BOARD HETEROGENEITY: DOUBLE-EDGED SWORD? FOCUSING ON THE MODERATING EFFECTS OF RISK ON HETEROGENEITY-PERFORMANCE LINKAGE

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ABSTRACT

Extant literature on group heterogeneity-performance link is characterized by theoretical divergence. While a board's cognitive heterogeneity can increase the variety of information utilized in boardroom discussion, it can also result in internal process losses, decreasing efficiency at the corporate top. The findings of this study reveal that board heterogeneity is negatively related to firm performance when the firm is operating in volatile managerial context of higher firm risk. More specifically, an empirical investigation using a sample of 295 Fortune 1000 firms reveals that board heterogeneity in functional background and educational specialty is negatively related to firm performance as firm risk increases. Implications of the results are discussed for the integration of theories and future research.

Key Words: Board Heterogeneity, Team Composition, Firm Risk

INTRODUCTION

Corporate leaders in today's volatile business arena are increasingly interested in the influence of board composition on strategic performance of firms. Thereby, greater research attention has been directed to compositional attributes that may increase a board's strategy role and, in particular, to the effects of board heterogeneity (e.g., Hillman & Dalziel, 2003; Haynes & Hillman, 2010; Tuggle, Schnatterly & Johnson, 2010). Since the board is a strategic decision-making group at the apex of the corporation, the implications of board heterogeneity for firm performance present important research questions. Board heterogeneity originally was seen as a desirable goal by many corporations, either to better reflect diversity found in the workforce and consumer groups or simply to be viewed as a socially responsible company (Robinson & Dechant, 1997).

The extant theoretical models on group composition-performance link, however, have provided competing prescriptions regarding the impact of group heterogeneity on performance. One school argues that increasing the cognitive heterogeneity in a group will increase the variety in human capital (Finkelstein & Hambrick, 1996; Mannix & Neale, 2005; Cannella, Park & Lee, 2008). Variations among group members' cognitive backgrounds provide diversity in information, experiences, and perspectives, which in turn will increase the group's decision comprehensiveness.

The opposing perspective holds that increasing heterogeneity leads to behavioral disintegration among group members, resulting in decreased social capital and process efficiency in a group (Pelled, Eisenhardt & Xin, 1999; Jackson & Joshi, 2001; Li & Hambrick, 2005). Demographically dissimilar group members are more likely to be socio-culturally distant, resulting in inefficiencies in interpersonal communications and internal dynamics. Thus, it should be noted that the extant literature on group composition provides ambiguous guidance to those seeking to answer the question: "How does board of directors' heterogeneity that embodies both positive and negative facets impact corporate performance?" Surprisingly, this important issue has been rarely explored in the research areas of board of directors and organization studies.

One path to resolving these competing perspectives on board heterogeneity is to examine the implications of board heterogeneity in particular contexts. This approach enables corporate practitioners to be aware of the role of contingency contexts involved when they make choices on the continuum between board heterogeneity and homogeneity, and academic researchers to develop mid-range theories that can help reduce the ambiguity associated with board heterogeneity. To this end, this study empirically investigates how board heterogeneity impacts firm performance in the managerial context of firm risk.

Firm risk, defined as volatility in business outcome variables, has been a central research topic across disciplines such as strategic management and financial economics (Ruefli, Collins & Lacugna, 1999; Gomez-Mejia, Haynes, Núñez-Nickel, Jacobson & Moyano-Fuentes, 2007). The context of higher firm risk provides top management including the board of directors with a greater demand for process efficiency in adapting to volatile firm-environment relationship. Managerial choices in environmental adaptations, for example, include R&D investments, changes in diversification posture, acquisitions and divestitures, adaptations in competitive strategy, and structural changes in resource allocation (Palmer & Wiseman, 1999). Such strategic decisions and their subsequent implementation are highly consequential board-level matters that have substantial impact on firm performance. In this respect, the managerial context of firm risk is an ideal research setting for studying possible divergent influences of board heterogeneity on firm performance. Moreover, as the corporate world becomes more dynamic with the emergence of global competition, it would be of benefit for academics and practitioners to consider how board heterogeneity impacts firm performance in increasingly volatile corporate environment.

