

# **The Benefits of Focus vs. Heterogeneity: An Analysis of Corporate Boards\***

**Anzhela Knyazeva<sup>a</sup>**

**Diana Knyazeva<sup>b</sup>**

**Charu Raheja<sup>c</sup>**

January 14, 2009

## **Abstract**

Does focus matter for board monitoring? This paper investigates the costs and benefits of dispersion in directors' incentives and ability within corporate boards. Directors exhibit a considerable amount of heterogeneity in their ownership in the firm, number of outside board appointments, and the characteristics of the other companies in which directors hold appointments. Firm and industry characteristics appear to affect the preference towards more versus less board heterogeneity. Board heterogeneity has significant effects on firm value and key firm decisions that cannot be explained by board composition, size, and expertise levels. Heterogeneity in director industry expertise is associated with lower firm value, which underscores the importance of focus in director appointments. Heterogeneity in director ownership incentives similarly has a negative effect on firm value. Heterogeneous boards compensate the CEO with less incentive pay and higher total pay. We also find that board heterogeneity is associated with lower cash holdings, higher dividends, and higher leverage.

Keywords: board characteristics, director heterogeneity, monitoring

---

\* We thank Sanjog Misra for helpful suggestions.

<sup>a</sup> University of Rochester, William E. Simon Graduate School of Business Administration, Rochester, NY 14627. E-mail: [anzhela.knyazeva@simon.rochester.edu](mailto:anzhela.knyazeva@simon.rochester.edu). Phone: 585-275-3102.

<sup>b</sup> University of Rochester, William E. Simon Graduate School of Business Administration. E-mail: [diana.knyazeva@simon.rochester.edu](mailto:diana.knyazeva@simon.rochester.edu).

<sup>c</sup> Wake Forest University, Babcock Graduate School of Management. E-mail: [charu.raheja@mba.wfu.edu](mailto:charu.raheja@mba.wfu.edu)

## **I. Introduction**

A growing body of empirical research examines the structure and effectiveness of corporate board of directors. Boards monitor top management and provide advice to the CEO on key corporate decisions. One strand of the literature has examined the ability of boards to monitor effectively and focused on the effects of board independence, size, equity ownership, executive experience, and number of outside board memberships on firm value and performance (see, e.g., Rosenstein and Wyatt, 1990; Yermack, 1996; Yermack, 2004; Fich, 2005; Fich and Shivdasani, 2006, among others). An additional part of the literature has examined the determinants of board composition (e.g., Boone, Karpoff, Field and Raheja, 2007; Hermalin and Weisbach, 1998; Coles, Daniel and Naveen 2008, among others). Differently from existing work, we study within-board heterogeneity in director characteristics. We argue that heterogeneity within the board will affect the performance of the board as a group in the exercise of its monitoring and advisory tasks. Rather than focus on the average measures such as the proportion of outsiders, or the average experience of board members, we examine dispersion in director incentives and acquired experience at the firm level.

The research agenda is threefold. First, we characterize the extent of within-board heterogeneity along dimensions associated with measures of board members' incentive to monitor and ability to advise management. Our main measures of incentives to monitor are director ownership in the firm and the number of outside appointments (the number of outside appointments measures reputational incentives). Director's ability to give advice is measured based on the experience of directors in other industries, and the age of the companies in other directorship appointments.

Second, we identify firms and industries in which heterogeneous boards are more prevalent. It is plausible that board composition, including the extent of dispersion in director characteristics, will be chosen optimally given firm and industry conditions and the visibility of the firm. Among the variables we consider as potential determinants of board heterogeneity are firm size, the extent of growth opportunities, degree of uncertainty in the firm, asset specificity, technology focus of the industry, and intensity of product market competition. We use previous work on board's monitoring and advising function to drive the hypotheses for board heterogeneity.

Third, we examine the relation between board heterogeneity, firm value, and value-relevant firm decisions. Greater board heterogeneity may have two effects. On the one hand, heterogeneous boards face conflicts of interest and higher coordination costs, which hamper board members from efficiently performing their monitoring and advisory functions. On the other hand, greater heterogeneity can increase the amount and quality of information available to the board, improving its ability to advise top management on a range of corporate problems and to monitor the CEO's investment decisions. We note that the costs and benefits of heterogeneity in the board may not apply equally to measures of monitoring and advisory heterogeneity since the ability of the board to monitor and the ability to give advice may be independent of one another and may require different skills from board members.

Our main findings are as follows. First, corporate boards exhibit a considerable amount of heterogeneity in the areas of director experience, ownership stakes, and reputational incentives. Second, firm and industry characteristics appear to affect the preference towards more versus less board heterogeneity. Third, we find that even after controlling for firm and industry characteristics, heterogeneity in director monitoring incentive and ability to give advice

has significant effects on firm value and key firm decisions that cannot be explained by board composition, size, and expertise levels. Heterogeneity in monitoring incentives is associated with lower firm value, which underscores the benefits of focus in director appointments. Of note is the finding of a lesser role for incentive pay in managerial compensation in firms with heterogeneous boards. Further, boards with considerable dispersion in director reputational incentives assume more debt, possibly to compensate for the weaker internal monitoring efforts undertaken by such boards.

Consistent with the arguments presented in Klein (1998), Adams and Ferreira (2008a), and Coles, Daniel, and Naveen (2008) among others, we find that the heterogeneity in director's ability to give advice is an important factor affecting firm value. Heterogeneity in director industry expertise is associated with lower firm value, which underscores the benefits of focus in director appointments. It is also associated with lower cash holdings, lower investment levels and less incentive pay in managerial compensation.

Several caveats apply. As in other board studies, evidence on the relation between board heterogeneity and firm valuation mostly applies to associations rather than causal relationships, all else given. Further, the empirical tests of the two alternative predictions (conflicts of interest and increase in coordination costs versus effective monitoring and improvement in the quality of information) will show the larger of the two effects. Thus, for example, while it is possible that there are benefits due to improvement in the quality of information in more heterogeneous boards, our negative results suggest that the costs of coordination may be higher than the benefits of heterogeneous boards. Finally, as a number of governance variables are correlated, one has to be mindful of potential collinearity concerns, so we attempt to address them in sensitivity checks.

The remainder of the paper is organized as follows. The section two overviews related literature on within-group heterogeneity and board governance and formulate the main testable predictions. The section three discusses the sample, variables, and methodology. Section four presents the empirical results. Section five concludes.

## **II. Related literature and testable predictions**

### Related corporate governance literature on boards

Most of the literature on corporate board considers levels and not heterogeneity of various director characteristics. Related work focuses on director incentives to monitor and considers the role of director ownership, retention in the firm, as well as the number of outside directorships. Studies have examined the effects of poor performance on the directorships of board members. For example, Kaplan and Reishus (1990) find that top executives of firms that cut dividends are about 50% less likely to receive additional outside directorships than top executives of firms that do not cut dividends. Beasley (1996), and Fich and Shivdasani (2007) find a decrease in the number of additional directorships for directors involved in companies with financial fraud. Yermack (2004) examines director incentives stemming from ownership, reputation, and retention, and Adams and Ferreira (2008b) find that even relatively small incentives, such as meeting fees (the average per meeting fee in 2003 dollars is \$1,000), increase director involvement in firms and the likelihood of directors attending board meetings.

