Board human capital and disclosure quality in high growth firms

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December 2018

Abstract

This study analyzes the moderating role of growth options in the relationship between disclosure quality and board human capital by focusing on director expertise and director tenure. Since the information environment is different for high-growth firms, characterized by higher information asymmetries, the role of boards of directors in the disclosure process may be affected by a firm's growth opportunities. The sample is composed of companies in the S&P500 index for the period 2007-2015. The results indicate that board human capital is more important in high-growth firms to assure the disclosure quality. These findings highlight the relevance of directors' human capital in the reporting process and specifically contribute to the debates regarding directors' tenure and expertise. Moreover, the results emphasize the need for the consideration of the context of firms to understand the role of boards. Our evidence also has direct implications for companies and regulators in defining requirements for board members.

Key words: board human capital; disclosure quality; growth options; board expertise; board tenure.

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1. Introduction

The purpose of this paper is to study the moderating role of growth options in the relationship between board human capital and disclosure quality. Much attention has been devoted in management research to the configuration of corporate governance mechanisms to guarantee the quality of the information disclosed by firms. Particularly, the board of directors has been considered to be crucial in assuring the quality of the reporting process and helping stakeholders to forecast the company's future economic performance and cash flows (Eng & Mak, 2003). Previous studies suggest that better-functioning, more efficient boards may lead to better disclosure practices (Karamanou & Vafeas, 2005; Peasnell, Pope, & Young, 2005; Wang & Hussainey, 2013), although the evidence regarding the association between the board characteristics and disclosure practices is far from definitive. In relation to the characteristics that are required for a board to be effective, prior research highlights how certain board human capital features, such as board expertise, provide valuable knowledge and skills. This may positively influence the monitoring ability of directors and their capability to participate in strategic decisions, thereby contributing to the development of boards' functions (Carcello, Hermanson, & Ye, 2011; Kor & Misangyi, 2008). Furthermore, board tenure is another important board human capital characteristic that is related to the familiarity with the firm and also affects how directors monitor activities and make strategic decisions (Ben-Amar, Francoeur, Hafsi, & Labelle, 2013). In the United States, as in other developed countries, both director features have been specifically considered by the Principles of Corporate Governance (Business Roundtable, 2016). These recognize that "*the composition of a board should reflect a diversity of*

thought, backgrounds, skills, experiences and expertise and a range of tenures that are appropriate given the company's current and anticipated circumstances and that, collectively, enable the board to perform its oversight function effectively".

Despite the ongoing academic and professional debate on the impact of board expertise and board tenure on strategic decisions, empirical studies have failed to provide conclusive findings on the association between these director characteristics and disclosure practices. This paper extends the previous research on the association between board human capital and disclosure quality by exploring how a firm's information environment, conditioned by its growth options, may determined the role of boards of directors in disclosure decisions. The information environment is different in high growth firms, where there is more information asymmetry due to the difficulty of outsiders having sufficient information about the company's future investment opportunities (Core, 2001). Industry and/or financial expertise and familiarity with the firm (tenure) are traits of directors that are particularly important to be able to ascertain the investment opportunities of the firm and communicate more effectively with its stakeholders. Board human capital is therefore expected to be more important in assuring disclosure quality in high growth firms. The prior literature, however, fails to consider that the relationship between board features and disclosure quality can be influenced by the information environment.

Consistent with previous studies, board human capital is proxied with board expertise (industry and financial) and board tenure (Johnson, Schnatterly, & Hill, 2013) and disclosure quality is proxied with accuracy and dispersion of analysts' forecasts (Ahmad-Zaluki & Wan-Hussin, 2010; Bhat, Hope, & Kang, 2006; Byard, Li, & Weintrop, 2006; García-Meca & Sánchez-Ballesta, 2011). In addition, in line with recent research (Chen, Hsu, & Chang, 2016) this study integrates agency and resource dependence theories to

provide a more complete understanding of how board human capital may improve strategic decisions, such as disclosure practices.

Our sample is composed of companies in the S&P500 index for the period 2007-2015. Our results confirm the moderating role of growth options in the association between board human capital and the quality of information disclosure. Both board expertise and board tenure become relevant in high-growth firms for the improvement of disclosure quality. In particular, disclosure quality can be improved with board expertise, but worsened with longer tenures. These results suggest that, on the one hand, growth opportunities may increase the need for directors to have a financial background as well as a thorough knowledge of firm and industry specific information. Yet, longer tenures seem to reduce the directors' ability to monitor and effectively advise managers (Hillman, Shropshire, Certo, Dalton, & Dalton, 2011) as directors became entrenched in their position and develop a friendly relationship with managers.

Our paper contributes to the literature on corporate governance and disclosure in several ways. First, , the inclusion of growth options as a contextual factor which moderates the relationship between board human capital and disclosure quality is the main novelty of this paper. Our evidence highlights that the one-size-fits-all approach may be inappropriate to understand the role of the board of directors in assuring disclosure quality. More specifically, our results shows how this relationship is moderated by growth options, indicating that the consideration of the information environment provides a better understanding of how board human capital affects disclosure quality. Second, our findings especially sharpen the debates regarding board expertise and board tenure, since board expertise becomes particularly significant in the disclosure process in the presence of higher information asymmetries. Moreover, although the literature is inconclusive

regarding the optimal directors' tenure, there have been recent claims that regulators should set a limit on board tenure. Our results partially support this view as they imply that extended tenures can be potentially harmful for high-growth firms. Last but not least, our evidence reinforces the importance of board human capital in strategic decisions, by specifically emphasizing the role of expertise and tenure of directors as important features that determine effective decisions regarding disclosure practices.

The paper is organized as follows. The literature review and the hypothesis development are provided in Section 2. Section 3 describes the data collection process and the sample, and explains the research method. Section 4 discusses the results of the empirical analysis and Section 5 summarizes the contributions of the paper.