The findings of this study using a sample of 295 Fortune 1000 firms suggest that board heterogeneity in a functional background and educational specialty is negatively associated with firm performance when the firm has higher levels of firm risk. The results imply that managerial context of higher firm risk increases the demand for process efficiency at the corporate top, and in such a situation process inefficiencies stemming from board heterogeneity become more salient, having a negative impact on firm performance. This study demonstrates how board heterogeneity, containing intrinsically ambivalent components with respect to performance, plays a role in different managerial contexts. In the following section, a set of hypotheses are developed based on

the review of theoretical frameworks addressing the role of board heterogeneity in managerial context of firm risk.

BOARD HETEROGENEITY EMBEDDED IN MANAGERIAL CONTEXT

The board of directors is a bundle of directors or human capital at the apex of a corporation and its effectiveness in board's functioning would be a collective outcome of board members. Board heterogeneity in terms of functional background, educational specialty, and organizational tenure should have substantial effects on the board's cognitive decision-making behaviors. The upper echelons perspective in strategic management suggests that these knowledge structures affect top managers' cognitive behaviors on choices, preferences, and interpersonal interactions, and thereby influence group-level outcomes when they are working as members of a team (e.g., Finkelstein & Hambrick, 1996). For instance, similarity in demographic backgrounds among group members contributes to the development of common schemata, providing a common premise for strategic decision-making (Gupta & Govindarajan, 1984). Some researchers focus on internal group dynamics, highlighting the dysfunctional effect of group diversity on performance (e.g., Watson, Kumar & Michaelson, 1993). Others emphasize the positive effects of membership heterogeneity on constructive group debate (Priem, Harrison & Muir, 1995). A more recent study on group composition has shed light on curvilinear relationships between group diversity and performance (Richard, Barnett, Dwyer & Chadwick, 2004). Over time, the theoretical pluralism and empirical inconclusiveness on team heterogeneity–performance relationship (e.g., Pelled et al., 1999; Cannella et al., 2008) have made the implications of board heterogeneity more ambiguous.

Previous board researchers have related board's demographic diversity to firm value and performance (e.g., Carter, Simkins & Simpson, 2003; Walt & Ingley, 2003). Researchers on board composition found that board diversity has a positive effect on firm performance. Carter et al (2003), for example, found that increased representation of women and minority members on the board to be positively related to firm value measured as Tobin's Q. Additionally, Kosnik (1990) suggested that board demographic diversity is an important component for effectiveness in a board's control and service functions. Although there has been an increasing number of research studies focusing on board's strategy role in recent years (e.g., Hillman & Dalziel, 2003; Haynes & Hillman, 2010), little is known to academic researchers and industry practitioners on how board heterogeneity that has both functional and dysfunctional facets impacts firm performance in strategic management contexts.

An underlying reason for the ambiguity centering on the performance implications of board heterogeneity is that, while demographic heterogeneity increases the span in knowledge structures, it also increases coordination costs associated with interactions among socio-culturally different individuals. That is, dissimilarity among group members' backgrounds enhances variety in attitudes, perspectives, and knowledge, which is conducive to decision comprehensiveness

(Milliken & Martins, 1996). These same demographically dissimilar group members, however, are more likely to be distant in their interpersonal behaviors. This lack of social integration can cause inefficiencies in group communication and internal processes (Jehn, 1995; Li & Hambrick, 2005). Given the competing perspectives on the consequences of group heterogeneity, it would be of benefit for board researchers to examine the role of board heterogeneity in a contingency context in which the demands for a board's knowledge variety versus internal process efficiency vary. Consequently, a managerial context of firm risk is chosen to evaluate these issues.

Firm risk has crucial implications for strategic managers, shareholders, employees, and other stakeholders such as suppliers and customers (Bromiley, 1991; Sanders & Hambrick, 2007). In general, as risk is associated with uncertainty, the higher the uncertainty in strategic management environment, the greater the firm risk would be. Increased firm risk means increased variability in performance outcomes (e.g., volatility in internal income streams and firm's stock value) and thus a less stable managerial environment. Moreover, corporate strategic management by nature is a dynamic and complex process, most of the time involving uncertainty and risk. That is, highly complex environments increase firm risk, involving extensive competitive heterogeneity within an industry (Palmer & Wiseman, 1999). Unpredictability of rivals and strategic variety of firms in the industry all increase environmental risk (Greve, 2003; Winfrey & Budd, 1997).