In addition to performance incentives, other studies have considered how the number of outsider board memberships affects director incentives to monitor. Fich and Shivdasani (2006) examine the busyness of outside directors and find lower market-to-book ratios, lower profitability, and lower sensitivity of CEO turnover to performance in firms where the majority of outsiders on the board hold three or more directorships. They conclude that directors who hold

multiple seats have less incentive to monitor management. Ferris, Jagannathan, and Pritchard (2003) also examine busy outside directors but do not find adverse effects on committee duties or fraud litigation. Masulis and Mobbs (2008) find a higher valuation in firms where insider directors hold outside board seats.

In terms of director background and the ability to give advice, several existing papers examine the implications of specific experts on boards. Krozner and Strahan (2001) focus on the implications of bankers on boards. Guner, Malmendier, and Tate (2006) analyze directors with financial expertise. They find that the presence of commercial bankers on boards increases the size of loans and decreases investment to cash flow sensitivity whereas the presence of investment bankers is associated with more frequent outside financing and larger public debt issues. However, bankers on boards are also associated with worse stock and earnings performance after acquisitions as banker directors need not act in the interest of shareholders. In a related study of director expertise, Fich (2005) finds that markets react favorably to appointments of executive experts (managers of other firms) to boards of directors. Agrawal and Knoeber (2001) find a greater incidence of politically experienced directors in larger firms, firms reliant on sales to the government, exports, and lobbying and a greater fraction of legal experts on boards of larger firms and firms facing costly environmental regulation. Papakonstantinou (2007) documents positive effects of board industry experience on performance. Existing work has also used industry expertise among other board characteristics (see, e.g. a study of earnings timeliness in Bushman, Chen, Engel, and Smith (2004) and an analysis of the effects of Sarbanes Oxley in Duchin, Matsusaka, and Ozbas (2008)).

Adams and Ferreira (2008a) consider board diversity by studying the effects of women on boards. They find that gender-diverse boards are associated with greater CEO turnover

sensitivity to stock performance and that directors receive more equity-based compensation in firms with more gender-diverse boards. However, they find that average effect of gender diversity on firm performance is negative, suggesting an overall cost to forcing companies to have a more diverse board.

The above studies contribute to our understanding of the potential effects of various board characteristics on monitoring quality and firm policies. To the best of our knowledge, our paper is the first to examine diversity in board members' expertise and monitoring incentives, and investigate its role for firm performance and a number of value-relevant firm policies.

### Testable predictions

#### *Determinants of board heterogeneity*

The first question in this paper focuses on the firm, industry, management, and state characteristics that lead firms to select more heterogeneous boards. We draw on the existing literature to identify factors that may influence board heterogeneity (for ex., Hermalin and Weisbach (1988), Yermack (2004), Boone et al. (2007), Linck, et al. (2008), Coles, Daniel and Naveen (2008), and Lehn Patro and Zhao (2008)).

First, oversight of large firms with complex asset structures requires board members to conduct more intensive monitoring and acquire more information (Fama and Jensen (1983), Lehn et al. (2004), Crutchey et al (2004), and Boone et al (2007)). In such a setting, shareholders would elect directors with varying degrees of monitoring incentives, leading to greater diversity in director characteristics. In addition, firm complexity increases the importance of the board's advisory role and entails a need for greater diversity in director expertise (Klein (1998), Agrawal and Knoeber (2001), Adams and Ferreira (2008a), Adams and Mehran (2003), and Coles, Daniel

and Naveen (2008)). Thus, we expect larger and more complex companies to require a more heterogeneous board both in terms of their monitoring incentives as well as in their ability to provide advice.

Next, the environment in which a company operates and the costs of information acquisition by board members are expected to affect board heterogeneity. Existing work provides two competing hypotheses on the effect of the firm's information environment and competition on board characteristics. In the ownership literature, Demsetz and Lehn (1985) propose that the noisiness of a firm's operating environment will affect monitoring costs. In the board literature, Coles et al. (2008), Lehn et al. (2004), and Linck, et al. (2008), argue that boards operating in companies with significant growth opportunities and greater information asymmetry will require higher levels of information to the board and greater need of advice to the CEO. This seems to imply a more heterogeneous board in firms with high growth opportunities and operating in competitive environment. Further, in industries with lower asset specificity, focus and similarity in director experience may be less important.

At the same time, the models presented in Raheja (2005) and Harris and Raviv (2007) show that companies operating in noisier environment can benefit from lower coordination costs among board members to increase the efficiency of decision-making in the board. Therefore, for firms with significant growth opportunities and firms operating in competitive industries, coordination costs associated with heterogeneous boards may detract from focus on the firm's core investment opportunities.

In our empirical tests, we use growth opportunities, the level of industry competition, the technology intensity of the industry, and the level of asset specificity to measure information acquisition requirements for the firm.



### *Hypotheses on effects of board heterogeneity on firm value*

Boards of directors are susceptible to collective action problems with respect to monitoring and advising the CEO. Individual directors share (fractionally) in the firm value gains from sound investment decisions through equity stakes (Yermack, 2004). Further, Kaplan and Reishus (1990) and Fich (2005) show that directors of successful firms benefit in reputational terms as they are more likely to be invited on other company boards. However, acquiring and analyzing information about investment projects proposed by the management and partaking in monitoring of the CEO poses a private cost to an individual board member. For outside board members, the detailed scrutiny of one firm's managerial decisions incurs an opportunity cost of time and effort that could be expended on other board appointments as well as attending to the full-time job tasks at the main place of employment. In addition, for both inside and outside directors, opposing a corporate decision proposed by the CEO exposes the dissenting director to potential pressures from the CEO and/or other board members (see, for example, the model presented in Warther (1998)). Heterogeneity in director characteristics can affect the overall level of monitoring and advising undertaken by board members above and beyond the effects of board size and board independence.

In addition to the direction of the heterogeneity effect, we also investigate the source of heterogeneity (payoffs / incentives versus experience / skill of individual board members). In the context of boards of directors, the payoffs directors derive from effective board governance are comprised of gains on company stock they hold (equity incentives) and reputational gains that aid with future board appointments (proxied by the number of other appointments or presence of a full-time position). Heterogeneity in individual director skill or experience can be proxied by

the presence of industry specific expertise and more generally, expertise in firms of similar industry or age.

Below we discuss existing work on the costs and benefits of within-group heterogeneity. This issue has been analyzed in the context of public good provision and collective action problem, game theory work on decision making of committees with heterogeneous agents, labor economics models of group production, and social sciences research.