2. Previous literature and hypothesis development

The search for board effectiveness and the characteristics that help to attain it has gained increasing attention in corporate governance research. Traditionally, the literature assigns the boards the provision of advice in strategic decisions and the monitoring of top management (Hillman & Dalziel, 2003; Pugliese et al., 2009). In this regard, both agency theory and resource dependence theory have been combined to explain how directors are involved in corporate decisions (Bravo & Reguera-Alvarado, 2017; Chen et al., 2016; Hillman & Dalziel, 2003). Specifically, one important role of the board is to assure an effective disclosure policy (Cuadrado-Ballesteros, Rodríguez-Ariza, & García-Sánchez, 2015; Eng & Mak, 2003). However, the participation of directors in strategic decisions needs to be understood in the context of firm-specific characteristics (Zona, Zattoni, & Minichilli, 2013). Particularly, the effect of boards on disclosure decisions depending on the context of the firm still remains an open question. In this paper, we suggest that the link

between boards attributes and disclosure quality may vary across different information environments. A possible moderator of this relationship is the firm's investment opportunity set, as an indicator of growth opportunities and information uncertainty. High growth firms can be harder to value due to a greater uncertainty regarding future expected payoffs. In a seminal paper, Myers (1977) characterizes the value of the firm as composed of two parts: the present value of assets already in place and the present value of the firms' options to make future investments on possibly favorable terms. The future investments, however, are discretionary. As a result, information asymmetry is high for firms with high growth opportunities (Core, 2001). Therefore, these companies can seek some reduction in information asymmetry through improved disclosure practices, but they are still likely to have more information asymmetry than low-growth firms. This is the case because as outside stakeholders will not have the inside information and the specialized knowledge of managers, it will be difficult for outsiders to ascertain the investment opportunities that are available to the firm (Gaver & Gaver, 1993).

Moreover, the opportunistic behavior of managers can be accentuated by the higher information asymmetry, as managers - who have information about the investment opportunity choices that outsiders do not have - choose to invest in order to maximize their own utility at the expense of that of stakeholders. As the growth opportunities increase, the observability of managers' actions decrease, raising the agency costs of monitoring and creating the need for growth firms to adopt particular control mechanisms, such as corporate governance and information disclosure (Cordeiro, Veliyath, & Romal, 2007; Hutchinson, 2002). Specifically, directors must take special care in high-growth firms to ensure that the firm has an adequate disclosure policy to convey the information about the firm's future potential to the market. In addition, from a resource dependence view, given

6

the complexity of high-growth firms, the lack of appropriate resources may intellectually constrain directors from being involved in specific disclosures decisions (Kroll, Walters, & Wright, 2008). In such a scenario, corporate governance mechanisms, and specifically board attributes, play a key role in the disclosure process of high-growth firms.

The previous literature has analyzed the influence of a number of director characteristics on corporate decisions. In this regard, board human capital has been considered to be important to improve board effectiveness (Certo, 2003; Hillman & Dalziel, 2003). Johnson, Schnatterly, & Hill, (2013, p. 240) define board human capital as the skills and experiences that directors use in their decision-making processes and that can be characterized by their expertise (as industry or financial) and their tenure, which can proxy for the director's familiarity with a firm.

2.1. Board expertise and disclosure quality

The industry-expertise of directors is important in assuring the board's ability to perform its advising and monitoring duties. Consistent with the resource dependence theory, this kind of expertise provides directors with valuable resources that are influential in the decision-making process within a board (Kor & Sundaramurthy, 2009). Directors with industry-expertise are more likely to be proactive in decisions regarding the reporting process since they have the necessary knowledge to ask the right questions at board meetings, and a better ability to improve their information gathering (Rutherford & Buchholtz, 2007). At the same time, from an agency theory perspective, board members with expertise related to the industry of the target company can more accurately evaluate the situation of the firm and oversee corporate strategies (Kroll et al., 2008) being better able to evaluate investment opportunities.. In particular, industry-expertise is likely to help to understand the

complexities of a company`s business environment and improve the monitoring of the disclosure process (Francis, LaFond, Olsson, & Schipper, 2004; Reichelt & Wang, 2010). The impact of board members with industry-expertise can be particularly significant in the presence of growth options because these directors have a deeper understanding of the risk and opportunities in the industry (Chen et al., 2016; Faleye, Hoitash, & Hoitash, 2018). These directors can be determinant in firms with high growth options since they are able to better understand the firm's unique challenges and opportunities, and analyze any information pertinent to the firm's operation and financial conditions (Wang, Xie, & Zhu, 2015).

In addition, researchers have also considered financial expertise as a resource that increases a board's effectiveness. Financial experts can provide the board with the necessary skills to be involved in specific and complex decisions related to the disclosure of information (Burak Güner, Malmendier, & Tate, 2008; Shiah-Hou & Cheng, 2012). In line with agency theory, board members need to be able to understand and correctly interpret information to supervise the reporting process, and financial experts are likely to contribute toward a better monitoring of specific disclosures (Carcello et al., 2011; Karamanou & Vafeas, 2005). On the other hand, financial expertise is likely to provide the necessary resources to become thoroughly involved in decisions related to the disclosure of information (Badolato, Donelson, & Ege, 2014). In particular, these directors may be particularly relevant in the disclosure process of high-growth firms because they can lower costs in acquiring information about the complexity and associated risks of future financial operations (Harris & Raviv, 2008) and they enhance the ability to predict future projections and estimates (García-Sánchez et al. 2017).

