

# **HOW FEMALE AND MALE DIRECTORS DIFFERENTIALLY INFLUENCE FIRM PERFORMANCE: AN INFORMATION-PROCESSING APPROACH**

## **ABSTRACT**

The purpose of this study is offering an alternative perspective to understand how and when the board team contributes to the firm. Focused on gender, in this study, interlocks and experience are examined as sources of information of the board team that being processed by each gender have different influence on firm performance. The findings show that the long experience of male directors precedes firm performance in stable conditions and that interlocks are resources that enhance the skills to process detailed information of female directors. The results also show some cases in which this information resources negatively relate to performance.

**Key words:** board of directors, gender, selectivity theory, information-processing, performance, Colombia,

## **INTRODUCTION**

One of the main functions of a board team is reducing the uncertainty of the organization (Hillman et al., 2009; Hillman and Dalziel, 2003; Pfeffer, 1972). Board members bring to the table resources that include experience, knowledge, skills, and contacts, among others, so researchers have been interested in investigating what types of resources contribute to the performance of an organization, finding, for instance, that experience is relevant under some circumstances (Finkelstein et al, 2009, p.95) and that interlocks do not seem to provide the benefits that have been argued (Kaczmarek et al., 2014; O'Hagan, 2017; Zajac, 1988). Another research stream has focused on the personal characteristics of board members as sources of the resources needed by an organization. On the influence of gender, some have argued that women bring innovative ideas and are more inclusive and that these resources widen sets of information and enrich discussions and therefore should drive higher performance (Huse et al., 2005; Nielsen & Huse, 2010). Actual results, however, are mixed and suggest that an analysis of types of resources by gender might shed light on the strong influence of gender on business dynamics. Westphal and Milton (2000) and are among the few whose studies develop this type of analysis, and their important results point to this avenue of analysis.

Extending the work of Westphal and Milton (2000), we investigate the differences between men and women regarding how they process information arising from their experience as directors

and from the interlocks that they access. We argue that women and men capture and process information differently and that this defines their contributions to firm performance. This perspective offers new insights to the existing research on gender, which has offered ambiguous results regarding the influence of women's contributions on corporate performance. Additionally, no research has investigated the contributions of male directors to firm performance, and, as a consequence, there is an incomplete understanding of gender as a variable of influence. The information processing approach has shown that women and men differ in how they process information, leading to different outcomes (Meyers-Levy & Loken, 2015), but this perspective has seldom been applied out of a marketing context (e.g. Chung & Monroe, 1998; McGiven et al., 1996). Considering gender in light of information processing theory may provide new avenues for understanding how and why women and men make their contributions as board members, as well as the mechanisms by which this influence occurs.

We apply this framework to explore how different dimensions of information processed by board members precede the financial performance of a firm. Experience and interlocks have special interest in this study because, although these are two of the most studied characteristics of boards members (Dalziel et al, 2011; Hillman et al., 2009), there are few explorations regarding their influence on financial performance differentiated by gender (i.e. O'Hagan, 2017). This study develops a theoretical framework about the processing of information originated in experiences and interlocks that female and male directors make and how and when the results of the information-processing influence firm financial performance. To test the hypothesis of the study we used a ten-year panel of 12,091 Colombian firms whose board members were identified and known their trajectories.

## **THEORETICAL FRAMEWORK**

### **Boards of directors and firm performance**

One of the functions of the board of directors is to offer resources to the organization (Hillman & Dalziel, 2003). According to resource dependence theory, the board team helps reduce the dependence of a firm on the environment (Hillman et al., 2000), because directors connect the organization to the resources it needs to adapt. When the board is well connected to the external environment, these connections reduce uncertainty in the focal organization, which in turn should be reflected in strategic adaptation and more opportune decisions that result in better performance (Hillman & Dalziel, 2003; Pfeffer, 1972). The board connects to the external environment in two

main ways: through the experience of the team members in other organizations and industries and through the establishment of interlocks between organizations.

Setting aside the possible connections that the board team makes among organizations, the study of which has not offered conclusive results (Mizruchi, 1996; Zajac, 1988), at the core of experience and interlocks is the information that the board team receives, processes, and makes available for the firm. The information brought to the table by the board team informs decisions and guides in their implementation. Some studies highlight the importance of this approach regarding mergers and acquisitions (M&A). Haunschild and Beckam (1998), for example, show that the depth of experience in M&A of the firm and its interlocks has a positive effect on the number of mergers and acquisitions in which a focal firm engages. These authors argue that interlocks are sources of specialized information and learning that are useful to determine an organization's future path. In another study, McDonald et al. (2008) argue that previous knowledge about M&A held by outside directors has a positive influence on the success of M&A in the organizations that they serve. Other studies, mainly guided by upper-echelons theory (Hambrick & Mason, 1994), note that the diversity of experiences, background, and connections in the board team are necessary to enrich discussions, make better decisions, and thereby impact the firm's performance (Hillman et al, 2000). These contrasting approaches—long experience with associated specialized information and multiple interlocks with diversity of information—do not give a clear understanding about what type of information is necessary for a better performance of a firm and when it is necessary. In this study, we offer an alternative and comprehensive view of information as a resource of the board team that influences the firm differentially depending on how board members process information and how their differential processing methods align with the firm's needs for knowledge and information.

