	0	0	1	1	0	0.275862	0	0
1	0	1	0	0	0	1	2	0	0.269625	0.0446429	0.0446429
1	1	0	0	0	0	1	1	0	0.210526	0	0
0	1	0	0	0	0	1	3	0	0.204633	0	0
1	1	1	0	0	0	1	2	0	0.131313	0	0

SIZEO500: Firm Size; fsBSIZE: Board Size; fsTMTFP: Proportion of Female Managers; fsINDEPa: Board Independence; fsPROPD: Proportion of Proprietary Directors; INDEX: Public Scrutiny; FAMOWN25: Family Owners.

Table 5: Truth Table Analysis

	1	2	3	4	5	6
Firm Size	●	●	●	●	●	⊗
Board Size	●	●	●	●	⊗	⊗
Public Scrutiny	⊗	●	●	●		⊗
Family Owners	⊗	⊗	⊗		●	●
Proprietary Directors	⊗	⊗	●	●	●	⊗
Board Independence		●		⊗	●	●
Female Managers	⊗		⊗	●	●	●
Raw coverage	0.0429076	0.161871	0.119805	0.0413932	0.0306243	0.0395423
Unique coverage	0.0429077	0.127882	0.0752146	0.011442	0.0259129	0.0395423
Consistency	0.726496	0.701166	0.768069	0.785942	0.938144	0.995763

Intermediate solution. Solution coverage: 0.37338. Solution consistency: 0.751185

## APPENDIX

Appendix Table 1: Conditions sets and subset analysis of consistency and coverage

Conditions set/subset	consistency	coverage	combined
fsBSIZEa*fsTMTFP*fsINDEPa*fsPROPDRATIO*INDEX*SIZEO500*FAMOWN25	0.958904	0.011779	0.107985
fsBSIZEa*fsTMTFP*fsINDEPa*fsPROPDRATIO*SIZEO500*FAMOWN25	0.777174	0.024062	0.133438
fsBSIZEa*fsINDEPa*fsPROPDRATIO*INDEX*SIZEO500*FAMOWN25	0.958904	0.011779	0.107985
fsBSIZEa*fsTMTFP*fsPROPDRATIO*INDEX*SIZEO500*FAMOWN25	0.918182	0.016995	0.128394
fsTMTFP*fsINDEPa*fsPROPDRATIO*INDEX*SIZEO500*FAMOWN25	0.968085	0.015312	0.123122
fsBSIZEa*fsTMTFP*fsINDEPa*fsPROPDRATIO*INDEX*SIZEO500	0.774419	0.056032	0.202246
fsBSIZEa*fsTMTFP*fsINDEPa*fsPROPDRATIO*INDEX*FAMOWN25	0.958904	0.011779	0.107985
fsBSIZEa*fsTMTFP*fsINDEPa*INDEX*SIZEO500*FAMOWN25	0.737226	0.016995	0.102649
fsBSIZEa*fsINDEPa*fsPROPDRATIO*SIZEO500*FAMOWN25	0.697548	0.043076	0.146758
fsBSIZEa*fsTMTFP*fsINDEPa*fsPROPDRATIO*SIZEO500	0.629362	0.088003	0.139142
fsBSIZEa*fsTMTFP*fsINDEPa*fsPROPDRATIO*FAMOWN25	0.786458	0.025408	0.138961
fsTMTFP*fsINDEPa*fsPROPDRATIO*SIZEO500*FAMOWN25	0.816144	0.030624	0.159431
fsBSIZEa*fsTMTFP*fsPROPDRATIO*SIZEO500*FAMOWN25	0.670498	0.029446	0.104380
fsBSIZEa*fsINDEPa*fsPROPDRATIO*INDEX*SIZEO500	0.785088	0.120478	0.302594
fsBSIZEa*fsINDEPa*fsPROPDRATIO*INDEX*FAMOWN25	0.958904	0.011779	0.107985
fsINDEPa*fsPROPDRATIO*INDEX*SIZEO500*FAMOWN25	0.726619	0.016995	0.100135
fsBSIZEa*fsPROPDRATIO*INDEX*SIZEO500*FAMOWN25	0.789063	0.016995	0.114394
fsBSIZEa*fsTMTFP*fsPROPDRATIO*INDEX*FAMOWN25	0.918182	0.016995	0.128394
fsTMTFP*fsPROPDRATIO*INDEX*SIZEO500*FAMOWN25	0.931298	0.020528	0.141837
fsTMTFP*fsINDEPa*fsPROPDRATIO*INDEX*FAMOWN25	0.968085	0.015312	0.123122
fsBSIZEa*fsTMTFP*fsPROPDRATIO*INDEX*SIZEO500	0.784530	0.071681	0.233404
fsTMTFP*fsINDEPa*fsPROPDRATIO*INDEX*SIZEO500	0.784922	0.059566	0.212768
fsBSIZEa*fsTMTFP*fsINDEPa*fsPROPDRATIO*INDEX	0.774419	0.056032	0.202246
fsBSIZEa*fsTMTFP*fsINDEPa*SIZEO500*FAMOWN25	0.687747	0.029278	0.114783
fsBSIZEa*fsINDEPa*INDEX*SIZEO500*FAMOWN25	0.604317	0.028269	0.067253
fsBSIZEa*fsTMTFP*fsINDEPa*INDEX*SIZEO500	0.744031	0.131079	0.289638
fsBSIZEa*fsTMTFP*fsINDEPa*INDEX*FAMOWN25	0.737226	0.016995	0.102649
fsBSIZEa*fsTMTFP*INDEX*SIZEO500*FAMOWN25	0.758621	0.022211	0.122896