According to the previous arguments, we posit that board expertise is associated with disclosure quality. Nevertheless, due to the higher information asymmetries presented for high-growth firms, we predict that board expertise is likely to be more relevant in these firms. Therefore, the following hypotheses are formulated:

H1a: *There is a positive association between board expertise and disclosure quality.*

H1b: *The positive association between board expertise and disclosure quality is dependent on growth opportunities.*

2.2. Board tenure and disclosure quality

Regarding board tenure, two opposite views have been commonly employed in the literature to explain the effect of director tenure on board effectiveness. First, the expertise hypothesis (Vafeas, 2003), based on the resource dependence theory, posits that a longer tenure is associated with a greater experience, commitment and competence of directors, because it provides a director with important knowledge about the firm and its business environment. Moreover, long-tenured directors have experience dealing with multiple CEOs, and accumulated knowledge about the business and the industry, leading to better strategic advice (Dou, Sahgal, & Zhang, 2015). In addition, directors with longer tenures may have enough familiarity with their responsibilities and better fulfill their tasks, thereby improving disclosure quality (Liu & Sun, 2010). In this line, prior studies have suggested that directors tenure, up to certain levels, may help to improve the quality of disclosures (Baatwah, Salleh, & Ahmad, 2015; Rao & Tilt, 2016). Nonetheless, the previous literature mainly argues in favor of having a balanced board in terms of tenure. This is explained by two main hypotheses derived from agency theory. First, the management friendliness hypothesis identified by (Vafeas, 2003) states that long-tenured directors are more likely to

have a friendly relationship with managers and, as a result, be less likely to monitor them. Second, the entrenchment hypothesis (Beasley, 1996) also argues that directors with longer tenures become entrenched in their positions and are less vigilant and that this can worsen the monitoring of the disclosure process. Consequently, extended tenure is generally considered by the literature as a negative attribute for directors (Ben-Amar et al., 2013) and, at higher levels of tenure, the relationship between board tenure and the disclosure quality may be negative. Specifically, Livnat, Smith, & Suslava (2016) suggest that the board tenure may have negative effects if it exceeds nine years on average. Notwithstanding, empirical evidence is inconclusive and, in the US context, some organisms such as the Council of Institutional Investors (CII) rejects outright term limits, because longer-tenured directors often improve a board's overseeing capabilities and these limits could minimize the critical expertise of boards. In a context where high growth options are present, this expertise stands as a necessary attribute that provides the required knowledge about the company and its environment to be qualified to assess future investment opportunities and the way they are communicated to the market. Yet, the negative effects, in case the management friendliness hypothesis or the entrenchment hypothesis dominate, could be accentuated due to the higher information asymmetries.

Consistent with the above arguments, we predict an association between board tenure and disclosure quality. Yet, the effect of board tenure depends on the average tenure of directors, which may lead to the prevalence of one specific hypothesis (expertise, management friendliness and entrenchment). As to which high-growth firms are expected to have greater information asymmetries, the role of directors may be reinforced for these firms, and therefore the previous relationship could be stronger. Therefore, we consider this an empirical question and formulate a bidirectional hypothesis:

H2a: *There is an association between board tenure and disclosure quality*.

H2b: *The association between board tenure and disclosure quality is dependent on growth opportunities*.

3. Research method

3.1. Sample

Our sample is composed of companies in the S&P500 index for the period 2007-2015. The sample is confined to firms in the S&P 500 to increase data availability for members of the board of directors. Several databases are merged in order to obtain the necessary information. First, data about directors is obtained from ASSET4. Second, financial data is extracted from Worldscope. Finally, the data on analysts' forecasts is obtained from the Institutional Broker's Estimate System (I/B/E/S). As a result, a panel data of 3,303 firm-year observations is built.

The dependent variable, the explanatory and control variables are defined in the next section and presented in Table 1.

Insert Table 1 about here

3.2. Variables

3.2.1. Dependent variable: disclosure quality

In line with the previous literature, disclosure quality is proxied with two properties of analysts' forecasts: analysts' forecasts accuracy (AFA) and analysts' forecast dispersion (DIS). The literature has traditionally documented that the quality of disclosure policies of a

firm is positively related to AFA and negatively related to DIS (Enache & Parbonetti, 2013; Lang & Lundholm, 1996; Vanstraelen, Zarzeski, & Robb, 2003). In this sense, forecast dispersion complements forecast accuracy as a measure of information quality since a higher information quality minimizes uncertainty about the firm's information environment and therefore leads to more agreement among analysts and less DIS (Abernathy, Kang, Krishnan, & Wang, 2016; Imhoff & Lobo, 1992).

AFA is defined as the negative of the absolute value of the difference between the Institutional Broker's Estimate System consensus forecast available at the beginning of the fiscal year and the actual earnings per share for the year, scaled by stock price (Abernathy, Herrmann, Kang, & Krishnan, 2013; Bhat et al., 2006; Katmon & Farooque, 2017; Lang & Lundholm, 1996). DIS is defined as the standard deviation in analysts' forecasts divided by the stock price (Enache & Parbonetti, 2013; Hope, 2003; Lang & Lundholm, 1996).

3.2.2. *Explanatory variables: board human capital*

Following prior research (Johnson et al., 2013), we define board human capital with two variables that proxy for the skills and experiences that board members bring to the decision-making process at a board meeting: board expertise (EXP), and board tenure (TEN). Consistent with previous studies that analyze the importance of directors with specific industry or financial expertise (Garcia-Torea, Fernandez-Feijoo, & de la Cuesta, 2016; Ullah et al., 2017; Guerrero-Villegas et al., 2018), EXP is computed as the proportion of directors with such expertise. TEN is calculated as the average number of years that directors spend on a particular board (Dalziel, Gentry, & Bowerman, 2011; Hillman et al., 2011; Kor & Sundaramurthy, 2009).