We focus on the gender composition of the board as a factor that determines the characteristics of information that prevail in the discussions of the board team and that influence the firm performance. There are three arguments for focusing on gender as a distinctive variable. First, research on gender in boards of directors has focused on understanding the resources provided by female directors and how they contribute to the performance of the firm as one of the possible outcomes. Female board members correlate, some argue, to high firm financial performance because women bring new perspectives into discussions and are more inclusive than male directors, triggering creativity, innovation, and inclusiveness (Bear, Rahman, & Post, 2010;

Campbell & Mínguez-Vera, 2008; Dezsö & Ross, 2012; Robinson & Dechant, 1997; Torchia et al., 2011). This perspective seems to associate women with the diversity of perspectives that the firm needs but tells us only half of the story regarding gender because there are no studies contrasting the contributions of men with those of women or because these differences have been subsumed under variables such as gender diversity that restrict observation of the contributions of each gender. Second, research shows null, positive, and negative results when relating the presence of female directors to firm financial performance (Adams & Ferreira, 2009; Post & Byron, 2015; Terjesen, et al., 2009; Terjesen et al., 2015), meaning that more research is needed to understand the drivers for the diverse types of results (Terjesen, et al., 2009). Third, research in other fields has evidenced differences between men and women that stem from how they process information and from how information-processing is activated under specific circumstances. Thus, we believe that studying differences in information-processing by gender may shed light on the varied results that relate the resources of board team to performance of the firm.

### **A perspective of differentiated information processing by gender**

According to selectivity theory (Meyers-Levy & Maheswaran 1991; Meyers-Levy & Sternthal 1991; Meyers-Levy, 2015) women and men differ in the quantity of information that they process and in how they process it. Information may be viewed as a pyramid. The base represents extended and detailed information, which is aggregated at different thresholds up to the highest point with the maximum level of aggregation and the most salient information. Studies based on selectivity theory corroborate that women have lower thresholds of information than men, characterizing women as comprehensive processors of information and men as selective processors (Darley & Smith, 1995). Women capture more diverse information at the base of the pyramid, and men capture salient information at the highest point. The implications of these findings are multiple. In the case of women, low thresholds facilitate the consideration of more information to develop their reasoning and to make decisions. Low thresholds also relate to information from the self as well as from others (McGivern et al., 1996; Meyers-Levy & Loken, 2015). According to this perspective, the communal characteristics that women exhibit in different contexts rest in their recognition of others in the interactions. For example, in board of directors the presence of female board members has been associated to a major development of social responsibility in the firm (Bear et al, 2010; Boulouta, 2013) and to a major knowledge of the customers (Daily et al., 1999; Galia & Zenou, 2012). Women have a notable capacity to elaborate on information that garners less attention from

men and, as a consequence, to consider relationships that are not evident for men (Chang, 2007; Meyers-Levy & Maheswaran 1991; Meyers-Levy & Sternthal 1991). In the case of men, their higher thresholds for information enable them to focus on key insights that facilitate the general understanding of a situation. Men elaborate their reasonings considering objective information (i.e. facts, data), following a logic that gives sense to the previous knowledge and information that they have acquired (Barber et al., 2009). This focus on previous information, discarding information that is not aligned to their own previous logic addresses their characterization as self-oriented.

The greatest development of selectivity theory has derived from research on consumer behavior and marketing (Barber et al., 2009; Chang, 2007; Darley & Smith, 1995). Besides corroborating the postulates of Meyers-Levy and colleagues (Meyers-Levy & Maheswaran 1991; Meyers-Levy & Sternthal 1991; Meyers-Levy, 2015), this research concludes that gender-differences emerge primarily when a situation demands elaboration (Darley & Smith, 1995). Barber and colleagues (2009) add that this type of uncertain situation, males consider more critics and published material than females, while in the face of uncertainty females make conscious efforts to acquire additional information. With less frequency, researchers in other fields use the selectivity hypothesis to investigate differences between men and women (i.e. Chung & Monroe, 1998, for memories, and McGivern et al, 1996, and O'Donnell & Johnson, 2001, for the management of complex information and the difficulty of tasks). Researchers also show that the multiple differences between genders reported in the literature may be explained by selectivity theory. For example, Graham et al. (2002) argue that women have been characterized as risk-averse because their low threshold for information enables them to consider more information to make decisions than men typically consider. Meyers-Levy et al. (2015), however, add that females' risk aversion depends on the situation.

In the following sections, experience and interlocking, as resources provided by board members (Dalziel et al, 2011; Hillman et al., 2009), are analyzed as sources of information that, since they are processed differently by male and female directors, may differentially influence firm financial performance.