Conditions set/subset	consistency	coverage	combined
fsTMTFP*fsINDEPa*INDEX*SIZEO500*FAMOWN25	0.772152	0.020528	0.121575
fsINDEPa*fsPROPDRATIO*SIZEO500*FAMOWN25	0.628788	0.055864	0.110861
fsBSIZEa*fsPROPDRATIO*SIZEO500*FAMOWN25	0.563144	0.073532	0.085751
fsBSIZEa*fsINDEPa*fsPROPDRATIO*SIZEO500	0.698878	0.188625	0.307104
fsBSIZEa*fsINDEPa*fsPROPDRATIO*FAMOWN25	0.718274	0.047619	0.163299
fsTMTFP*fsPROPDRATIO*SIZEO500*FAMOWN25	0.713333	0.036009	0.140730
fsTMTFP*fsINDEPa*fsPROPDRATIO*FAMOWN25	0.840467	0.036345	0.178840
fsBSIZEa*fsTMTFP*fsPROPDRATIO*SIZEO500	0.620304	0.130574	0.161601
fsBSIZEa*fsTMTFP*fsPROPDRATIO*FAMOWN25	0.680297	0.030793	0.112361
fsBSIZEa*fsTMTFP*fsINDEPa*fsPROPDRATIO	0.537198	0.093555	0.080925
fsTMTFP*fsINDEPa*fsPROPDRATIO*SIZEO500	0.560117	0.096416	0.093153
fsBSIZEa*fsPROPDRATIO*INDEX*SIZEO500	0.707797	0.157328	0.288763
fsINDEPa*fsPROPDRATIO*INDEX*FAMOWN25	0.726619	0.016995	0.100135
fsINDEPa*fsPROPDRATIO*INDEX*SIZEO500	0.735236	0.125694	0.276900
fsBSIZEa*fsPROPDRATIO*INDEX*FAMOWN25	0.789063	0.016995	0.114394
fsBSIZEa*fsINDEPa*fsPROPDRATIO*INDEX	0.785088	0.120478	0.302594
fsPROPDRATIO*INDEX*SIZEO500*FAMOWN25	0.605505	0.022211	0.059613
fsTMTFP*fsINDEPa*fsPROPDRATIO*INDEX	0.784922	0.059566	0.212768
fsTMTFP*fsPROPDRATIO*INDEX*SIZEO500	0.792553	0.075215	0.242213
fsBSIZEa*fsINDEPa*SIZEO500*FAMOWN25	0.615975	0.067474	0.110206
fsBSIZEa*fsTMTFP*fsPROPDRATIO*INDEX	0.784530	0.071681	0.233404
fsTMTFP*fsPROPDRATIO*INDEX*FAMOWN25	0.931298	0.020528	0.141837
fsBSIZEa*fsTMTFP*fsINDEPa*FAMOWN25	0.718861	0.033990	0.137964
fsBSIZEa*fsTMTFP*fsINDEPa*SIZEO500	0.648956	0.172640	0.219862
fsTMTFP*fsINDEPa*SIZEO500*FAMOWN25	0.619186	0.035840	0.082521
fsBSIZEa*fsTMTFP*SIZEO500*FAMOWN25	0.609468	0.034663	0.076764
fsBSIZEa*fsINDEPa*INDEX*FAMOWN25	0.604317	0.028269	0.067253
fsINDEPa*INDEX*SIZEO500*FAMOWN25	0.541555	0.033990	0.048778
fsBSIZEa*fsINDEPa*INDEX*SIZEO500	0.691706	0.268046	0.354939
fsBSIZEa*INDEX*SIZEO500*FAMOWN25	0.540761	0.033485	0.048414
fsTMTFP*fsINDEPa*INDEX*SIZEO500	0.742194	0.139997	0.296981
fsBSIZEa*fsTMTFP*INDEX*SIZEO500	0.750430	0.146727	0.311191