Higher firm risk is likely with these environmental characteristics, and top management teams including the board of directors are required to be efficient in strategic information processing and devising strategic actions in firm adaptation. Many risk-related corporate decisions involve the board's assessment and approval such as vertical integration, R&D, M&A, internationalization, lending and borrowing among others. It should be noted that board of directors at the apex of the corporation is in a position to assess and approve these initiatives in environmental adaptation. Risk-related changes in market domains and technologies, for example, are all agenda for boardroom discussion. To retain superior firm performance in these highly volatile business environments, corporations are required to be efficient in their adaptive responses in maintaining compatible firm-environment relationships (Miles & Snow, 1978). Given the contextual demands for process efficiency in a volatile managerial environment, inefficiency in board process would have a dysfunctional impact on firm performance. In particular, the dysfunctional aspects become more salient in the managerial context of higher firm risk where efficiency in information processing and group decision-making in a board would be a critical factor for firm performance.

Board diversity in human capital could be the source for a variety of information and knowledge utilized in group decision-making. At the same time, it is also noted that the heterogeneity composition in a group not always leads to the breadth of knowledge and information leveraged in a board and subsequent group performance due to the problems in group dynamics. In firms with higher firm risk (e.g., fluctuations in corporate income flows and stock prices), the managerial imminence in maintaining and/or improving the firm performance is efficient firm adaptation to the changes in business and managerial environments, which requires

process efficiency in group decision-making processes. That is, if there are gridlocks at the corporate top and senior management members including the board of directors rely on formal systems and procedures in group decision-making processes, heterogeneity of human capital may not be utilized in enhancing the decision comprehensiveness. Moreover, process inefficiencies derived from heterogeneity composition are often not well managed in various organizational settings, which is detrimental when the external environment requires fast responses and adaptation.

Diversity attributes employed in this study include the cognitive attributes that comprise directors' task-related cognitive diversity (e.g., functional experience, educational specialty, organizational tenure) (Jackson et al., 1995). Cognitive diversity in group membership would be conducive to creativity and informational diversity in group decision-making processes (e.g., Jackson & Joshi, 2002). Prior studies on group demography have also suggested that groups composed of members from different backgrounds fail to realize the potential benefits of informational and knowledge variety because of problems with group processes such as communication, collaboration, and social interaction (e.g., Milliken & Martins, 1996; Chatman, Polzer, Barsade & Neale, 1998). Demographically similar individuals are more likely to interact with members who are perceived as members of in-groups, thus facilitating interpersonal interactions and communication and further reducing conflict (Li & Hambrick, 2005). For instance, it has been found that dissimilar experiences in functional experience lead to difficulties in communication and decreased group integration (Tsui & OReilly, 1989). Team members with diverse educational backgrounds often fail to exchange key information and experience poor coordination of activities compared to groups in which members have similar educational backgrounds (Jehn, Chadwick & Thatcher, 1997). Tenure homogeneity is also positively related to increases in interaction, communication, and collective effort (Smith, Smith, Olian, Sims, O'Bannon & Scully, 1994). Furthermore, demographic differences could engender emotional conflict as group members personalize their differences (Jackson & Joshi, 2002). Li and Hambrick (2005) found empirical evidence that factional groups in international joint venture management groups are positively related to emotional conflict, which in turn leads to behavioral disintegration within the group.