### **Experience as source of information**

Experience refers to the “practical knowledge, skill, or practice derived from direct observation of or participation in events or in a particular activity” (Merriam-Webster, 2019). In executive leadership, experience has been associated with the extended knowledge that executives

acquire in the same position, organization, or industry (Finkelstein et al, 2009). Experience of board of members has been related to different types of organizational outcomes. For example, Westphal and Milton (2000) reported that having experience as part of a minority group contributed to a higher influence of minority members in the decisions of a board. Regarding financial performance, McDonald et al. (2008) theoretically associated independent directors' experience in mergers and acquisitions (M&A) with better performance in firm acquisitions, and Kroll et al. (2008) corroborated that previous experience in acquisitions, as board members or as CEO of an acquirer firm, influenced firm performance.

When the experience of the board team is looked at as a source of information, it should be observed as sets of information—arising from specific situations and environments—that individuals capture at different thresholds. In a situation experienced at a high threshold, individuals process the salient information in terms of decisions, that is, in terms of cause and effect. When a situation is experienced at a low threshold, individuals process surface-level information that often consists of detailed information about how and why things occur. For example, high threshold information regarding M&A refers to the number of departments that were combined, the number of job positions eliminated, or the types of roles that were merged and maintained. Information at low threshold refers to how and why different tasks were combined or defined in departments, what the implications for the staff were, how change was managed, how the new roles got to comply the previous ones, among other detailed information.

Information captured at a high threshold becomes useful through replicated experiences in the same or similar contexts that corroborates previous information and relationships. In this way, relevant information may be incorporated into existing cause-and-effect logic to complement it. At high thresholds of information-processing, confirmation of previous information leads to increased certainty about its relevance and application to current situations. Related experiences facilitate the recognition of salient cues that may be used to interpret the environment and, as it relates to the organization, to make decisions. In the case of board members, this type of experience-reinforced specialized knowledge can be useful in similar situations. It is the type of experience relevant to the studies of McDonald et al. (2008) and Kroll et al. (2008).

Previous findings suggest that, in comparison to females, the more selective processing of information (Meyers-Levy & Maheswaran 1991; Meyers-Levy & Sternthal 1991), as well the processing of information by confirmation (Chung & Monroe, 1998; Chang, 2007), are the key

factors associated with male board members in an organization. If the experience of board members is understood as a source of information that is processed by the board team, it should be expected that the experience of the board team has an important influence on performance when male board members have a long experience in matters related to the organization or the industry. This influence occurs because these experiences are the mechanisms through which board members process information, a mechanism differentiation by gender. This argument supports the following hypothesis:

*Hypothesis 1. The longer the experience of male members of a board team, the higher the performance of the firm.*

Information also may be captured and processes at low thresholds. The processing of information at low thresholds includes a more detailed consideration of the components of the situation—base information—than when information is captured at a high threshold. With low thresholds of information there is a clearer understanding of the relationships and configurations of the components that make possible the results, in contrast to the causal relations observed at higher thresholds. Managing information at low thresholds facilitates to consider information that is not salient and to develop the ability to establish relationships between elements, relationships that may seem subjective because, at this base-level, information resides in people (e.g. customers, employees, colleagues). Who process information at low thresholds gather detailed information aside of superficial information, detailed information facilitates to understand how and why of the components of a specific situation.

Within selectivity theory, women have been linked to a stronger capacity to process information at low thresholds (Meyers-Levy & Loken, 2015; Meyers-Levy & Maheswaran 1991; Meyers-Levy & Sternthal 1991). According to Meyers-Levy and Loken (2015), females “are more likely to detect, elaborate more extensively, and use relatively less accessible and more distally relevant information when forming assessments” (p.134). A direct implication of the way in which women tend to process information is that they have more information to consider when making decisions. For example, Graham and colleagues (2002) argue that the differences in risk propensity observed between male and female decision makers stem from the quantity of information that women manage, which, being greater than the quantity of information that men consider, allows them to make more-informed decisions. That is why they make decisions that appear less risky than those made by men. In contrast, men base their decisions on heuristics because the quantity

of information they manage is reduced. Additionally, given that many business instances still exhibit notable male dominance, much of the information provided by women is associated with traits of creativity and innovation given that female's contributions are the less frequent in that male-dominated board (i.e. Fitzsimmons, 2012, and Terjesen, 2009, offer some examples in boards of directors). There is a third implication of the low-threshold information processing that informs women's decision-making: given their extended comprehension of base-information, they may benefit more than men from diverse contexts that enlarge the pool of information they manage. In contrast to males, female decision makers will benefit less from long-term experiences or multiple similar experiences because these do not offer the new information that would lead to the advantages women typically gain through their method of processing information.