3.2.3. Growth options and other control variables

Several variables are also included as potential determinants of the accuracy and dispersion of analysts' earnings forecasts. First, the market-to-book ratio (MTB) is employed as a proxy for the growth options of a firm (Chan, Faff, Khan, & Mather, 2013; Chung & Charoenwong, 1991). The previous literature shows that the MTB has the highest information content compared to alternative proxies for a firm's investment opportunity set (Adam & Goyal, 2008). The greater the value of this ratio, the more attractive the company will be for investors (Alonso et al., 2005). To test whether the relationship between a director's human capital and disclosure quality is driven by firms with high growth options, we include interaction terms between each director variable and a dummy variable designed to capture high growth options (D_MTB). Therefore, this variable is coded as 1 if the firm-year observation has an above overall sample median value for MTB and zero otherwise. Although the market-to-book ratio has been extensively used in the literature as a proxy for growth options, we also employ the Tobin`s Q as an alternative measure in order to carry out a sensitivity analysis. Tobin`s Q (TobinQ) is defined as the market value of a firm divided by the replacement cost of the firm`s assets (Fu et al., 2016). Additionally, a variable related to the loss (LOSS) of firms is included because analysts' forecasts for loss-reporting firms are on average less accurate and more disperse than forecasts for profit-reporting firms (Hwang, Jan, & Basu, 1996). This variable is a dummy indicator, which is an indicator variable equal to 1 if the firm had negative earnings, and 0 otherwise (Bhat et al., 2006). Firm size (SIZE) - measured as the logarithm of market value (Abdul Wahab, Allah Pitchay, & Ali, 2015; Abernathy et al., 2013) - is also included in the model. Prior research consistently shows that analyst forecasts are better for larger firms (García-Meca & Sánchez-Ballesta, 2006). Larger firms have greater requirements for the disclosure of

information (Enache & Parbonetti, 2013). These companies generally report more stable earnings and therefore more accurate and less disperse forecast can be made (Jelic, Saadouni, & Briston, 1998). Company size can also affects analysts' incentive to gather information about firms and analysts' earnings forecasts (Lang & Lundholm, 1996). Furthermore, due to the uncertainty of future earnings, earnings of firms with a higher variability in their earnings are more difficult to predict (Jaggi & Jain, 1998). Earnings variability (VAR) is measured by the coefficient of variation of earnings for the previous five years (García-Meca & Sánchez-Ballesta, 2011). In addition, the coverage of analysts (COV), measured by the logarithm of analysts following (Abernathy et al., 2013), is also considered since the number of analysts following the firm increases the competitive pressure in offering information of a high quality (Bozzolan, Trombetta, & Beretta, 2009). Board independence is also included as a control variable, since independent directors provide a higher quality of board monitoring (Klein, 2002) and help to improve disclosure quality (Cheng & Courtenay, 2006). Board independence (BIND) is measured by the proportion of independent directors in a board (Saeed & Sameer, 2017). Finally, the complexity of the forecasting task may differ across industries and across time periods (García-Meca & Sánchez-Ballesta, 2011). We control for industry and year fixed effects including a vector of industry dummies (IND) and a vector of year dummies (YEAR).

3.3.   Model specification

The general models employed in order to test our hypothesis are:

$$AFA_{it} = \alpha + \beta_1 EXP_{it-1} + \beta_2 EXP_{it-1} * D\_MTB_{it-1} + \beta_3 TEN_{it-1} + \beta_4 TEN_{it-1} * D\_MTB_{it-1} + \beta_5\ MTB_{it-1} +$$

$$\beta_6 LOSS_{it-1} + \beta_7\ SIZE_{it-1} + \beta_8\ VAR_{it-1} + \beta_9\ COV_{it-1} + \beta_{10}\ IND_{it-1} + \beta_{11}\ YEAR_{it-1} + \varepsilon_{it-1} \qquad (1)$$

$$DIS_{it} = \alpha + \beta_1 EXP_{it-1} + \beta_2 EXP_{it-1} * D\_MTB_{it-1} + \beta_3 TEN_{it-1} + \beta_4 TEN_{it-1} * D\_MTB_{it-1} + \beta_5 MTB_{it-1} +$$

$$\beta_6 LOSS_{it-1} + \beta_7 SIZE_{it-1} + \beta_8 VAR_{it-1} + \beta_9 COV_{it-1} + \beta_{10} IND_{it-1} + \beta_{11} YEAR_{it-1} + \varepsilon_{it-1} \qquad (2)$$

Where α is the intercept and β is the coefficient of each independent and control variable. Our model combines cross-sectional observations with time series. Thus, we estimate our model using a panel data analysis. In order to avoid omitted variable bias, both expertise and tenure are included in the same specification. We use the Hausman test to choose the most suitable estimation method: fixed effects or random effects. The Hausman test suggests that unobserved effects are important and that models should be estimated using fixed effects. Fixed effects control for time-invariant and unobserved firm characteristics.

The use of fixed effects helps to eliminate some unobservable factors, but some endogeneity issues might remain because of director self-selection (Dou et al., 2015). The previous literature notes that the selection of board members with certain attributes is probably not random and that reporting practices may influence board structure (Armstrong et al., 2014; Carcello et al., 2006). This would imply that individuals self-select boards where they serve based on certain characteristics. Specifically, directors who belong to firms with better disclosure practices can build their reputations and avoid undertaking an additional workload (Abernathy et al., 2013; Dou et al., 2015). Therefore, it is possible that those directors with higher expertise might choose boards of firms with better reporting practices, and that directors are only willing to stay longer periods, extending their tenure, in those firms. In order to mitigate these endogeneity concerns, and to ensure that analysts' forecasts capture financial information disclosed by firms, AFA and DIS were calculated one-year ahead (Enache & Parbonetti, 2013; Wang & Hussainey, 2013). The use of lagged explanatory variables attenuate any potential endogeneity issues of reverse causality by

precluding the possibility of directors self-selecting firms with better disclosure practices (Ben-Amar & McIlkenny, 2015; Carter, D'Souza, Simkins, & Simpson, 2010).