The notion of costs of heterogeneity in group decision arise from models of public good provision that predict a more collective action problems and less cooperation with heterogeneous agents (see, e.g., Cornes, 1993; Vigdor, 2004; Bardhan, 1993; Ledyard, 1995, etc.) In particular, within-group heterogeneity in payoffs interferes with collective action and increases the cost of sustaining cooperation due to free riding and divergence in incentives among agents. Further, in the game theory literature on committee decision making, heterogeneity in agent preferences can impede information sharing and lead to untruthful information revelation (see, e.g., Austen-Smith and Feddersen, 2005; also see Vandebussche (2006) for a detailed survey of the models of policy committees). Fluck and Khanna (2008) model group decision making in the context of corporate board decisions and show that frictions between information collection and information sharing and free riding among active board members can decrease overall board monitoring and firm valuation in cases where board members discuss their information prior to decision making. Thus, the surveyed work would predict higher coordination costs and lower firm value in the presence of heterogeneity in board member payoffs<sup>1</sup>.

---

<sup>1</sup> Several organizational behavior studies of occupational diversity found negative effects of diversity (e.g., Goodstein, Gautam, and Boeker (1994) find an adverse effect of diversity in hospital board member backgrounds on strategic change; Murray (1989) finds a negative effect of occupational diversity of the top management team on short-term performance and a positive effect of diversity in occupation, age and tenure on long-term performance. Pegels, Song, and Yang (2000) show that top management team whose heterogeneity resembles that of the competitive interaction group peers perform the best.

Related to board heterogeneity and monitoring, Adams and Ferreira (2008) find that gender-diverse boards are associated with increased board meeting attendance and overall board monitoring, but this is associated with a decrease in overall firm value. They attribute this decreased overall value to arguments in Almazan and Suarez (2007), Adams and Ferreira (2007), and Burkart, Gromb and Panunzi (1997) that too much monitoring can decrease shareholder value. While the arguments in these papers are not about free riding, but instead about too much monitoring, the overall result is similar to the above argument that heterogeneity in payoff can be associated with a decreased shareholder value.

Focusing on the benefits of heterogeneity, Bergstrom, Blume, and Varian (1986) show that heterogeneity in endowments increases the public good provision. In some sociology and labor economics work, heterogeneous groups may be more likely to overcome collective action problems (e.g., Heckathorn, 1993; Oliver, Marwell, and Teixeira, 1985; Kandel and Lazear, 1992), particularly at low levels of heterogeneity and payoffs.

Thus, we test two possible hypotheses in terms of the heterogeneity of payoffs among board members:

1. *Conflicts of interest hypothesis*: Board-member payoff heterogeneity decreases incentives for individual board members to acquire information and monitor management, resulting in a negative effect on firm value
2. *Effective monitoring hypothesis*: Board-member payoff heterogeneity increases the incentives for individual board members to acquire information thus increasing the ability of the board to monitor management, resulting in a positive effect on firm value

With respect to abilities and expertise, labor economics work that treats individual worker skills as additive intermediate production inputs would predict a positive effect of heterogeneity (see, e.g., Alesina, Spolaore, and Wacziarg, 2000; Hamilton, Nickerson, and Owan, 2003; Erhardt, Webel, and Schrader, 2003). Heterogeneity in skills could result in greater flexibility and information, particularly under uncertainty.

Differences in expertise are also likely to lead to variation in forecasts of the outcomes of investment projects. Stock and Watson (1999) and Elliott and Timmermann (2004) show that aggregation of individual forecasts improves forecast accuracy. To the extent to which expertise affects director information sets, aggregation of forecasts of board members with heterogeneous expertise could improve the board's ability to predict the future outcomes of managerial decisions. Work on committee decision making (e.g., Sibert, 2003) shows that aggregation across heterogeneous agents can lead to smoother committee decisions.

At the same time, divergence in director opinion could lead to a slower decision making and more conflicts in the board. Related to arguments Jensen (1993), Lipton and Lorsch (1992) and Yermack (1996), homogeneous boards may be more cohesive and productive, thus leading to more effective firm decisions. Baranchuk and Dybvig (2006) present a model where multiple directors with divergence of opinions can increase conflict on the board and reduce the ability of the board to pursue effective strategies.

Thus, we test two possible hypotheses in terms of the heterogeneity in director experience:

3. *Difficulty of coordination hypothesis:* Board-member experience heterogeneity increases coordination costs among board members and decreases the ability of board members to make decisions, resulting in a negative effect on firm value

4. *Quality of information hypothesis:* Board-member experience heterogeneity increases the amount of information available to the board thus increasing the ability of the board to be effective, resulting in a positive effect on firm value

For both heterogeneity in director payoffs and heterogeneity in director experience, the question of which hypothesis prevails in the case of corporate board heterogeneity is ultimately an empirical one. Further, because the monitoring incentive is associated with directors' payoff and incentive to maximize firm value, whereas the advisory incentive is associated with directors differences in information based on experience, it is possible that the costs and benefits of the different types of heterogeneity are different from one another.

### **III. Data and variables**

#### *Sample*

The sample includes firms with available Compustat, CDA Spectrum, and Corporate Library's Board Analyst data. Due to Board Analyst data availability, the sample period is 2001-2006. We exclude small firms (total assets below 20 mln), firms incorporated abroad, financial firms (SIC 6000-6999), and regulated utilities (SIC 4900-4999). For the construction of board heterogeneity measures, at least one of the firm's directors is required to have available Board Analyst data on director ownership and other board appointments. The final sample size is 5,597 obs.<sup>2</sup>

#### *Variables*

---

<sup>2</sup> Eliminating observations with book value of total assets less than twenty million, foreign firms, financial firms (SIC 6000-6999), regulated utilities (SIC 4900-4999), and observations with missing CDA Spectrum 13f filings data, CRSP data and Compustat data on firm characteristics results in 22,600 obs. for 2001-2006. Matching to Board Analyst data results in 7,763 obs. Construction of board heterogeneity measures, which requires at least one director with another board seat and at least one director with a stake in the firm, results in 5,597 obs. Sample size varies when Execucomp variables are added.

Variable definitions and summary statistics are presented in Table 1.

[Table 1]

### Board heterogeneity

Our variables of interest measure heterogeneity of board member characteristics. Heterogeneity measures are computed using director-specific data for all directors on the firm's board. Higher values of the constructed measures reflect a greater degree of heterogeneity in ownership incentives, number of board appointments, and director expertise. Four dimensions of director heterogeneity are considered. The first two measures measure variation in the strength of ownership and reputational incentives.

Heterogeneity of director ownership is defined as the standard deviation of equity stakes held by the firm's directors. (Relative equity stake as a percentage of total director ownership is computed for each director  $i$  on the sample firm's board. Standard deviation of equity stakes is computed using data on the firm's directors.) Higher values of the variable reflect more heterogeneity in ownership incentives of the board. For the average firm in our sample, dispersion in director equity stakes is 20.6% (1.3% if expressed as a percentage of total shares outstanding).