*Hypothesis 2. The more diverse the experiences of female members of a board team, the higher the performance of the firm.*

### **Interlocks and different types of information processing**

Interlocks are the second way that the board team may connect to the external environment. Interlocks occur when a person serves as a board member in two or more organizations at the same time. Given that links to other organizations contribute to the flow of resources between them, this research field distinguishes between insider and outsider members and argues that the presence of outsiders favors inter-organizational connections to needed external resources (Pfeffer, 1972). However, the results that relate interlocks to performance are ambiguous and largely do not support its importance (Kaczmarek et al., 2014; Mizruchi, 1996; Zajac, 1988). Zajac (1988), for instance, proposed that interlocks should be more frequent among firms that would clearly benefit from such relationships but did not find any difference in the frequency of interlocks between the two groups of firms, with clear need and those without it. Zajac concludes that intra-industry interlocks might have no meaning in terms of inter-organizational relations, nor, in consequence, in terms of performance. Kaczmarek et al. (2014) add a new view into this stream, they found that although the excess of interlocks may lead to negative financial performance, but the diversity in board composition reduces this negative effect. The studies of interlocks by gender, have shown significant differences between men and women regarding the types of interlocks they develop (Ibarra, 1993; Van Emmerik, 2006), but there is a limited focus on the effect of these differences on the performance of the firm (i.e. Macintosh & Krush, 2017, for sales people; O'Hagan, 2017, for board members). According to Macintosh and Krush (2017) men benefit more from customer



networking, while women benefit more from professional networking. In the study of O'Hagan, female board members that are a part of an interlock have greater influence on corporate performance when compared to males with similar characteristics.

Although interlocks may be driven by firms' information needs, they also may be driven by individual ties (Mizruchi, 1996). In this study we focus on ties that the directors directly build with the interaction with colleagues through the board, which are the less explored dimension regarding firm performance. The information that directors receive through their direct contact with colleagues is tied to two characteristics studied among the interlocks of directors: the diversity of the contacts and their strength. Diversity of contacts may broaden the information that directors can use in other meetings (Kaczmarek et al., 2014). The higher the number of contacts, the wider the information that the directors may access. As for strong ties, these are formed through frequent contacts between directors at different board meetings. Strong ties may lead to a greater understanding of the information that is being shared between directors. Shared information is indirect because it refers to organizational decisions that are not directly experienced by the directors capturing the information. Strong ties, then, become relevant in deepening the indirect experiences that are transmitted through the contacts between directors.

However, as established by selectivity theory, the usefulness of the information also depends on the type of process that transforms such information. As selective processors of information, male directors focus on salient elements and tend also to use a hypotheses-confirming strategy to corroborate the logic of their arguments. In hypothesis-confirming, men tend to ignore information that is not aligned with the elements that constitute the logic they have built and to consider only information that is aligned. For male directors, frequent discussions with co-directors are likely to lead them to confirm a hypothesis because they offer multiple opportunities to incorporate, and mainly to validate, new information they are receiving. Given the wide set of information that women rely on to manage, female directors are going to benefit less from frequent interactions because they provide limited new information to incorporate into their characteristic comprehensive information-processing. Considering the previous arguments, we understand that frequent contacts facilitate construction and validation of new information that male directors may bring into the board discussion and that may influence firm performance, which leads to the following hypothesis:

*Hypothesis 3. The higher the frequency of interlocks of male members of a board team, the higher the performance of the firm.*

In contrast, as comprehensive processors, women may construct a wider set of information. So, although the information that emerges from the relationships with other directors is indirect, the ability of women to relate information at low levels and the wide set of information that they use to manage, suggest that female directors are able to make sense of the greater quantity of information that originates in their interactions with multiple directors. When male directors access multiple contacts and the diverse information they provide, some of this information is ignored if it does not align with previous information. For women, the previous logic implies that, given their characteristic information-processing, they may take advantage of multiple and diverse relationships with co-directors to incorporate new information into the discussion of the board team. This infusion of new information should positively influence firm performance because the board team may access more information through well-connected women directors. Accordingly, we propose the following hypothesis:

*Hypothesis 4. The greater the number of interlocks of female members of a board team, the higher the performance of the firm.*

#### **The situation of the organization as a contingency**

Regarding firm performance, research on gender in boards of directors shows that female directors relate to a better performance when companies are in less than favorable situations (Fitzsimmons, 2012; Francoeur et al., 2008). However, the cause of this is unclear. Some studies argue that appointments of renowned male directors may be less likely in problematic situations, problematic situations may reduce the available resources to have the more renown board members that use to be male, which should increase the appointments of female directors and in consequence the positive impact that the presence of female directors will have on performance (Yousfi, 2010). Other studies highlight women's skills in dealing with problematic situations as drivers of a firm's improved performance (Fitzsimmons, 2012; Francoeur et al., 2008). According to these studies, an irregular financial situation of a firm should put the attention of directors on the detailed elements of the situation to understand different avenues to solve it. The focus on the analysis of detailed information is characteristic of women and because of that, it is argued that the presence of female directors drives to higher performance, but the results of research far of being conclusive open the

opportunity to deep in the comprehension of how different financial stages become into calls that enhance the attention of directors and the prevalent information-processing in the board team.