These ideas are echoed in board research as well. Board members tend to favor demographically similar board candidates in board selection processes because they regard demographically similar candidates to be socio-politically more compatible, which will facilitate interaction and communication in board processes (Westphal & Zajac, 1995). Board heterogeneity in tenure, functional and educational backgrounds may cause interpersonal distance and behavioral inefficiency. When boards are heterogeneous, members may be less willing to share their ideas. Heterogeneity in board members' backgrounds creates an atmosphere that discourages interpersonal interaction and communication in boards' decision-making process; thus, the collaborative outcomes or total shared knowledge in a board is diminished. That is, board heterogeneity in board members' backgrounds often hampers the formation of cohesion and

conformity in a board thereby hindering efficient exchange of key strategic information and delaying board's decision-making. Board researchers argue that the board's functioning in monitoring and advising the management should be understood in terms of relational dynamics between the CEO and board (e.g., Deutsch, Keil & Laamanen, 2007). Process inefficiency on the part of the board may result in greater information imbalances between the CEO and the board, which could further undermine the efficient firm adaptation to environmental changes. It would be less likely for CEOs to obtain board's consensus and approval in an efficient manner if the board has problems in internal processes. Delays in strategic decision-making and gridlock at the corporate top would have detrimental impact on the firm's efficient and effective adaptations to volatile managerial environment leading to decreased firm performance.

These conditions in a board's internal processes would have negative impacts on firm performance, especially when the corporation is experiencing higher firm risk. The bottom line for this argument is that higher firm risk is basically derived from the changes in the firm-environment relationship. In other words, higher volatility in firm performance arises from changes in the congruency in the firm-environment relationship (Miles & Snow, 1978). From a congruency perspective, efficient firm adaptation to changing environment is an indicator of firm capability that is necessary for securing superior firm performance. Ineffective resolution of the problems in environmental adaptation results in decreased firm performance. Decisions not to take action should also negatively affect firm performance for firms operating in a volatile business environment. Thus, contextual imminence in corporations with higher firm risk would be the process efficiency in information processing and decision-making at the apex of the corporation. Consequently, the board's process losses derived from heterogeneous composition would negatively affect firm capability in maintaining the congruency in its product-market environment and efficient implementation of superior strategies. Furthermore, the negative facet of a board's internal process losses should be more salient in the managerial posture of higher firm risk. This line of argument posits that:

H1: The relationship between board heterogeneity and firm performance is moderated by firm risk, such that:

H 1a: Board functional heterogeneity is negatively associated with firm performance when the firm has higher levels of firm risk.

H 1b: Board educational heterogeneity is negatively associated with firm performance when the firm has higher levels of firm risk.

H 1c: Board tenure heterogeneity is negatively associated with firm performance when the firm has higher levels of firm risk.

METHODOLOGY

A sample of 300 firms for this study was randomly drawn from the Fortune 1000 list for the base year of 2003. A majority of these firms encompass a variety of industry structures, firm sizes, competitive strategies, and board composition structures, which potentially increases the research validity. Thus, Fortune 1000 firms provide an appropriate data setting for examining the impact of board heterogeneity on firm performance in the contingency context of firm risk. Data from 295 firms were entered in the statistical analysis since firm risk data on five firms were not publically available.

Measures

Board heterogeneity. Prior empirical studies on group demography have primarily relied on the homogeneity-heterogeneity dimension for measuring demographic heterogeneity at group levels (e.g., Polzer, Milton & Swann, 2002; Jehn, Northcraft & Neale, 1999). The homogeneity-heterogeneity measure captures the compositional effects on group performance. For the categorical variables of board heterogeneity in functional background and educational specialty, this study uses an entropy-based index of heterogeneity (Blau, 1977). It is calculated as follows:

$$1 - \sum_{i=1}^{N} (P_i)^2$$

where P_i is the proportion of a group's individual in the ith category. This index ranges from 0 = absolute homogeneity to 1 = absolute heterogeneity. Educational specialization, represented by the highest obtained university degree, is divided into five specializations: arts, sciences, engineering, business and economics, and law (Wiersema & Bantel, 1992). This study employs a trichotomous functional background measure of output, throughput, and peripheral functions, in which output functions include marketing and sales; throughput functions include operations, R&D, and engineering; and peripheral functions include law, finance, and accounting (Michel & Hambrick, 1992). The continuous variable of board tenure heterogeneity was measured using the coefficient of variation defined as the standard deviation divided by the mean (Pelled et al., 1999). Board tenure was measured by the length of time each board member had served in the current position. Larger coefficients imply greater heterogeneity. The logarithm of the heterogeneity measure is used to reflect the decreasing rate of the effect of dissimilarity (Wiersema & Bantel, 1992). Information on individual directors' demographic characteristics was obtained from companies' proxy statements filed with the Securities Exchange Commission (SEC). Where necessary, the data was cross-validated against demographic information provided by Standard & Poor's Register of Corporations, Directors, and Executives. Demographic proxies of 3215 directors in total were examined and coded to capture the degree of board heterogeneity.