Conditions set/subset	consistency	coverage	combined
fsBSIZEa*fsTMTFP*INDEX*FAMOWN25	0.758621	0.022211	0.122896
fsTMTFP*fsINDEPa*INDEX*FAMOWN25	0.772152	0.020528	0.121575
fsBSIZEa*fsTMTFP*fsINDEPa*INDEX	0.744031	0.131079	0.289638
fsTMTFP*INDEX*SIZEO500*FAMOWN25	0.784615	0.025745	0.139878
fsINDEPa*fsPROPDRATIO*FAMOWN25	0.662651	0.064782	0.148411
fsBSIZEa*fsINDEPa*fsPROPDRATIO	0.647532	0.216389	0.246148
fsPROPDRATIO*SIZEO500*FAMOWN25	0.519886	0.092378	0.074449
fsBSIZEa*fsPROPDRATIO*SIZEO500	0.607465	0.328622	0.236359
fsINDEPa*fsPROPDRATIO*SIZEO500	0.611948	0.205115	0.192148
fsBSIZEa*fsPROPDRATIO*FAMOWN25	0.577833	0.078075	0.092673
fsBSIZEa*fsTMTFP*fsPROPDRATIO	0.530499	0.144876	0.100704
fsTMTFP*fsPROPDRATIO*SIZEO500	0.528104	0.143867	0.092909
fsTMTFP*fsINDEPa*fsPROPDRATIO	0.535055	0.121992	0.092409
fsTMTFP*fsPROPDRATIO*FAMOWN25	0.742515	0.041730	0.162141
fsPROPDRATIO*INDEX*SIZEO500	0.650667	0.164227	0.218233
fsPROPDRATIO*INDEX*FAMOWN25	0.605505	0.022211	0.059613
fsBSIZEa*fsPROPDRATIO*INDEX	0.707797	0.157328	0.288763
fsINDEPa*fsPROPDRATIO*INDEX	0.735236	0.125694	0.276900
fsINDEPa*SIZEO500*FAMOWN25	0.532151	0.080767	0.075191
fsBSIZEa*fsINDEPa*FAMOWN25	0.587180	0.077065	0.100092
fsBSIZEa*fsINDEPa*SIZEO500	0.653986	0.364462	0.330664
fsBSIZEa*SIZEO500*FAMOWN25	0.481390	0.097930	0.062588
fsTMTFP*fsPROPDRATIO*INDEX	0.792553	0.075215	0.242213
fsTMTFP*fsINDEPa*FAMOWN25	0.763025	0.076392	0.229588
fsBSIZEa*fsTMTFP*fsINDEPa	0.594550	0.183577	0.160315
fsTMTFP*fsINDEPa*SIZEO500	0.571787	0.191654	0.145196
fsTMTFP*SIZEO500*FAMOWN25	0.530303	0.041225	0.053719
fsBSIZEa*fsTMTFP*SIZEO500	0.642304	0.223288	0.240946
fsBSIZEa*fsTMTFP*FAMOWN25	0.639344	0.039374	0.099214
fsINDEPa*INDEX*FAMOWN25	0.541555	0.033990	0.048778
fsBSIZEa*fsINDEPa*INDEX	0.691706	0.268046	0.354939
fsBSIZEa*INDEX*SIZEO500	0.629378	0.311459	0.261765