Heterogeneity in the number of board appointments is defined as the standard deviation of the number of directorships held by the firm's directors. On the one hand, presence of several outside directorships could proxy for an established reputation in the market for director human capital. On the other hand, directors with a number of other board seats could have weaker incentives. According to Yermack (2004), directors derive stronger reputational incentives from the potential for new board appointments rather than from the threat of firing from existing board positions. Hence, directors with multiple board seats may have weaker incentives from the

potential addition of new board positions. Further, Fich and Shivdasani (2006) point to the detrimental role of director business described as holding three or more directorships. Regardless of which of the two interpretations holds, higher dispersion in the number of board seats held by the firm's directors would indicate a greater amount of (within-firm) heterogeneity in reputational incentives of the board. At an average firm, dispersion in the number of directors' other board appointments is 1.6 or two-thirds of the sample mean of 2.4 board appointments per director.

The remaining heterogeneity measures aim to capture dispersion in experience of the firm's directors with companies in particular industries or in a given phase of the lifecycle (growth vs. mature firms) as well as different fields of general expertise. The measures are constructed for boards where at least one director has an appointment at another firm. Due to limitations on the length of the governance data series, we assess director expertise based on the presence of another appointment in a specific capacity, type of firm, or industry in the current year. This variable construction method emphasizes contemporaneous skills of the firm's directors.

Heterogeneity in industry expertise of the firm's directors is measured using a proxy for fractionalization,  $1 - \sum d_k^2$ , where  $d_k$  is the proportion of appointments held by members of the firm's board in industry  $k$  in the total number of appointments held by the firm's board members in all industries. Fama-French industry classification is used for the purpose of constructing industry expertise measures. The variable construction approach uses data on directors' other board seats, excluding the appointment on the sample firm's board. For directors with multiple board appointments at other firms, each appointment is given equal weight, which would be consistent with additive nature of the board members' expertise. Lower values of the

heterogeneity variable indicate concentration of board seats held by the firm's directors at other firms in a small number of industries (not necessarily the firm's industry). In contrast, higher values of the variable are consistent with dispersion of directors' board seats across a wide cross-section of industries. By definition of the fractionalization measure, the heterogeneity variable is bounded between zero and one. The sample average of the fractionalization measure is 0.70 (median of 0.75). The measure can be interpreted as the probability that any two randomly picked board appointments held by the firm's directors at other firms will be in different industries.

Two refinements of heterogeneity in industry expertise are used for robustness. In the first case, we consider the possibility that insider positions on another firm's board contribute materially to director's experience. We therefore redefine heterogeneity in industry expertise using only appointments to other firms' boards in the insider capacity. In the second case, we revisit the assumption about the additive nature of individual directors' experience in a given industry. Instead of counting each appointment for directors with several other board seats, we focus on the most influential appointment. The following data filters are applied (in the order below) to identify the most influential appointment for each director, excluding the sample firm: insider status; lead director status; length of tenure on the board; firm size.

In addition to heterogeneity in expertise in different industries, we examine dispersion in other areas of board member experience. Directors can be broadly classified into categories or functional fields of expertise, including academic expertise, outsider experience in a Main Street firm (non-financial firm that is not in the sample firm's industry), insider experience in a Main Street firm, outsider experience in the firm's industry, insider experience in the firm's industry, outsider experience in the financial industry, and insider experience in the financial industry,



with the last category being comprised of directors with no other identified expertise. All directors that do not have outsider status are classified as having insider status (which would include affiliated or grey directors). In the context of director expertise, insider – outsider distinction is used to characterize the director’s level of familiarity with the field or industry in question, with the implication that an appointment in the insider capacity would entail a greater level of field-specific expertise than an outsider board position. Board appointments in same-industry, other Main Street, or Wall Street firms as well as academic appointments are used to describe different dimensions of expertise directors bring to the board (industry-specific, general business, financial, or conceptual expertise).

Further, we examine dispersion in the level of director executive expertise, using the highest position the director currently holds at any firm, excluding the sample firm: CEO position, non-CEO insider position, or outsider position, with the last category being comprised of directors with no other board appointments.

Finally, to measure heterogeneity in board members’ experience with firms of different degree of maturity (phase of the lifecycle), we focus on the sales growth of the firms where directors hold other positions. For directors with multiple positions, average sales growth is computed across the firms on whose boards the director sits. Directors with no other board appointments are excluded from consideration. Higher values of the measure indicate more heterogeneity in board members’ experience with growth opportunities sets.

#### Other board characteristics

We recognize that differences in board heterogeneity can be related to other board characteristics, including board size and independence. Unless otherwise specified, board characteristics are obtained from Board Analyst. The average board in the sample has 10.7

members. The proportion of independent directors is commonly interpreted as a measure of board conflicts of interests. On average, over two-thirds of the board is comprised of outside directors, which is consistent with the effects of the Sarbanes-Oxley Act during the sample period. The level of director equity incentives is captured using percentage equity stake (the average of 0.64% of shares outstanding for an average director and 6.3% for all directors). At an average firm in our sample, a director holds 2.4 appointments, and 38% of directors are busy, with three or more board seats. Lastly, we construct the level of board industry expertise as the proportion of directors with other board appointments in the same Fama-French industry as the sample firm in a given year. For the average firm, over 7% of directors can be classified as ‘industry experts’ using our definition.

#### Firm value and corporate decisions

Our analyses of bottom-line effects of board heterogeneity focus on firm value. Similarly to earlier work, we measure firm value as the ratio of market value of the firm to the book value of total assets. Sample average market-to-book ratio is 1.4. In robustness checks, the denominator of the market-to-book ratio is replaced with lagged book value. And the numerator is computed with and without adjustment for deferred taxes. Return on assets is used as an alternative measure of firm performance. An average firm in the sample realizes a 14.2% annual return on assets.

We also examine several proxies for corporate decisions to understand potential reasons behind the effects of heterogeneity on firm value: total CEO pay level, use of incentive compensation, cash holdings, dividend payout level, investment, and leverage ratio. The CEO at the average sample firm receives \$6.6 mln in annual compensation, including approximately 37% in the form of stock option grants. To account for significant correlation of executive

compensation with firm size (and mitigate the effect of the right tail), we normalize total CEO pay by the firm's market value. The use of incentive pay is measured using the percentage of stock option grants in total compensation. Cash holdings are measured using the proportion of cash and short-term investments in total assets net of cash. For the average firm, cash comprises approximately 34% of total assets (the median is 10%). Dividend payout is defined as the ratio of cash dividends on common stock scaled by market value of the firm (1% for the average firm). Leverage ratio is computed as the fraction of long-term debt in total assets (23% for the average firm). Market leverage is used for robustness and is defined as the ratio of long-term debt to the market value of total assets. Investment is measured using the ratio of capital expenditure to total assets (with missing values replaced with zero, similarly to Frank and Goyal (2003)). Total investment, defined as the sum of capital expenditure and research and development expenditure, is used for robustness.

#### Firm characteristics and miscellaneous control variables

To account for the possibility that other characteristics explain both heterogeneity measures and firm value, we control for several other variables in firm value regressions. The following variables are obtained from Compustat. Firm size is measured using log of market value. The average firm in our sample has market value of \$7.0 bln in assets. Cash flow is measured as income before extraordinary items plus depreciation, scaled by total assets. (The variable is excluded from ROA regressions.) Sales growth, our proxy for the extent of growth opportunities, is defined as the annual change in net sales. Sample firms have on average grown at the annual rate of 11.2% per year. Cash flow volatility is the standard deviation of return on assets computed over ten-year rolling annual periods. We also include firm age defined as the log of the number of years since the firm's first listing in CRSP. The average firm age is 24 years.