Firm risk and firm performance. Firm risk, conceptualized as unpredictability of organizational outcome variables, has been predominately measured as variance in corporate income flows (Internal accounting risk) and variance in firm value (External market risk) (see Ruefli et al., 1999 ; Devers, McNamara, Wiseman & Arrfelt, 2008 for a complete review). Internal accounting risk was calculated as the standard deviation of return on assets for the period from 1999 to 2003 based on yearly data. External market risk, conceptualized as the relative volatility of a given stock versus the market, was measured using beta coefficient (systematic market risk) for 2003. Data on ROA and beta were obtained from Compustat database. The dependent variable of firm performance was captured by the return on invested capital (ROIC: net profit divided by invested capital) for 2003 using data from Standard & Poor's Compustat.

Control variables. Several control variables were included in the empirical model to isolate the effects of the hypothesized variables on firm performance. Firm size, measured as the logarithm of total annual revenue, was included to control for the potential impact of scale economies on firm performance. Past firm performance was controlled since prior firm performance could influence the firm behavior affecting firm performance (Kahneman & Tversky, 1979), and measured as the average ROA during 1999-2001. Since business diversification involves a substantial resource commitment and typically has a great impact on firm performance, the degree of corporate diversification was controlled. The entropy measure of diversification (Jacquemin & Berry, 1979) was used, in which diversification indices were computed using the line-of-business sales data obtained from Compustat. Because firm performance may vary across industries due to industry-specific situations, both the industry type and industry profitability were controlled. This study included a dummy variable of industry category that corresponds to the two-digit SIC code of the firm, and industry profitability was calculated as the average percentage change in profit during the period for all firms included in the sample. The following variables on board structure are also controlled. Board independence was included since independent board from the CEO is in better socio-political condition for objectively evaluating management proposals. This study employed the independence-interdependence measure (Boeker, 1992), in which independent directors as outside board members who are appointed prior to the current CEO. Board size was used to control the potential impact of board size on firm performance and was measured as the logarithm of the number of directors on the board. Board composition data were available from corporate annual proxy statements. Board equity ownership was included to reflect the impact of equity ownership on firm performance and measured as the percentage of total common equity owned by directors and log transformation was applied to reduce heteroscedasticity in the ownership data.

Analytic methods

Hierarchical regression analysis was used to test the moderating effects of firm risk on the relationship between board heterogeneity and firm performance. Control variables included in this

study were entered in the first hierarchical step. After entering the control variables, the independent variables of board heterogeneity in tenure, functional background, and educational specialization were entered. The two-way interaction terms were then entered in the final regression model. Coefficient and incremental variances explained by the two-way interaction terms were tested for significance (Cohen, Cohen, West & Aiken, 2003).

RESULTS

Table 1 presents the mean, standard deviation, and correlation for the variables used in the analysis. Sample firms have, on average, 10.3 directors on their boards and about 47 percent of the directors are independent from the CEO based on the measure employed in this study. Correlation matrix shows that board heterogeneity in demographic backgrounds is not significantly correlated with firm performance. Variance of returns is negatively correlated with firm performance (p<0.01). In the regression analysis, checks for possible violations of normality assumptions in the data revealed skewness in the distribution of data; therefore, log transformation was applied on the variables of board equity ownership and corporate diversification. Studentized residuals and Cook's D values were examined to check for outliers. However, no reason was found to remove any cases from the sample. Multicollinearity was not a significant problem in the regression analyses since all of the variance inflation factors within the regression models were below ten (Cohen et al., 2003).