4. Results and discussion

Table 2 displays the descriptive statistics for the variables included in the statistical analyses. The average values for analysts forecast accuracy (-0.019) and dispersion (0.002) are in line with those of previous studies in the US context (Abernathy et al., 2013; Bhat et al., 2006). The percentage of board members with industry or financial expertise is 55%. Descriptive statistics for board tenure (mean 9.32; median 8.98) are higher than the values shown in other studies examining U.S. firms (Huang & Hilary, 2018; Livnat et al., 2016)[1]. The values for the market-to-book ratio (MTB) and Tobin`s Q (TobinQ) present a high variability, thus indicating the existence of important differences in relation to the growth options of the firms analyzed, which may have a potential effect on the role of directors' characteristics. Additionally, the descriptive statistics for board expertise and board tenure are examined for both high-growth options and low-growth options firms in order to guarantee that our results are not influenced by significant differences in board characteristics between these groups of firms. The results confirm that the mean and median differences are insignificant. The descriptive statistics for board expertise (mean 0.554; median 0.545) and board tenure (mean 9.145; median 8.875) in firms with low-growth options are similar to the values for board expertise (mean 0.549; median 0.546) and board tenure (mean 9.510; median 9.050) in firms with high-growth options.

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[1] Huang & Hilary (2018) use a sample of S&P 1500 firms over a 12-year period (1998-2010) and documents an average tenure of 8.2 years and a median tenure of 7.7 years. Livnat et al. (2016) use a larger sample of 3,000 firms over an 18-year period (1996-2014) and show an average tenure of 6.90 years and a median tenure of 6.33 years.

Regarding control variables, approximately 7% of the firms report a loss (LOSS) for the year. In line with the previous literature (Abernathy et al., 2013; Karamanou & Vafeas, 2005) the average number of analysts following a firm is 14.3. In relation with board independence, the mean percentage of independent directors is 81 for our sample. This confirms the compliance with the recommendation of US corporate governance principles.

Insert Table 2 about here

The sample correlations between all the variables are reported in Table 3. First, board expertise and board tenure are not correlated. Therefore, as suggested by Johnson et al. (2013), both characteristics measure different human capital attributes. Second, the bivariate correlation analysis shows slight associations between board human capital and analysts' forecast accuracy and dispersion. Results also fail to show a strong association between the market-to-book ratio and the Tobin`s Q. In addition, consistent with the theoretical arguments, most of the control variables also appear to be correlated with the properties of analysts' forecast (accuracy and dispersion). Overall, none of the variables show a significantly high correlation, which suggests multicollinearity is not likely to be an issue in our regression models[2].

Insert Table 3 about here

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[2] Generally, multicollinearity is considered be a problem if a correlation between independent variables is higher than 0.7 (Cooper & Schindler, 2003).

We report the regression models results in Table 4. We perform multivariate analyses using analysts' forecast accuracy (AFA) and analysts' forecast dispersion (DIS) as dependent variables in Equations (1) and (2). In addition, the assumptions underlying the regression model are verified for all the models, and no problems about multicollinearity and heteroscedasticity are present. Although the correlation coefficients are not high, we compute the variance inflation factor (VIF), and the VIF coefficients to confirm the inexistence of multicollinearity. The lack of heteroscedasticity has been tested with the Breusch-Pagan/Cook-Weisberg test. Finally, all the models contain year controls to ensure that one particular year is not unduly influencing our results. Our results remain robust to the inclusion of year controls.

Insert Table 4 about here

The results of the first model (Model 1), which consider all the control variables, are reported in columns 1 and 2. In line with the previous studies, a negative (positive) association between AFA (DIS) and both LOSS and VAR is found. The coefficients for both variables are significant at the 0.01 level and this association remains for all the regression models. Firm size (SIZE) is positively (negatively) associated with the AFA (DIS) coefficient, being significant at the 0.01 level for all the regression models.

Model 2 tests the role of the explanatory variables and Model 3 includes the interaction terms between both board expertise and board tenure and the dummy variable designed to capture high growth options (D_MTB). First, Model 2 fails to show a relationship between AFA or DIS and board expertise (EXP). In theory, a higher expertise enables directors to improve their monitoring and advising activity on the reporting process. All the same,

although we expected a positive association between this director characteristic and disclosure quality, not considering the moderation of the environment in this model might explain the lack of any relationship between both variables. In line with the recent literature (Veltrop, Molleman, Hooghiemstra, & van Ees, 2018; Zona et al., 2013), these findings suggest that a "one-size-fits-all" approach may not be the most appropriate to assess the effects of directors' characteristics on firm strategies. In fact, in the presence of high growth options (Model 3), board expertise is positively (negatively) associated with the AFA (DIS). Therefore, these findings support hypothesis H1b.

Second, a negative (positive) association between AFA (DIS) and board tenure (TEN) is reported in Model 2. Board tenure influences information quality and therefore the accuracy and dispersion of the analysts' forecasts. Nevertheless, while a director's firm-specific experiential knowledge may be crucial for boards to improve the disclosure quality, the results suggest that excessively long tenures can result in reduced monitoring effectiveness, thereby lessening the disclosure quality and decreasing (increasing) the accuracy (dispersion) of the forecasts. Next, the results in Model 3 show that the coefficient on the interaction term is also negative (positive) and significant, which suggests that the negative (positive) association between forecast accuracy (dispersion) and board tenure is moderated by the firms' growth opportunities. Consistent with the theoretical arguments, these directors' characteristics appear to be particularly relevant for firms with higher information asymmetries. Therefore, our hypotheses H2a and H2b are also supported.