Institutional investors may play a significant role in the firm. Without assuming causality, we control for the total percentage stake of institutional investors in the firm.<sup>3</sup> Institutional holdings are obtained from CDA Spectrum 13f filings.

Board heterogeneity measures are predicted using firm size, age, cash flow volatility, high tech industry dummy, log of number of business segments, S&P500 dummy, log of number of firms in the industry, specificity of assets in the industry (industry median share of property, plants, and equipment in total assets), and product market concentration (sales-based Herfindahl index). The listed variables are expected to affect the benefits and costs from heterogeneous boards.

To mitigate the potential impact of extreme observations, continuous variables are winsorized at one percent of the left and right tail of the distribution.

### *Methodology*

Ordinary least squares estimates are reported, unless otherwise indicated. Industry dummies at the three-digit SIC level and year effects are included in all regressions. We report t-statistics based on heteroskedasticity robust standard errors with clustering by firm.

To address potential causality issues with board heterogeneity, we lag all right-hand-side variables one period. We also estimate two-stage least squares regressions, using determinants listed above and industry median of board heterogeneity as first stage predictors of heterogeneity.

## **IV. Results**

---

<sup>3</sup> We note that sample firms are characterized by high total institutional ownership (73% on average). Indeed, the “institutional majority” variable obtained directly from Board Analyst (where not missing) shows that institutions hold a majority of shares outstanding in close to 70% of companies. The numbers are comparable to those that would have been obtained for the universe of RiskMetrics firms.

Several firm and industry characteristics that could be capturing costs and benefits of heterogeneity are considered in Table 2. We note that the four dimensions of heterogeneity exhibit distinct relations with firm and industry controls. In the case of industry expertise, a more diverse set of directors is attracted to the boards of larger, older, S&P500 firms that are well established. For mature firms with fewer growth opportunities and firms in less competitive industries, coordination costs arising from heterogeneous board expertise are relatively less important, resulting in more heterogeneity. In contrast, high tech and growth firms retain directors with more industry focus. In case of expertise with growth opportunities, low asset specificity (a high proportion of tangible assets), which potentially increases demand for more transferable director skills, marginally increases heterogeneity. Firm level risk plays a significant role. The need to adjust to uncertainty increases potential benefits from a heterogeneous board containing directors exposed to different levels of growth opportunities. A similar effect is observed for heterogeneity in the number of board appointments. Larger boards have more heterogeneity in the number of board appointments held by its members. However, larger and more mature firms' directors receive less disperse equity incentives (perhaps, to compensate for greater heterogeneity along other dimensions).

[Table 2]

We next turn to the relation between board heterogeneity and firm outcomes. Tabulations are shown in Table 3. Means of firm value and corporate decision variables are reported by quartiles of board heterogeneity.

[Table 3]

Tabulation results are mixed. Firm value and performance appear to have a negative relation to board heterogeneity although the sign is reversed in some cases. We now proceed to multivariate analysis that controls for variations in firm and board characteristics.

[Table 4]

Holding other variables constant, heterogeneity in directors' industry experience and ownership incentives has a negative effect on firm value. An increase from the 25<sup>th</sup> percentile to the 75<sup>th</sup> percentile of heterogeneity in ownership incentives (by 10.9) decreases market-to-book ratio by approximately 0.10. The effect continues to hold when heterogeneity in expertise is added to the regression. An increase from the 25<sup>th</sup> percentile to the 75<sup>th</sup> percentile of heterogeneity in industry expertise (by 0.23) decreases market-to-book by 0.18. Heterogeneity in the number of board appointments initially enters with a negative effect on firm value, which disappears after we control for director busyness and institutional ownership. Heterogeneity in director experience at firms with different growth opportunities is not statistically significant. Most control variables enter with expected signs. Size, sales growth, and firm risk are positively related to market-to-book. Older firms have tend to have lower market-to-book. Firms with higher institutional ownership, higher director ownership, and smaller boards have higher firm valuations. Director busyness has a negative effect on firm value. Overall, it appears that the costs of coordination outweigh the benefits, and firms with greater heterogeneity in director ownership incentives and industry experience tend to have lower valuations.

We verify the robustness of the findings in Table 5. Panel A of Table 5 focuses on additional measures of heterogeneity in director experience. The main results hold when we include each of the four alternative measures of heterogeneity in director expertise, including dispersion in the field of expertise, insider focused measure of heterogeneity in industry

expertise, influential appointment based measure of heterogeneity in industry expertise, and heterogeneity in executive experience. (The alternative measures are correlated with the original measure of heterogeneity in industry expertise, so they are included separately to avoid multicollinearity.) For robustness alternative specifications and definitions of the dependent variable are examined in Panel B. The results are qualitatively similar. Both heterogeneity effects retain their signs and significance when right-hand-side variables are lagged one period (Column D). Finally, the main heterogeneity effects are analyzed in a 2SLS framework in Panel C. Besides the controls used in Table 2, we include three-digit SIC industry medians of board heterogeneity to capture industry-specific costs and benefits of heterogeneity, which are arguably exogenous for an individual firm. The variables of interest retain their signs and significance

[Table 5]

Table 6 shows regressions of other corporate outcome variables on board heterogeneity and controls. We find that firms with more board heterogeneity have lower ROA. Heterogeneity in board appointments matters for future operating performance. We also find that CEO incentive pay is higher in companies with more homogeneous boards (along the dimensions of industry expertise and number of other appointments). Setting CEO compensation takes a coordinated action on the part of board members, and heterogeneous boards may be showing more reluctance to curb total pay levels or insist on equity incentives for the CEO. The result is economically significant. An increase in heterogeneity in industry expertise from the 25<sup>th</sup> to the 75<sup>th</sup> percentile has a 1.6% effect on the proportion of incentive pay (equivalent to 4.3% of the sample average). A greater degree of heterogeneity in industry expertise is also associated with lower cash holdings. For example, a one standard deviation increase in heterogeneity in industry expertise focus has a -6.3% on cash holdings as a percentage of total assets, which is

approximately 19% of the sample average cash holding. The effects of heterogeneity in director reputational incentives are practically important as well. The difference between the first and third quartiles is 0.8 (one standard deviation is approximately 0.6). An increase in heterogeneity in directors' board appointments by 0.8 has the effect of a decrease in the incentive pay percentage by 1.7% (equivalent to 4.7% of the sample mean); and an increase in the leverage ratio by 1.9% (8.1% of the sample mean).

Evidence on the effect of heterogeneity on investment behavior is mixed. Although heterogeneity in expertise with growth opportunities contributes to higher levels of total investment, dispersion in the number of board appointments has the opposite effect on capital expenditure. However, heterogeneous boards predict higher investment sensitivity to cash flow and heterogeneity in director ownership has the effect of lowering investment sensitivity to investment opportunities. It is possible that other forms of agency conflicts or private benefit acquisition are more pervasive than empire-building when director heterogeneity leads to coordination problems on corporate boards. Nevertheless, firms with heterogeneous boards appear to have some compensatory mechanisms in place, namely, higher dividend levels and, for boards with greater dispersion in the number of director board appointments, also higher leverage ratios.