According to selectivity theory, gender differences in information-processing appear when the situation demands elaboration (Chang, 2007; Darley & Smith, 1995; Meyers-Levy & Sternthal, 1991). These differences disappear when men are exposed to messages that call their attention to information that has not been previously considered. For example, the study of Darley and Smith (1995) showed that while females did change their processing strategy to privilege objective information when the risk moved from low to moderate, males did not change their strategy even when noticing the difference in risk. These results corroborate that men are guided by agentic goals and privilege self-confidence in their knowledge, discarding information when it is overwhelming (Chung & Monroe, 1998). Similarly, the study of Chang (2007) showed that women engage in similar degrees of brand evaluation regardless the type of ad, but the evaluation of men is influenced by comparative ad appeals. The studies of Chang (2007) and Chung and Monroe (1998) conclude that women use both confirming and disconfirming information to make their evaluations.

According to previous findings, the low threshold of information that women manage, as well as the fact that they consider confirming and disconfirming information, should enable them to perceive early warnings of problematic situations in an organization. In problematic situations, organizations demand new perspectives from the board team that will help them to pilot in turbulent contexts, and the way that women process information facilitates the emergence of new ideas, particularly when women members have a wide set of interlocks through which they acquire a high volume of information. Perceiving early warnings enables female board members to make available the information they manage as part of their position on the board. However, given that women evaluate confirming and disconfirming information on a continuous basis, the relationship between the information processed by women and firm performance will not vary depending the context in which the firm operates.

In the case of male directors, selectivity theory shows two different paths. On one hand, their strategy of confirming information will be useful for an organization when conditions are stable, and the business dynamics of the past continue to remain valid. The logic that has previously been relied upon may guide current decisions. As a result, we expect that under stable conditions, the resources of information brought to the organization by male directors will have a positive

influence on firm performance. On the other hand, when an organization faces problematic situations, the information resources of male members of the board team will not be as useful because they manage information at high thresholds of. Even when male directors heed warnings about the situation, their information resources restrict their ability to contribute the new ideas that the organization needs at that moment. Additionally, if the confirmation hypothesis continues guiding their decisions (i.e. similar to the study of Darley & Smith, 1995), the effect on performance could be negative because their information strategy is not aligned with the needs of the organization. This logic drives us to set the following hypothesis:

*Hypothesis 5. The resources of information of male members of a board team will be (a) positively related to the performance of the firm when the firm faces no-crisis times, and (b) negatively related to the performance of the firm when the firm faces crisis times.*

## **METHODOLOGY**

The empirical test of this study is composed by private Colombian firms that reported their financial information to the Superintendence of Societies for at least one year in the period between 2000 and 2009. The information about board composition was gathered from BPR Benchmark (i.e., a financial database of companies in Colombia, Casa Editorial El Tiempo, 2011). Firms that reported less than 6 directors, the minimum number necessary to constitute a board of directors (Presidencia de la Republica, 2009), were dropped from the sample. The final sample comprises 53,810 observations from 12,091 firms.

The dependent variable, the performance of the firm, is ROA (return on assets) measured as the EBIT over the total assets of the company. The ROA is preferred over measures of return over sales as it contemplates the rentability of the long-term allocation of resources and over the return over equity as it does not contemplate the financial structure of the firm (Hagel et al., 2013).

Regarding the independent variables, *long-experience* was measured as the number of years of the director in the firm and in the industry in a three-years window. This window allows us to control for a possible bias generated by the lack of experience information in previous years. *Diverse experience* accounted for the number of firms and industries in which a director is working as board director during a year. The *number interlocks* count the number of different co-directors on the boards in which a director participates in a year. The *frequency of the interlocks* is measured as the average number of boards in which a director meets each co-director. So, if a director was

appointed in a unique board or in multiple boards with no common co-directors the frequency will be one. And, as the number of common directors in board increases so will the frequency of interlocks. To capture the impact of these variables at the level of the board team they were averaged for all the board members and for each group of male and female directors. When there were no male or female directors the variable for that gender took the value of zero.

To capture the situation that a firm is undergoing we develop a categorical variable based on the observed ROA and its change in the last year. Thus, there are three categories associated to the variable: i) Stable situation when there was a positive ROA and a positive change in this indicator; ii) Warning situation, when firms present a positive ROA and a negative change; and iii) Crisis situation, when firms present a negative ROA.

The control variables for the study include variables at the board level such as the board size, the number of retirements of directors and the betweenness centrality of the board. Literature suggests that centrality of a firm within the networks may positively influence the resources accessed by the firm and therefore its financial performance (O'Hagan, 2017). As firm control variables are the age of the firm (log-transformed), the size measured in the total assets value (log-transformed), a risk indicator measured by the long-term debt over the total assets (Bolouta, 2013) and a liquidity indicator measured by the current assets over the total assets (Amore et al., 2014). We also included the change in the ROA of the industry to control for overall tendencies.

To test the hypotheses of the study we use a panel regression model with fixed effects for the firm. The fixed timeless effect was proved with a Breusch-Pagan test and the fixed effects specification corroborated by a Hausman test. Both tests were favorable to our specification with a 99.9% confidence level. We also control for time fixed effects.