In order to ensure that these results are not driven by our experimental design, additional sensibility analyses and robustness tests were performed. As commented in the previous section, the multivariate analysis was replicated by using the Tobin`s Q (TobinQ) as an alternative measure for growth opportunities. As predicted by Lyle (2018) and observed in

the Table 3, Tobin`s Q is not highly correlated with the market-to-book ratio and can be therefore as a complementary measure for growth opportunities. Previous literature has used it as a proxy for growth options and agency problems (Cao et al., 2008). Table 5 reports the results including Tobin`s Q and the interaction terms between each board variable and a dummy variable designed to capture high growth options (D_TobinQ), which is coded as 1 if the firm-year observation has an above overall sample median value for Tobin`s Q and zero otherwise. As it can be seen, the results are similar to those presented in Table 4 and confirm the relevance of growth opportunities as a moderators of the relationship between board characteristics (expertise and tenure) and disclosure quality. Moreover, although lagged explanatory variables attenuate potential endogeneity issues of reverse causality, an additional analysis is performed to ensure that the variables disclosure quality and directors` characteristics are not endogenously determined. First, to control for this potential endogeneity problem, in line with the related literature (Abernathy et al., 2013; Abernathy et al., 2014; Hoitash et al., 2009), a probit regression is initially estimated to determine the predicted probability of having a directors with specific expertise and with a high tenure. The dependent variables are a dummy variable that equals one if the firm has a high number of directors with specific expertise (above the median value) and zero otherwise, and a dummy variable that equals to one if the firm has directors with high tenure (above the median value) and zero otherwise. Consistent with previous findings, we identify firm size, leverage, operating performance and earnings variability as firm characteristics that can explain the presence of these directors on the boards (Abernathy et al., 2013; Linck et al., 2008; Jia, 2017). The probit regression enables to calculate the Inverse Mills ratio (the ratio of the probability density function to the cumulative distribution function), and we include it as an additional explanatory variable in the models

that are presented in Table 6. Results again confirm that the association between board characteristics (expertise and tenure) and disclosure quality is dependent on growth opportunities. The significance and direction of the main explanatory variables and the control variables remain basically unchanged after the inclusion of the Inverse Mills ratio in the equation. Second, firms with high growth opportunities might present directors with more expertise and tenure to assure a better information quality to mitigate information asymmetries. In order to discard this potential relation between corporate governance and growth opportunities, the mean and median differences are examined and presented in the Table 7 to guarantee that our results are not influenced by significant differences in board characteristics between the firms with high-growth options and low-growth options. This table confirms that the differences for board expertise are insignificant, therefore the values for this variable are similar for both groups of firms.

All the previous tests lead us to highlight the moderating role of growth options in the relationship between board characteristics and disclosure quality. On the one hand, the association between board expertise and disclosure quality depends on the growth opportunities of a firm. As commented in the theoretical framework, this expertise provides directors with unique skills. Specifically, industry knowledge and financial sophistication is often required to provide detailed disclosure practices (Xie, Davidson, & DaDalt, 2003), and this is particularly relevant in high growth firms. As expected, directors from high-growth firms may need specialized knowledge to ascertain the investment opportunities that are available to the firm and their expertise could be determinant in the communication process. In particular, directors with industry or financial expertise can anticipate future conditions of the industry and the impact of investment decisions, and provide more accurate information about the complexity of future scenarios and the risks of future

financial operations (García-Sánchez et al., 2017; Harris & Raviv, 2008). Previous research has highlighted that the role of the board members in providing specific abilities to the firm has become crucial for the selection of board members (Galia, Lentz, Max, Sutan, & Zenou, 2017) and has specifically emphasized that companies acknowledge the value of board members' expertise (Cohen, Krishnamoorthy, & Wright, 2010). We extend the previous literature by examining the influence of director expertise on information quality, and by highlighting their role in high-growth firms for the mitigation of information asymmetries.

On the other hand, longer tenures seem to be negatively related to disclosure quality. These findings are in line with the evidence shown by Lewis, Walls, & Dowell (2014) in relation with CEO tenure. These authors argue that long-tenured CEOs are more committed to the established operating paradigm and likely to view voluntary disclosure as unnecessary. Consistent with the management friendliness theory, long-tenured directors may become closer to managers, diminishing their ability to represent stakeholders effectively and thus lowering the quality of monitoring decisions in the reporting process. Furthermore, from an entrenchment hypothesis perspective, as board members spend more time working as a team, they tend to reach a consensus on the way that they understand the company's business and the manner in which they formulate the firm's strategy, so that disclosure practices are unlikely to be improved. Therefore, in our sample, the entrenchment effect and the management friendliness hypothesis dominate the marginal effect of board learning (Huang & Hilary, 2018). This may be explained by the fact that the average values of board tenure for our sample are higher than in previous studies. Particularly, tenure has been documented as having negative effects after nine years of tenure on average (Livnat et al., 2016), and our results reinforce these previous findings. The negative effect of board tenure on disclosure quality appears to be especially significant in firms with higher growth

options. When growth opportunities increase, the agency costs of monitoring increase and high-growth firms may need to adopt stronger governance mechanisms. In theory, tenure can provide directors with valuable resources that can help to improve the reporting process. Nonetheless, high-growth firms are characterized by higher information asymmetries and, as a result, agency theory may prevail because of the greater agency conflicts. Therefore, the detrimental effect of longer board tenure is stronger for high-growth firms. This can be explained by the worsening of the board's ability to oversee technical matters of the firm's operations and to monitor the more complex reporting process (Livnat et al., 2016). We contribute to the ongoing debate regarding the potential effects of board tenure on corporate outcomes by showing that longer tenures are particularly unfavorable for high-growth firms since board tenure is negatively associated with information quality.

5. Concluding remarks

This paper provides new empirical evidence about the effect of board human capital on disclosure quality. In particular, the moderating role of growth options in the relationship between board human capital and analysts' forecast accuracy and dispersion is analyzed. The results of the study support the expectation that the association between board human capital and disclosure quality is dependent on the firms' growth. Specifically, in the presence of high growth options board expertise strengthens and board tenure deteriorates the quality of the disclosure process.