Conditions set/subset	consistency	coverage	combined
fsBSIZEa*INDEX*FAMOWN25	0.540761	0.033485	0.048414
INDEX*SIZEO500*FAMOWN25	0.466000	0.039206	0.034295
fsINDEPa*INDEX*SIZEO500	0.648141	0.284536	0.282259
fsTMTFP*INDEX*FAMOWN25	0.784615	0.025745	0.139878
fsTMTFP*fsINDEPa*INDEX	0.742194	0.139997	0.296981
fsTMTFP*INDEX*SIZEO500	0.719285	0.155645	0.295231
fsBSIZEa*fsTMTFP*INDEX	0.750430	0.146727	0.311191
fsPROPDRATIO*SIZEO500	0.525749	0.369342	0.148864
fsINDEPa*fsPROPDRATIO	0.570467	0.271075	0.164644
fsBSIZEa*fsPROPDRATIO	0.562486	0.406697	0.191318
fsPROPDRATIO*FAMOWN25	0.542831	0.101296	0.090020
fsTMTFP*fsPROPDRATIO	0.475874	0.192495	0.087749
fsPROPDRATIO*INDEX	0.650667	0.164227	0.218233
fsBSIZEa*FAMOWN25	0.452431	0.108026	0.056928
SIZEO500*FAMOWN25	0.421111	0.127545	0.050506
fsBSIZEa*SIZEO500	0.578206	0.524987	0.240309
fsBSIZEa*fsINDEPa	0.623042	0.414942	0.288077
fsINDEPa*SIZEO500	0.535635	0.404678	0.168308
fsINDEPa*FAMOWN25	0.557509	0.128050	0.107352
fsTMTFP*FAMOWN25	0.680672	0.081777	0.183108
fsBSIZEa*fsTMTFP	0.578674	0.243816	0.171050
fsTMTFP*SIZEO500	0.535498	0.252566	0.132965
fsTMTFP*fsINDEPa	0.555196	0.259801	0.152912
INDEX*FAMOWN25	0.466000	0.039206	0.034295
fsINDEPa*INDEX	0.648141	0.284536	0.282259
fsBSIZEa*INDEX	0.629378	0.311459	0.261765
INDEX*SIZEO500	0.559714	0.329631	0.172241
fsTMTFP*INDEX	0.719285	0.155645	0.295231
fsPROPDRATIO	0.474479	0.597510	0.154597
fsBSIZEa	0.540851	0.627124	0.209520
fsINDEPa	0.500349	0.603567	0.173719
SIZEO500	0.467013	0.605081	0.134731

<b>Conditions set/subset</b>	<b>consistency</b>	<b>coverage</b>	<b>combined</b>
FAMOWN25	0.434167	0.175332	0.072526
fsTMTFP	0.495524	0.344607	0.131264
INDEX	0.559714	0.329631	0.172241

SIZEO500: Firm Size; fsBSIZE: Board Size; fsTMTFP: Proportion of Female Managers; fsINDEPa: Board Independence;  
fsPROPD: Proportion of Proprietary Directors; INDEX: Public Scrutiny; FAMOWN25: Family Owners.