## **RESULTS**

Table 1 presents the descriptive statistics and correlation matrix of the variables used in the study. Only the betweenness centrality presented a high correlation with some of the independent variables but the evaluation of the variance inflation factor (VIF) did not presented risks of collinearity in the models.

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Insert Table 1 about here

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Table 2 presents the models to test Hypothesis 1, 2, 3 and 4. Model 1 shows that the number of retirements from the board and the firm's age have a negative effect on the ROA, while the

firm's size has a positive impact. Models 2a, 3a, 4a, 5a 6a and 7a show the general results for each independent variable measured for the board team. Interestingly, these models show that when the variables are calculated for the whole board team, without making distinctions by gender, there are not significant relationships to explain the firm financial performance. This result illustrates the importance of evaluating the information resources of the board by the gender of the directors.

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Insert Table 2 about here

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Hypothesis 1 indicates that the longer the experience of the male directors the higher the financial performance. This hypothesis is not validated with the experience in the firm (Model 2b) and with the experience in the industry the result shows a negative relationship (Model 3b), as an additional year of experience of the male directors in the industry reduces the ROA in 0.009 ( $\rho < 0.05$ ). Hypothesis 2 predicts that the more diverse experience of female directors the higher the firm financial performance. Model 4b shows that when female directors are appointed in one additional board the ROA of the firm increases in a 0.005 ( $\rho < 0.05$ ). Additionally, the diversity of industries in which female directors participate has a positive impact on the ROA of the firm ( $\beta = 0.007$ ,  $\rho < 0.05$ ; Model 5b). These results give support to the Hypothesis 2.

Regarding the effect of interlocks, the Hypothesis 3 indicates that the higher the frequency of interlocks for men the higher firm financial performance. The Model 6b in Table 2 shows that the relation between the frequency of the interlocks of the male directors and the ROA is negative ( $\beta = -0.014$ ,  $\rho < 0.05$ ), a result that is opposite to what was predicted. We note however that the performance of the firm increases to the extent that female directors have frequent interlocks ( $\beta = 0.010$ ,  $\rho < 0.05$ ). Hypothesis 4 predicts that firms will benefit from female directors that have a higher number of interlocks. This hypothesis is not supported according to the results of Model 7b. This model however, in line with the Model 6b, shows a negative relationship between the number of interlocks of male directors and the ROA ( $\beta = -0.002$ ,  $\rho < 0.05$ ).

The results for the Hypothesis 5 are presented in the Table 3. The Hypothesis 5a predicts that informational resources of male directors will be negatively related to the firm financial performance in crisis times. The Model 1 that relates the experience of the board team by gender with performance shows that the experience of the males in the board team is positively related to the ROA in stable situations ( $\beta = 0.010$ ,  $\rho < 0.05$ ) but not in any other situation. The Model 2 shows that the experience in the industry of males and females in the board team is not related to financial

performance in any of the considered situations. Thus, the Model 1 gives support to the Hypothesis 5a and allows precisising that the more relevant experience for male directors is the experience in the firm.

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Insert Table 3 about here

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Model 3 and Model 4 in Table 3 consider the diverse experience of the board team by gender as explanatory variables of the performance of a firm. These models show that in warning ( $\beta=-0.009$ ,  $\rho<0.01$  for the number of firms and  $\beta=-0.018$ ,  $\rho<0.01$  for number of industries) and crisis situations ( $\beta=-0.008$ ,  $\rho<0.08$  for the number of firms and  $\beta=-0.019$ ,  $\rho<0.05$  for number of industries) the diverse experience of male directors in a board team is negatively related to the ROA while this experience does not have any influence when the situation of the firm is stable. These results give support to the Hypothesis 5b. Additionally, these models show that the experience diverse of female directors is positively related to financial performance when firms have a stable situation ( $\beta=0.006$ ,  $\rho<0.01$  for the number of firms and  $\beta=-0.008$ ,  $\rho<0.05$  for number of industries).

Hypotheses 5a and 5b were also evaluated considering the informational resources originated in board interlocks. In Model 5, the frequency of the interlocks of male directors has a negative relationship with firm performance is significant only in warning ( $\beta=-0.026$ ,  $\rho<0.01$ ) and crisis ( $\beta=-0.030$ ,  $\rho<0.01$ ) situations, but no at stable situations of the firm, confirming the Hypothesis 5b for informational resources of interlocks. Under stable situations the frequency of interlocks of male directors in the board team are not significant to explain the firm performance. This model also shows a positive relationship of the frequency of interlocks of female directors with performance under warning situations ( $\beta=0.010$ ,  $\rho<0.05$ ). Finally, Model 6 in Table 3 illustrates that the number of interlocks of male directors is negatively related to the firm performance in all of the considered situations ( $\beta=-0.002$ ,  $\rho<0.05$  in stable situations;  $\beta=-0.003$ ,  $\rho<0.01$  in warning situations; and  $\beta=-0.003$ ,  $\rho<0.05$  in crisis situations). The results of the Model 6 corroborate the Hypothesis 5b but offer opposite results for the Hypothesis 5a. This model also indicates that in stable situations the number of interlocks of female directors is positively related to the performance of the firm ( $\beta=0.001$ ,  $\rho<0.01$ ).