On the one hand, board expertise is particularly relevant for high growth firms as they will have the required knowledge to be able to better identify the investment opportunities and be more vigilant in assuring that the company is able to convey information about those

opportunities to the market. Directors with industry or financial expertise can more accurately evaluate the complexities of a company's business environment and improve the monitoring of the disclosure process. On the other hand, since board tenure is particularly long in our sample, the entrenchment effect and the management friendliness hypothesis dominate the expertise hypothesis. As growth opportunities increase, the information asymmetries are higher and therefore high-growth firms may need to adopt stronger governance mechanisms. Consequently, in these firms, directors with longer tenures become entrenched in their positions and closer to managers, and tend to be more lax in their monitoring functions. As a result, boards with extended tenures can be especially harmful for high-growth firms.

This paper has several implications for firms, regulators, and academics. First, our evidence contributes to the academic and professional debate on the benefits obtained from having directors with industry and/or financial expertise serving on the boards of companies. Second, our results also sharpen the discussion about the pros and contras of board tenure, which has recently become a controversial issue. Given the importance of information quality in capital markets, and its potential benefits for firms, understanding the relationship between board composition and disclosure quality would help owners and regulators to establish appropriate corporate governance mechanisms. In particular, our findings extend previous research by focusing on director human capital. Therefore, stakeholders may demand that nomination committees appoint directors with specific human capital. Further, given the lack of specific guidelines regarding board expertise and board tenure on current international corporate governance codes, our findings may also be beneficial for the regulators and firms to understand the consequences of board expertise and tenure. In addition, we contribute to the academic debate on the need for the consideration of the

context in which the directors work to better understand their role. Our paper highlights the requirement of a more specific approach, based on the characteristics of the firms where directors work, in order to study their influence on corporate strategies. The traditional one-size-fits-all approach may be inappropriate to understand the role of the board of directors. Particularly, the information environment, which may be determined by growth options, can significantly moderate the role of board members.

This research has some limitations and presents interesting avenues for future research. First, although the United States represents a relevant context for the analysis of boards of directors, future studies could explore different legal and/or institutional contexts. In addition, other moderating factors different from growth options could also be examined. Despite these limitations, we think our paper offers a valuable insight into management issues because the influence of boards on corporate strategies remains a relevant question in international business and therefore we expect our evidence will provide encouraging opportunities to adopt contextual approaches to better understand the role of directors.

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Table 1
Definition of variables

Variables	Description	Measure
Dependent variables		
AFA	Analysts' forecast accuracy	One-year ahead negative of the absolute value of the difference between the Institutional Broker's Estimate System consensus forecast available at the beginning of the fiscal year and the actual earnings per share for the year, scaled by stock price
DIS	Analysts' forecast dispersion	One- year ahead standard deviation in analysts' forecasts, scaled by stock price
Independent and control variables		
EXP	Experience	Proportion of board members with specific industry and/or financial background
TEN	Board tenure	Average number of years that directors spend on a particular board
MTB	Market-to-book	Market to book ratio
TOBINQ		
D_MTB	High-growth opportunities	Dummy variable equal to 1 if the firm-year observation has an above overall sample median value for MTB and 0 otherwise
D_TOBINQ		
LOSS	Loss indicator	Indicator variable equal to 1 if the firm had negative earnings, 0 otherwise
SIZE	Company size	Logarithm of market value (millions of dollars)
VAR	Earnings variability	The coefficient of variation of earnings for the previous five years
COV	Analysts coverage	Log of number of analysts following a firm
BIND	Board independence	Proportion of independent directors
IND	Industry	Industry dummies using SIC codes
YEAR	Year	Year dummies

Table 2
Descriptive statistics

Variables	Mean	St. dev.	Q1	Median	Q3
AFA	-0.019	0.055	-0.015	-0.0007	-0.004
DIS	0.002	0.008	0.000	0.001	0.002
EXP	0.552	0.188	0.417	0.546	0.684
TEN	9.322	3.178	7.140	8.980	11.10
MTB	3.752	6.743	1.700	2.800	4.550
TOBINQ	1.487	1.147	0.610	1.115	1.890
LOSS	0.070	0.255	0	0	0
SIZE	4.179	0.461	3.859	4.120	4.441
VAR	0.154	0.266	0.027	0.063	0.160
COV	1.155	0.289	1.041	1.230	1.342
BIND	0.807	0.114	0.762	0.844	0.894

.See Table 1 for the definition of the dependent, explanatory and control variables.

Table 3
Pearson coefficients

	AFA	DIS	EXP	TEN	MTB	TOBINQ	LOSS	SIZE	VAR	COV
AFA	1									
DIS	-0.472***	1								
EXP	-0.038**	0.064***	1							
TEN	0.058***	-0.064***	-0.018	1						
MTB	0.090***	-0.068***	-0.021	0.012	1					
TOBINQ	0.0160***	-0.139***	0.106**	0.054***	0.358***	1				
LOSS	-0.353***	0.032***	0.044**	-0.055***	-0.020	-0.094***	1			
SIZE	0.157***	-0.157***	-0.139***	-0.060***	0.140***	0.145***	-0.145***	1		
VAR	-0.085***	0.035**	-0.082**	-0.041	-0.007	-0.038**	0.052***	0.386***	1	
COV	-0.025	0.013	-0.035	-0.012	0.013	-0.018	0.022	0.014	0.022	1
BIND	0.036**	-0.102***	-0.129***	-0.156***	0.029	-0.001	-0.014	0.165***	0.083***	0.028

See Table 1 for the definition of the dependent, explanatory and control variables.
* p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01.