## **V. Conclusion and future work**

We have examined heterogeneity in director characteristics within corporate boards. The presented results have the following implications. Corporate boards exhibit a considerable amount of heterogeneity along dimensions unrelated to conflicts of interest or demographics, namely, in the areas of director experience, ownership stakes, and reputational incentives. Firm and industry characteristics appear to affect the preference towards more versus less board



heterogeneity. Heterogeneity in director characteristics has statistically and economically significant effects on firm value and key firm decisions that cannot be explained by previously documented relations with board composition, size, and expertise levels. Heterogeneity in director industry expertise and director ownership incentives is associated with lower firm value, which underscores the benefits of focus and the costs of coordination as they apply to director appointments. Heterogeneity is also associated with lesser role of incentive pay in managerial compensation, lower cash holdings, and higher dividends. Further, boards with considerable dispersion in director reputational incentives assume more debt, possibly to compensate for the weaker internal monitoring efforts undertaken by such boards.

Several questions are open for future research: Do markets respond more negatively to acquisition bids announced by firms with heterogeneous boards? Is there an effect of board heterogeneity on the cost of equity (debt)?

## References

- Adams, Renee, and Daniel Ferreira, 2008a, Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics* (forthcoming).
- Adams, Renee, and Daniel Ferreira, 2008b, Do directors perform for pay? *Journal of Accounting and Economics*, 46, 154–171
- Adams, Renee, and Hamid Mehran, 2003, Board structure and banking firm performance, Federal Reserve Bank of New York Economic Policy Review, 9, 123–142.
- Agrawal, Anup, and Charles Knoeber, 2001, Do some outside directors play a political role? *Journal of Law and Economics*, 44(1), 179–198.
- Alesina, Alberto, Enrico Spolaore, and Romain Wacziarg, 2000, Economic Integration and Political Disintegration, *American Economic Review* 90(5), 1276–1296.
- Austen-Smith, David, and Timothy Feddersen, 2005, Deliberation and voting rules, In: *Social Choice and Strategic Decisions*, eds. David Austen-Smith and John Duggan, Springer, Berlin.
- Baranchuk, Nina, and Phil Dybvig, 2006. Consensus in diverse corporate boards. Working paper, Washington University.
- Bardhan, Pranab, 1993, Symposium on management of local commons, *Journal of Economics Perspectives*, 7(4), 87–92.
- Boone, Audra, Laura Field, Jonathan Karpoff, and Charu Raheja, 2007, The determinants of corporate board size and composition: An empirical analysis. *Journal of Financial Economics* 85(1), 66–101.
- Beasley, Mark, 1996, An empirical analysis of the relations between the board of director composition and financial statement fraud, *The Accounting Review* 71(4), 443–465.
- Bergstrom, Theodore, Lawrence Blume, and Hal Varian, 1986, On the private provision of public goods, *Journal of Public Economics* 29, 25–49.
- Burkart, Mike, Denis Gromb, and Fausto Panunzi, 1997, Large shareholders, monitoring and the value of the firm, *Quarterly Journal of Economics* 112, 693–728.
- Bushman, Robert, Qi Chen, Ellen Engel, and Abbie Smith, 2004, Financial accounting information, organizational complexity and corporate governance systems, *Journal of Accounting and Economics* 37(2), 167–201.
- Cornes, Richard, 1993, Dyke maintenance and other stories: Some neglected types of public goods, *Quarterly Journal of Economics* 108(1), 259–271.
- Duchin, Ran, John Matsusaka, and Oguzhan Ozbas, 2008, When are outside directors effective? Working paper.
- Elliott, Graham, and Allan Timmermann, 2004, Optimal forecast combinations under general loss functions and forecast error distributions, *Journal of Econometrics* 122(1), 47–79.
- Erhardt, Niclas, James Werbel, and Charles Shrader, 2003, Board of director diversity and firm financial performance, *Corporate Governance: An International Review* 11(2), 102–111.

- Ferris, Stephen, Murali Jagannathan, and A. C. Pritchard, 2003, Too busy to mind the business? Monitoring by directors with multiple board appointments, *Journal of Finance* 58(3), 1087–1112.
- Fich, Eliezer, 2005, Are some outside directors better than others? Evidence from director appointments by Fortune 1000 firms, *Journal of Business* 78(5), 1943–1971.
- Fich, Eliezer, and Anil Shivdasani, 2006, Are busy boards effective monitors? *Journal of Finance* 61(2), 689–724.
- Fich, Eliezer, and Anil Shivdasani, 2007, Financial fraud, director reputation, and shareholder wealth? *Journal of Financial Economics* 86 (2), 306–336
- Goodstein, Jerry, Kanak Gautam, and Warren Boeker, 1994, The effects of board size and diversity on strategic change, *Strategic Management Journal* 15(3), 241–250.
- Guner, A. Burak, Ulrike Malmendier, and Geoffrey Tate, 2006, Financial expertise of directors, Working paper.
- Hamilton, Barton, Jack Nickerson, and Hideo Owan, 2003, Team incentives and worker heterogeneity: An empirical analysis of the impact of teams on productivity and participation, *Journal of Political Economy* 111(3), 465–497.
- Heckathorn, Douglas, 1993, Collective action and group heterogeneity: Voluntary provision versus selective incentives, *American Journal of Sociology* 58, 329–350.
- Hermalin, Benjamin, and Michael Weisbach, 1998, Endogenously chosen boards of directors and their monitoring of the CEO, *American Economic Review* 88, 96–118.
- Ledyard, John, 1995, Public goods: A survey of experimental research, In: *Handbook of Experimental Economics*, eds. Kagel, John and Alvin Roth. Princeton University Press, Princeton, 111–194.
- Kandel, Eugene, and Edward Lazear, 1992, Peer pressure and partnerships, *Journal of Political Economy* 100(4), 801–817.
- Kaplan, Steven, and David Reishus, 1990, Outside directorships and corporate performance, *Journal of Financial Economics* 27, 389–410.
- Kosnik, Rita, 1990, Effects of board demography and directors' incentives on corporate greenmail decisions, *Academy of Management Journal*, 33(1), 129–150.
- Kroznor, Randall, and Philip Strahan, 2001, Bankers on boards: monitoring, conflicts of interest, and lender liability, *Journal of Financial Economics* 62(3), 415–452.
- Masulis, Ron, and Shawn Mobbs, 2008. Are all inside directors the same? CEO entrenchment or board enhancement, Working paper, Vanderbilt University
- Murray, Allan, 1989, Top management group heterogeneity and firm performance, *Strategic Management Journal* 10, 125–141.
- Oliver, Pamela, Gerald Marwell, and Ruy Teixeira, 1985, A theory of the critical mass, I. Interdependence, group heterogeneity, and the production of collective action, *American Journal of Sociology* 91(3), 522–556.
- Papakonstantinou, Filippou, 2007, Boards of directors: The value of industry experience, Working paper.