The results of the hierarchical regression analyses are presented in Table 2 and 3. Hypothesis 1a predicted a negative moderating effect of firm risk in the relationship between board functional heterogeneity and firm performance. The results of the analyses provide evidence that board functional heterogeneity is negatively related with firm performance when the firm's contextual circumstance is characterized by higher firm risk. The results were indicated by the significant R-square change and significant regression coefficient of the interaction terms for both internal accounting risk (β= -3.23; p<0.01; ΔR^2= 0.02; Interaction model 1, Table 2) and external market risk (β= -21.36; p<0.01; ΔR^2= 0.04; Interaction model 1, Table 3). Thus, hypothesis 1a received strong support.

Table 1
Descriptive statistics and correlation coefficients

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Firm performance	4.98	39.25													
2. Board functional heterogeneity	0.51	0.12	-0.05												
3. Board educational heterogeneity	0.58	0.11	0.01	0.29**											
4. Board tenure heterogeneity	-0.21	0.28	-0.00	0.09	0.06										
5. Internal accounting risk	3.91	4.30	-0.19**	-0.17**	-0.16**	-0.17**									
6. External market risk	1.00	0.79	-0.24**	-0.11	-0.20**	-0.04	0.40***								
7. Firm size	14.68	24.09	0.05	0.10	0.06	0.02	-0.14*	-0.07							
8. Past firm performance	3.64	6.26	0.22**	0.02	0.15**	0.19**	-0.46***	-0.37**	0.06						
9. Corporate diversification	0.71	0.56	0.05	0.02	-0.04	-0.01	-0.12*	-0.10	0.21***	0.04					
10. Industry type	42.75	16.12	0.01	0.05	-0.12*	-0.16**	-0.03	0.04	0.09	-0.10	-0.12*				
11. Industry profitability	-0.01	0.20	0.14*	-0.04	-0.07	0.10	-0.02	-0.04	0.02	0.25***	-0.02	-0.19**			
12. Board independence	0.47	0.28	0.03	0.08	0.04	0.23**	-0.04	-0.01	-0.01	-0.02	0.08	-0.04	-0.03		
13. Board size	10.3	1.12	0.06	0.22**	0.26***	0.13*	-0.26***	-0.28**	0.31***	0.16**	0.13*	0.01	-0.06	0.13*	
14. Board equity ownership	0.07	0.19	-0.01	-0.02	-0.03	-0.06	0.10	-0.02	-0.10	-0.13*	-0.13*	0.04	0.08	0.04	-0.07

* p < 0.05; ** p < 0.01; *** p < 0.001

Hypotheses 1b focuses on the moderating effect of firm risk in the relationship between board educational heterogeneity and firm performance. The results also support Hypothesis 1b which suggested a negative moderating impact of firm risk in the relationship between board heterogeneity in educational specialty and firm performance. The results indicate

a significant negative effect of internal accounting risk (β= -2.38; p<0.05; ΔR^2= 0.02; Interaction model 2, Table 2) and external market risk (β= -16.35; p<0.01; ΔR^2= 0.03; Interaction model 2, Table 3) in the relationship between board educational heterogeneity and firm performance. The findings suggest that heterogeneity in board members' educational specialty has a negative impact on firm performance as the firm risk increases.

Table 2
Moderating effect of internal accounting risk in the relationship between board heterogeneity and firm performance

Variable	Control variables	Independent variables	Interaction Model 1	Interaction Model 2	Interaction Model 3
Intercept	-21.16	-19.88	-6.93	-9.45	-20.16
Firm size	0.00	0.00	0.00	0.00	0.00
Past firm performance	1.28 **	1.34 **	0.86 *	1.01 *	1.43 **
Corporate diversification	2.93	2.53	1.62	1.63	2.24
Industry type	0.13	0.11	0.08	0.09	0.11
Industry profitability	21.54	22.27	24.46 *	23.76	20.26
Board independence	3.83	6.18	6.78	6.57	5.70
Board size	11.15	17.96	11.23	12.02	18.70
Board equity ownership	3.71	3.00	3.32	3.82	1.79
Functional heterogeneity		-19.06	-12.41	-23.77	-19.50
Educational heterogeneity		-1.07	-1.42	8.87	-0.35
Tenure heterogeneity		-8.29	-10.64	-9.72	-1.96
Functional heterogeneity × internal accounting risk			-3.23 **		
Educational heterogeneity × internal accounting risk				-2.38 *	
Tenure heterogeneity × internal accounting risk					-0.78
R^2	0.06	0.07	0.10	0.09	0.08
Adjusted R^2	0.04	0.04	0.06	0.05	0.04
F	2.44 *	1.97 **	2.43**	2.21 ***	1.87 **
ΔR^2		0.01	0.02	0.02	0.00
F for ΔR^2		0.72	7.03**	4.67 *	0.85