Table 4
Multivariate analysis

Dependent variable	Model 1		Model 2		Model 3	
	AFA	DIS	AFA	DIS	AFA	DIS
Intercept	-0.234***	0.033***	-0.226***	0.032***	-0.221***	0.031***
	(-8.37)	(-8.34)	(-0.50)	(7.94)	(-7.52)	(7.46)
EXP			-0.003	0.001	-0.011	0.001
			(-0.50)	(1.44)	(-1.44)	(0.38)
EXP*D_MTB					0.001*	-0.001***
					(1.83)	(-2.82)
TEN			-0.001*	0.000***	-0.001	0.000**
			(-1.71)	(3.72)	(-0.91)	(2.38)
TEN*D_MTB					-0.001*	0.001***
					(-1.72)	(2.73)
MTB	0.000	0.000	0.000	0.000	0.000	0.000
	(0.21)	(0.29)	(0.18)	(0.41)	(0.15)	(0.41)
LOSS	-0.048***	0.006***	-0.048***	0.006***	-0.048***	0.006***
	(-12.47)	(-11.11)	(-12.50)	(-11.13)	(-12.48)	(-11.12)
SIZE	0.052***	-0.005***	0.053***	-0.006***	0.052***	-0.006***
	(8.66)	(-6.54)	(8.75)	(-6.81)	(8.34)	(-6.46)
VAR	-0.033***	0.003***	-0.033***	0.004***	-0.033***	0.004***
	(-5.71)	(4.36)	(-5.77)	(4.54)	(-5.70)	(4.43)
COV	-0.002	0.000	-0.002	0.000	-0.002	0.000
	(-0.53)	(0.10)	(0.51)	(0.03)	(-0.55)	(0.09)
BIND	0.010	-0.012***	0.011	-0.012***	0.009	-0.011***
	(0.79)	(-6.30)	(0.81)	(-6.42)	(0.69)	(-6.23)
IND	included	included	included	included	included	included
YEAR	included	included	included	included	included	included
Adjusted R^2	0.145	0.135	0.146	0.140	0.147	0.142
F test	34.71***	31.84***	30.58***	29.03***	27.38***	26.33***

The proxy for growth opportunities is MTB. See Table 1 for the definition of the dependent, explanatory and control variables. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01

Table 5
Sensitivity analysis

Dependent variable: TOBINQ	Model 1		Model 2		Model 3	
	AFA	DIS	AFA	DIS	AFA	DIS
Intercept	-0.282***	0.149*	-0.274***	0.036***	-0.277***	0.035***
	(-9.37)	(1.92)	(-8.93)	(8.31)	(-8.80)	(8.01)
EXP			-0.002	-0.001	-0.011	-0.000
			(-0.39)	(-1.51)	(-1.49)	(-0.19)
EXP*D_TOBINQ					0.001**	-0.000***
					(2.04)	(-2.63)
TEN			-0.001*	0.001***	-0.000	-0.001*
			(-1.64)	(3.65)	(-0.51)	(-1.88)
TEN*D_TOBINQ					-0.001**	0.001*
					(-2.31)	(1.67)
TOBINQ	-0.006***	0.002	-0.006***	0.001**	-0.006***	0.000***
	(-4.08)	(0.68)	(-4.03)	(2.54)	(-4.02)	(2.61)
LOSS	-0.048***	0.051***	-0.048***	0.006***	-0.048***	0.006***
	(-12.43)	(5.21)	(-12.46)	(11.13)	(-12.48)	(11.15)
SIZE	0.065***	-0.010	0.066***	-0.007***	0.067***	-0.007***
	(9.67)	(-0.59)	(9.72)	(-7.20)	(9.65)	(-7.00)
VAR	-0.034***	0.017	-0.034***	0.004***	-0.034***	0.004***
	(-5.93)	(1.17)	(-5.99)	(4.66)	(-5.92)	(4.60)
COV	-0.002	0.001	-0.002***	0.000	-0.002	0.000
	(-0.64)	(0.11)	(-0.61)	(0.10)	(-0.65)	(0.14)
BIND	0.011	-0.104***	0.011	-0.012***	0.009	-0.012***
	(0.82)	(-3.08)	(0.84)	(-6.46)	(0.68)	(-6.30)
IND	included	included	included	included	included	included
YEAR	included	included	included	included	included	included
Adjusted R^2	0.150	0.021	0.151	0.142	0.153	0.143
F test	36.10***	4.47***	31.76***	29.49***	28.57***	26.43***

The proxy for growth opportunities is TOBINQ. See Table 1 for the definition of the dependent, explanatory and control variables. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01

Table 6
Sensitivity analysis

Dependent variable: MTB	Model 3	
	AFA	DIS
Intercept	-0.155***	0.027***
	(-3.80)	(4.73)
EXP	-0.010	0.000
	(-1.40)	(0.37)
EXP*D_MTB	0.001*	0.000**
	(1.90)	(2.42)
TEN	-0.000	-0.001***
	(-1.02)	(-2.85)
TEN*D_MTB	-0.001*	0.001***
	(-1.72)	(2.73)
MTB	0.000	0.000
	(0.26)	(0.36)
LOSS	-0.045***	0.006***
	(-10.66)	(9.91)
SIZE	0.049***	-0.005***
	(7.69)	(-6.12)
VAR	-0.043***	0.004***
	(-5.95)	(4.10)
COV	-0.001	0.000
	(-0.46)	(0.06)
BIND	0.008	-0.011***
	(0.63)	(-6.20)
INVMILLS	-0.116	0.007
	(0.63)	(0.98)
IND	included	included
YEAR	included	included
Adjusted R^2	0.149	0.143
F test	26.28 ***	25.00***

See Table 1 for the definition of the dependent, explanatory and control variables. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01

Table 7
Comparison between high-growth firms and low-growth firms

	High-growth firms		Low-growth firms		Mean Difference
	Mean	**Median**	**Mean**	**Median**	
EXP	0.549	0.546	0.554	0.545	0.005
TEN	9.510	9.050	9.145	8.875	0.365