## DISCUSSION

The purpose of this article was to analyze the contributions of the board team to the organization under an information-processing approach, which maintains that people process information in different ways according to their gender. It was argued that this approach facilitates a better comprehension of the multiple results that relate different types resources of the board team with firm performance. The study finds that experience and interlocks of the directors provide the board team with information that is processed differently by males and females in the board team, and according to these differentiated processes the informational resources of the board team may influence the performance of the firm. Diverse experiences and interlocks provide women with more information that enhance their skills as comprehensive processors of information. This result suggests that the creativity and the innovative ideas that literature associate with the presence of female directors in the board team (Torchia et al., 2011) origins in their capacity to process multiple information, as this study shows when positively relates the information processed by women with performance. The comprehensive capacity to process information of women is particularly relevant in low-complexity situations (stable) and also in medium-complexity situations (warning) as most literature evidences (Post & Byron, 2015), but in crisis times their information resources seems to be surpassed.

In the case of male directors, long experience in the firm is particularly useful to enhance their contributions to the firm in stable situations. Long experience in the firm, in contrast to long experience in the industry, provides males with direct information of and in the source, with little need of elaboration on it to elucidate cause-effect relationships. By mean of long experience, male directors validate key information, that they have selected to interpret a situation. When the stage of the firm is stable, without alerts of poor performance, the information that male directors manage, mainly through their experience, is positively related to performance because it aligns to the needs of the firm. In stable contexts, the knowledge of the drivers of such stability becomes fundamental to maintain it. However, the information at high thresholds, which is skillfully managed by male directors, losses relevance when the performance of the firm is poor. Although selectivity hypothesis proposes that the differences between men and women will disappear when there are elements that call the attention of men in such way that they engage in a more comprehensive information-processing (Chang, 2007; Darley & Smith, 1995; Meyers-Levy & Sternthal, 1991), this study shows that in complex situations (crisis situation), the reaction of male



directors may be not enough to contribute positively to the firm because the complexity associated with both poor performance and the informational resources available exceeds the capacity of males to comprehensively process the information. From this result we infer that the effect of the attentional alert on the success of the engagement of men into comprehensive information-processing will be contingent to the level of complexity to be managed.

Additionally, the results of the study show that interlocks play a positive role when they are associated to female directors instead of male directors and independently on the type of measure (diversity or frequency, which was hypothesized as a useful resource for male directors). Our understanding of this result is that women, more than men, are able to take advantage of the information accessed through co-directors, given that this information may be characterized as informal and in consequence with high levels of subjectivity. Given the subjectivity of this information men either do not have the enough comprehensive capacity to manage this information or decide to ignore it. In contrast, although women benefit mainly from the diversity of information, the subjective information of the co-directors became an opportunity to enhance their propensity to search for external information (Barber et al., 2009). This should be particularly true when women face disadvantageous positions and they are motivated to gain legitimacy in their role. However, this aspect needs a deeper exploration.

Our results imply that the analysis of the resources and contributions of the board team to the organization should be extended to consider the effect of gender as a factor that creates differences in them. Research on women in board of directors has offered mixed results regarding their relationship with the performance of the firm (Post & Byron, 2015; Terjesen et al., 2009). So, this study shows that gender as cross cultural characteristic has effects that extend beyond indexes of gender diversity or the quantity of positions held by women. The differences in socialization of genders influence the mechanisms they use to interpret the context and make decisions within it and this view influences the way in which they use the available resources such as the information originated through experience and interlocks. These results have several implications for research. First, the understanding of the effects of gender of the board team in firm performance require more exploration. Second, the perspective of information may be applied to other resources such as background or board dynamics, and to understand different outcomes of the board team in the firm (e.g. social responsibility). Third, although the heterogeneity of resources has been set from upper echelon theory as the main element through which the board composition may influence positively

the organization, this study shows that there are other characteristics of the board resources that deserve also attention. Fourth, the analysis of gender and other cross-cultural characteristics as influential as it, should move forward indexes of diversity because these indexes hide the differentiated effects of the resources associated to these characteristics, and do not equate them with the specific needs of the organization.

## CONCLUSION

Literature on boards of directors tends to observe that the experiences and interlocks have similar effects on the members of the board team and in consequence on the firm. However, this literature has evidenced that board members may contribute differently to the board, given their personal characteristics, such as gender. This study shows that the board team contributes to the performance of the firm through mechanism of information-processing differentiated by gender. While male board members take advantage of the information from long experience in the firm to influence positively the performance when the environment is stable, female board members use subjective and diverse information from experience and interlocks to positively impact the firm when it faces complex situations. Understating how the board team manage information is an appropriate mechanism to understand its influence on performance.