* p < 0.05; ** p < 0.01; *** p < 0.001

Hypothesis 1c suggested a negative moderating impact of firm risk in the relationship between board tenure heterogeneity and firm performance. However, there was no significant moderating effect of firm risk for both internal accounting risk and external market risk on the relationship between board tenure heterogeneity and firm performance. The results of testing

hypothesis 1c show that firm risk has little moderating effect in the relationship between board tenure heterogeneity and firm performance. The results imply that board heterogeneity in organizational tenure has little impact on the board's internal group dynamics and firm performance in the context of higher firm risk. The control variables of past firm performance and industry profitability had a positive effect on firm performance (p<0.05). Other control variables did not have a significant impact on firm performance.

Table 3
Moderating effect of external market risk in the relationship between board heterogeneity and firm performance

Variable	Control variables	Independent variables	Interaction Model 1	Interaction Model 2	Interaction Model 3
Intercept	-22.04	-21.26	-2.17	-3.35	-15.87
Firm size	0.00	0.00	0.00	0.00	0.00
Past firm performance	1.45 ***	1.53 ***	1.04 *	1.10 **	1.31 **
Corporate diversification	3.91	3.47	2.46	2.44	3.71
Industry type	0.16	0.15	0.14	0.15	0.16
Industry profitability	29.51 *	30.88 *	31.00 *	31.47 *	33.62 **
Board independence	2.57	5.41	5.78	5.78	5.99
Board size	9.61	17.50	3.55	3.41	12.25
Board equity ownership	4.31	3.50	-0.02	0.69	2.18
Functional heterogeneity		-21.53	2.30	-21.71	-22.29
Educational heterogeneity		-1.19	-7.34	12.55	0.06
Tenure heterogeneity		-10.07	-9.08	-9.23	-19.90
Functional heterogeneity × external market risk			-21.36 **		
Educational heterogeneity × external market risk				-16.35 **	
Tenure heterogeneity × external market risk					11.58
R^2	0.08	0.09	0.13	0.12	0.10
Adjusted R^2	0.06	0.06	0.10	0.08	0.06
F	3.15 **	2.55 **	3.44***	3.13 ***	2.59 **
ΔR^2		0.01	0.04	0.03	0.01
F for ΔR^2		0.10	11.99**	8.68 **	2.75

* p < 0.05; ** p < 0.01; *** p < 0.001

DISCUSSIONS AND FUTURE RESEARCH

Despite the growing recognition of the importance of board composition, there has been no clear consensus about the impact of board heterogeneity on firm performance. To reduce the ambiguity associated with board heterogeneity, this study empirically examined the performance implications of board heterogeneity by focusing on a managerial context of firm risk in which a firm's adaptive capability to volatile managerial environment matters substantially for firm performance. The results of this study suggest that the performance implications of board heterogeneity may be contingent upon the strategic/managerial context of the firm.

Empirical examination of 295 Fortune 1000 firms provides evidence that heterogeneity in board membership in terms of functional background and educational specialty is negatively associated with firm performance when the firm's managerial context is characterized by higher firm risk. Board cognitive heterogeneity, although beneficial with regard to informational variety in a board, has dysfunctional consequences for firm performance in firms with higher firm risk—less stable managerial environment inside and outside of the organization. In other words, the costs of internal process inefficiencies associated with board heterogeneity can exceed the benefits of informational diversity when the firm's strategic context emphasizes efficiency in firm adaptation.