- Pegels, Carl, Yong Song, and Baik Yang, 2000, Management heterogeneity, competitive interaction groups, and firm performance, *Strategic Management Journal* 21(9), 911–923.
- Richardson, Scott, A. Irem Tuna, and Peter Wysocki, 2003, Accounting for taste: Board member preferences and corporate policy choices, Working paper.
- Rosenstein, Stuart, and Jeffrey G. Wyatt, 1990, Outside directors, board independence, and shareholder wealth, *Journal of Financial Economics* 26(2), 175–191.
- Sibert, Anne, Monetary policy committees: Individual and collective reputations, *Review of Economic Studies* 70(3), 649–665.
- Stock, James, and Mark Watson, 1999, Forecasting inflation, *Journal of Monetary Economics* 44(3), 293-335.
- Vandenbussche, Jerome, 2006, Elements of optimal monetary policy committee design, Working paper.
- Vigdor, Jacob, 2004, Community composition and collective action: Analyzing initial mail response to the 2000 Census, *Review of Economics and Statistics* 86(1), 303-312.
- Warther, Vincent, 1998, Board effectiveness and board dissent: A model of the board's relationship to management and shareholders, *Journal of Corporate Finance* 4, 53-70.
- Yermack, David, 1996, High market valuation of companies with a small board of directors, *Journal of Financial Economics* 40(2), 185-211.
- Yermack, David, 2004, Remuneration, retention, and reputation incentives for outside directors, *Journal of Finance*, 59(5), 2281-2308.

**Table 1. Variable definitions and summary statistics**

The sample includes US firms with nonmissing Compustat, CDA Spectrum, and Board Analyst data. Firms with total assets less than 20 mln, financial firms (SIC 6000-6999), and regulated utilities (SIC 4900-4999) are excluded. At least one director on the firm's board should have an appointment at another firm reported in Board Analyst. The sample period is 2001-2006.

Variable	Obs	Mean	Q1	Med	Q3	SD	Description
<i>Firm value and decisions</i>							
Market-to-book	5597	1.424	0.733	0.981	1.515	1.483	Ratio of market value (book value of total assets plus price times shares outstanding minus book value of equity) to total assets; Compustat
Market-to-book (II)	5597	1.619	0.758	1.046	1.742	1.915	Market-to-book ratio as defined above, however, market value is divided by lagged total assets; Compustat
Market-to-book (III)	5092	1.417	0.698	0.962	1.509	1.534	Market-to-book ratio as defined above, however, market value is defined as book value of total assets plus price times shares outstanding minus book value of equity and deferred taxes; Compustat
ROA	5597	0.142	0.088	0.140	0.203	0.128	Ratio of operating income before depreciation to lagged total assets; Compustat
CEO incentive pay	3878	36.569	9.950	36.342	58.762	28.219	Ratio of (Black-Scholes) value of CEO option grants to total CEO compensation including option grants; Execucomp
CEO total pay (mln)	4671	6630	1834	3692	7283	34308	Total CEO pay including option grants (mln); Execucomp
CEO total pay	4671	0.258	0.073	0.152	0.298	0.367	Ratio of total CEO pay including option grants to market value, multiplied by 100; Execucomp
Cash	5597	0.337	0.030	0.098	0.288	0.938	Ratio of cash and short-term investments to total assets net of cash and short-term investments; Compustat
Dividends	5572	1.063	0.000	0.116	1.380	1.879	Ratio of common dividends to market value, times 100; Compustat
Leverage	5583	0.229	0.077	0.216	0.330	0.187	Ratio of long-term debt to total assets; Compustat
Leverage (market)	5585	0.201	0.036	0.165	0.314	0.182	Ratio of long-term debt to market value; Compustat
Capex	5597	4.977	2.074	3.569	6.182	4.714	Ratio of capital expenditure to total assets; replaced by zero if missing; Compustat
Capex+RD	5597	8.500	3.608	6.383	11.002	7.652	Ratio of capital expenditure plus R&D to total assets; replaced by zero if missing; Compustat
<i>Firm characteristics</i>							
Cash flow	5597	0.075	0.051	0.089	0.130	0.131	Ratio of income before extraordinary items plus depreciation to total assets; Compustat
Firm size (mln)	5597	6991	923	2236	5487	28394	Market value (mln) ; Compustat
Firm size	5597	7.697	6.828	7.712	8.610	1.413	Log of market value; Compustat
Growth opp	5597	0.112	0.006	0.081	0.172	0.269	Annual change in net sales; Compustat
Firm risk	5597	0.055	0.025	0.040	0.069	0.051	Ten-year moving standard deviation of ROA; Compustat
Firm age (years)	5597	23.819	9.000	17.000	34.000	20.129	Number of years since first listing in CRSP; CRSP
Firm age	5597	2.786	2.197	2.833	3.526	0.940	Log of number of years since first listing in CRSP; CRSP
Product market concentration	5597	0.196	0.083	0.143	0.242	0.170	Herfindahl index of net sales (by three-digit SIC industry); Compustat
Industry asset tangibility	5597	0.246	0.096	0.179	0.339	0.199	Median (three-digit SIC) industry ratio of net property, plants, and equipment to total assets; Compustat
High tech	5597	0.209	0.000	0.000	0.000	0.406	Dummy equal to one if the firm's SIC industry is 2833-2836, 3570-3577, 3600-3674, 7371-7379 or 8731-8734; zero otherwise; Compustat
Industry size (number)	5597	102	13	28	130	155	Number of companies in the firm's (three-digit SIC) industry; Compustat
Industry size	5597	3.582	2.565	3.332	4.868	1.475	Log of the number of companies in the firm's (three-digit SIC) industry; Compustat
S&P500	5597	0.326	0.000	0.000	1.000	0.469	Dummy equal to one if the firm is included in the S&P500 index; zero otherwise; Compustat
Segments (number)	4827	2.864	1.000	3.000	4.000	1.871	Number of business segments; Compustat Segments
Segments	4827	0.817	0.000	1.099	1.386	0.708	Log of number of business segments; Compustat Segments