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Table 1. Descriptive and correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>Mean</b>	0.00	2.28	2.38	2.22	1.55	1.24	10.08	0.00	7.05	2.42	0.01	2.75	15.67	0.01	0.05
<b>Standard deviation</b>	0.41	0.72	0.67	1.46	0.63	0.47	5.01	0.02	1.65	3.03	0.01	0.8	1.63	0.07	0.09
<b>Minimum</b>	-25.13	1	1	1	1	1	5	-0.35	6	0	0	0	0	0	0
<b>Maximum</b>	14.31	3	3	13.17	5.5	7.23	47.33	0.44	10	10	0.21	4.7	22.81	0.99	1
1 ROA															
2 Experience in the firm	.01														
3 Experience in the industry	.00	.93**													
4 Diverse experience in firms	.00	.12**	.25**												
5 Diverse experience in industries	.01	.14**	.2**	.81**											
6 Frequency of the interlocks	.01	.07**	.16**	.71**	.49**										
7 Number of interlocks	.01	.11**	.21**	.74	.71*	.22									
8 Change in ROA of the industry	.00	-.06*	-.06	.01**	.01**	0**	.02**								
9 Board size	.01**	.01**	.01**	.02**	.06**	-.02**	.42**	.02**							
10 Retirements	-.05*	-.07**	-.06**	-.03**	-.03**	-.02**	.05**	-.04*	.2**						
11 Betweenness centrality	.01**	.08**	.14**	.46**	.46**	.1	.61**	-.01*	.12**	.05**					
12 Firm's age	.03**	.34**	.3**	.02**	.06**	-.01**	.07**	-.01**	.08**	-.06**	.04**				
13 Firm's size	.13	.2**	.22**	.21**	.23*	.09**	.28**	-.02**	.14**	-.05**	.18**	.23**			
14 Long-term leverage	.00	-.03**	-.02**	.02**	.01**	.02**	.03**	.02	.04**	.03**	.02**	-.05**	.04**		
15 Liquidity	-.01**	-.06**	-.07**	-.1**	-.09**	-.05**	-.09**	.01**	-.02**	.01**	-.05**	-.07**	-.2**	-.01**	

Notes: \*\* p<0.05, \* p<0.01.

Table 2. Experience and Interlocks as source of information by gender.

Independent Variable	1 Controls	2 Long experience in the firm	3 Long experience in the industry	4 Diverse experience in firms	5 Diverse experience in industries	6 Frequency of the interlocks	7 Number of interlocks
<b>Model a</b>							
Board team average		-.001	-.005	-.001	-.001	-.004	-.002
<b>Model b</b>							
Change in industry ROA	.248	.223	.222	.248	.248	.248	.247
Board size	-.001	.001	.000	-.002	-.002	-.002	-.001
Number of retirements	-.006**	-.005**	-.005**	-.006**	-.006**	-.006**	-.006**
Betweenness centrality	.179	.257	.262	.242	.237	.198	.335
Firm's age	-.059**	-.051**	-.047*	-.059**	-.059**	-.060**	-.059**
Firm's size	.202**	.206**	.206**	.202**	.202**	.202**	.202**
Risk	.004	.004	.004	.004	.004	.004	.004
Liquidity	-.062	-.076	-.076	-.062	-.062	-.062	-.062
Male directors		-.004	-.009*	-.004	-.008	-.014*	-.002*
Female directors		.004	.005	.005*	.007*	.010*	.001
Constant	YES	YES	YES	YES	YES	YES	YES
Time fixed effects	YES	YES	YES	YES	YES	YES	YES
Observations	49,259	47,431	47,431	49,259	49,259	49,259	49,259
R-squared	0.063	0.064	0.065	0.063	0.063	0.063	0.063
Number of firms	11,367	11,259	11,259	11,367	11,367	11,367	11,367

Notes: \*\* p<0.01, \* p<0.05; ROA is the dependent variable for all models; Controls estimators correspond to models b and do not differ significantly from the ones for models a.

Table 3. The situation of the firm as contingency for information resources.

Independent variable	1 Long experience in the firm	2 Long experience in the industry	3 Diverse experience in firms	4 Diverse experience in industries	5 Frequency of the interlocks	6 Number of interlocks
Male directors in:						
Stable situation	.010*	.005	-.005	-.009	-.006	-.002*
Warning situation	.003	-.002	-.009**	-.018**	-.026**	-.003**
Crisis situation	.005	-.001	-.008*	-.019*	-.030**	-.003*
Female directors in:						
Stable situation	.003	.003	.006**	.008*	.006	.001**
Warning situation	.002	.002	.003	.004	.010*	.000
Crisis situation	-.001	-.000	.004	.004	.014	-.000
Controls	YES	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES	YES
Time fixed effects	YES	YES	YES	YES	YES	YES
Observations	37,239	37,239	38,967	38,967	38,967	38,967
R-squared	0.096	0.096	0.090	0.090	0.090	0.090
Number of firms	8,570	8,570	8,670	8,670	8,670	8,670

Notes: \*\* p<0.01, \* p<0.05; ROA is the dependent variable for all models; Control variables include change in industry ROA, board size, number of retirements, betweenness centrality, firm's age, firm's size, risk and liquidity.