The mechanism for the internal process inefficiency would be that board members in different demographic groups tend to be less attracted to each other, reducing interpersonal interactions and hampering efficient communication. This group condition causes the board to be less cohesive and integrative in their interactions, thus reducing board efficiency in utilizing the human and social capital of the board as well as its level of collaboration. The process losses with the board could also negatively affect the collaborations between the CEO and the board, often delaying strategic initiatives proposed by management. These group dynamics potentially inhibit information exchange among the directors and decrease efficiency in information processing at the corporate top, thus negatively affecting the successful formulation and execution of the firm strategies involved in environmental adaptation. Thus, the results imply that the role of board heterogeneity is contingent on the task environment of the firm; dysfunctional consequences of board heterogeneity can be more salient when the firm's strategic context requires process efficiency at the apex of the corporation.

As the earlier literature review showed, existing theories on group demographics provides inconclusive and somewhat conflicting suggestions regarding the implications of board heterogeneity for firm performance. This is because while cognitive heterogeneity can have beneficial implications for performance, it can also have dysfunctional consequences in terms of process inefficiency. Jackson and Joshi (2002: pp. 218) state that "as a consequence of the great variation in effects found across studies, researchers cannot be certain that they understand phenomena well enough to justify making prescriptive statements about how to effectively manage diversity." Board heterogeneity is no exception in this regard. The study argues that the performance consequences of board heterogeneity can be better understood when the firm's

managerial context is taken into consideration because the demands for informational variety versus efficiency in group processes may vary depending on the environmental contexts. For example, board heterogeneity in occupational background (which arguably is a proxy for heterogeneity in directors' experiences in different functional areas) would be beneficial for firms in a stable, but complex managerial environment because heterogeneity in knowledge structures increases the breadth of information and knowledge utilized in a board. However, the task environment of higher firm risk requires a higher level of process efficiency in the board's information processing and interaction with the CEO. Subsequently, the negative performance consequences of board heterogeneity are more pronounced in the case of higher firm risk. Therefore, it should be argued that performance implication of board heterogeneity is not unilateral, rather a contingency concept that should consider the strategic environment of the firm.

The results of this study have some important practical implications as well. Governance practitioners, especially in profit pursuing organizations, tend to believe that board heterogeneity brings confusion, uncertainty, and discomfort (Bryson, 2004). In recent years, corporations have tended to pursue board demographic diversity (e.g., gender, ethnicity, occupations) on the assumption that diversity is good in all contexts. However, exhortations to increase board heterogeneity have been made without paying attention to the firm context. A clearer understanding of the processes through which heterogeneity contributes to firm performance can clearly help in decisions about the composition of boards of directors. As the results show, board heterogeneity must fit the firms' managerial/strategic context. Given the fact that boards of directors are the ultimate decision-makers of corporations, the process losses derived from heterogeneous board composition could have significant negative impacts on firm performance when the corporation's strategic environment requires efficient firm adaptation. Thus, practicing managers need to fully assess the tradeoffs of board heterogeneity in conjunction with managerial context of their firms.

While interpreting the results, it is important to bear in mind some of its limitations. Previous research focusing on the moderating effect of time in the group heterogeneity-performance relationship has suggested that as group members undergo interactions and shared experiences, demographic distinctions blur and dysfunctional effects of dissimilarity are neutralized (e.g., Harrison, Price, Gavin & Florey, 2002). Therefore, future research focusing on group developmental processes that occur over time would extend the knowledge about whether board heterogeneity has a constant or tenure-variant impact on board effectiveness. Second, as globalization gathers momentum, the boards of many large corporations now have members from different nationalities and ethnic groups. There is a greater need to study the impact of national culture on individual group member's cognition as well as its impact on board processes and outcomes. Although the current research focuses on task-related demographic attributes such as functional experience, educational specialty, and organizational tenure, future research on board heterogeneity can benefit by paying greater attention to cultural heterogeneity in board composition. Finally, the current study is restricted to only one managerial context of firm risk.

Future research focusing on other strategic decision contexts such as corporate diversification posture should extend the understanding of the context specificity of the relationship between board heterogeneity and firm performance.

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