Institutional ownership	5597	72.710	62.007	75.919	86.281	18.744	Institutional ownership as a percent of shares outstanding; CDA Spectrum
<i>Board characteristics</i>							
Board size (number)	5597	10.707	8.000	10.000	12.000	3.418	Number of directors on the board; Board Analyst
Board size	5597	2.325	2.079	2.303	2.485	0.298	Log of number of directors on the board; Board Analyst
Board independence	5597	0.684	0.583	0.700	0.800	0.155	Proportion of independent directors on the board; Board Analyst
Director ownership	5597	0.642	0.036	0.136	0.548	1.320	Average director stake as a percent of shares outstanding; Board Analyst
Director ownership (total)	5597	6.337	0.375	1.342	5.705	12.638	Total director ownership as a percent of shares outstanding; Board Analyst
Board appointments	5597	2.403	1.857	2.333	2.857	0.745	Average number of board appointments held by the firm's directors; Board Analyst
Busy directors	5597	0.380	0.235	0.375	0.500	0.196	Proportion of directors with three or more board appointments on the firm's board; Board Analyst
Industry expertise	5597	0.072	0.000	0.000	0.125	0.111	Proportion of directors with another board appointment in the same Fama-French industry; Board Analyst
Executive expertise	5597	0.196	0.063	0.125	0.250	0.217	Proportion of directors with a CEO position at another firm; Board Analyst
<i>Board heterogeneity</i>							
Heterogeneity (director ownership)	5597	20.562	14.855	19.755	25.744	7.462	Standard deviation of $s_i$ (proportion of shares held by director $i$ in the total number of shares held by directors) across the firm's directors; defined if total director ownership is positive; higher values reflect more heterogeneity; Board Analyst
Heterogeneity (board appointments)	5597	1.594	1.167	1.508	1.944	0.620	Standard deviation of $b_i$ (number of board appointments held by director $i$ ) across the firm's directors; higher values reflect more heterogeneity; Board Analyst
Heterogeneity (industry expertise)	5597	0.697	0.625	0.750	0.857	0.222	Index of heterogeneity of director industry expertise, $1 - \sum d_k^2$ , where $d_k$ is proportion of other board seats held by the firm's directors in (Fama-French) industry $k$ ; defined if at least one director holds a board seat at another firm with nonmissing SIC code; higher values reflect more heterogeneity; Board Analyst
Heterogeneity (industry of occupation)	5597	0.525	0.000	0.500	1.000	0.398	Index of heterogeneity of director industry expertise as defined above, however, only insider appointments at other firms are considered; Board Analyst
Heterogeneity (industry expertise (key))	5597	0.655	0.500	0.667	0.800	0.179	Index of heterogeneity of director industry expertise as defined above, however, only the most influential appointment is considered for directors with multiple appointments at other firms (selection criteria were applied in the following order until a single influential appointment was identified: insider status; lead director status; longest tenure; largest firm size); Board Analyst
Heterogeneity (field of expertise)	5597	0.596	0.519	0.613	0.684	0.114	Index of heterogeneity of director field of expertise, $1 - \sum f_k^2$ , where $f_k$ is proportion of the firm's directors (directors' appointments) in field $k$ and $k$ is one of the following categories of expertise: (i) no other board appointments or academic positions; (ii) academic; (iii) other outsider appointments in nonfinancial firms not in the firm's industry; (iv) other outsider appointments in financial firms (SIC 6000-6999); (v) other outsider appointments in the firm's industry; (vi) other inside appointments in nonfinancial firms not in the firm's industry; (vii) other inside appointments in financial firms; (viii) other inside appointments in the firm's industry; Fama-French industry definitions are used; higher values reflect more heterogeneity; Board Analyst
Heterogeneity (executive expertise)	5597	0.559	0.486	0.582	0.656	0.126	Index of heterogeneity of director executive experience, $1 - \sum x_k^2$ , where $x_k$ is proportion of the firm's directors with the level of current executive experience $k$ and $k$ is one the following experience levels: (i) CEO position at another firm; (ii) non-CEO insider status on at least one other firm's board; (iii) outsider status on at least one other firm's board; (iv) no other board appointments; higher values reflect more heterogeneity; Board Analyst
Heterogeneity (expertise in firm type)	5597	0.158	0.071	0.115	0.187	0.152	Standard deviation of $\bar{g}_i$ (average annual sales growth of firms where director $i$ holds other board seats) across the firm's directors; defined if at least one director holds a board seat at another firm with nonmissing sales growth; higher values reflect more heterogeneity; Board Analyst

**Table 2. Determinants of board heterogeneity**

Ordinary least squares regressions predicting board heterogeneity. In Columns IV and VIII of Panels A and B, explanatory variables are lagged one year. Sample selection criteria and variable definitions are shown in Table 1. Robust t-statistics (with clustering by firm) are italicized.

*Panel A: Heterogeneity in director ownership stakes and board appointments*

Dependent variable:	Heterogeneity (director ownership)								Heterogeneity (board appointments)					
	I	II	III	IV	V	VI	VII	VIII						
Firm size	-0.763 ***	-0.756 ***	-0.671 ***	-0.580 ***	0.060 ***	0.061 ***	0.059 ***	0.071 ***						
	<i>-5.84</i>	<i>-5.12</i>	<i>-4.19</i>	<i>-3.18</i>	<i>5.22</i>	<i>4.55</i>	<i>4.05</i>	<i>4.18</i>						
Growth opportunities	0.604	0.603	0.712	0.422	-0.052	-0.054	-0.057	-0.061						
	<i>1.50</i>	<i>1.49</i>	<i>1.63</i>	<i>0.94</i>	<i>-1.30</i>	<i>-1.32</i>	<i>-1.26</i>	<i>-1.16</i>						
Firm age	-1.395 ***	-1.392 ***	-1.368 ***	-1.092 ***	-0.043 ***	-0.043 ***	-0.043 ***	-0.035 **						
	<i>-7.28</i>	<i>-7.09</i>	<i>-6.47</i>	<i>-4.74</i>	<i>-2.99</i>	<i>-2.98</i>	<i>-2.63</i>	<i>-2.02</i>						
Product market concentration	1.989	2.064	2.020	5.941	0.233	-0.080	-0.079	-0.158						
	<i>1.04</i>	<i>0.90</i>	<i>0.79</i>	<i>2.19</i>	<i>1.30</i>	<i>-0.38</i>	<i>-0.32</i>	<i>-0.54</i>						
Firm risk	4.692	4.703	3.014	8.596 **	0.978 ***	0.996 ***	1.024 ***	1.344 ***						
	<i>1.53</i>	<i>1.53</i>	<i>0.96</i>	<i>2.01</i>	<i>3.47</i>	<i>3.53</i>	<i>3.33</i>	<i>3.35</i>						
Industry asset tangibility	4.308	4.318	3.738	4.301	0.503	0.461	0.348	0.612 *						
	<i>1.35</i>	<i>1.35</i>	<i>1.06</i>	<i>1.13</i>	<i>1.60</i>	<i>1.49</i>	<i>1.02</i>	<i>1.95</i>						
High tech	1.268	1.267	1.789 **	1.119	-0.052	-0.052	-0.072	3.3E-04						
	<i>1.42</i>	<i>1.42</i>	<i>2.04</i>	<i>1.03</i>	<i>-0.71</i>	<i>-0.71</i>	<i>-0.90</i>	<i>0.0E+00</i>						
Industry size		0.045	0.242	1.462		-0.201 **	-0.206 **	-0.125						
		<i>0.05</i>	<i>0.26</i>	<i>1.42</i>		<i>-2.54</i>	<i>-2.41</i>	<i>-1.26</i>						
S&P 500		-0.035	0.225	-0.054		-0.009	-0.005	-0.022						
		<i>-0.08</i>	<i>0.47</i>	<i>-0.11</i>		<i>-0.24</i>	<i>-0.13</i>	<i>-0.54</i>						
Segments			-0.614 **				-0.018							
			<i>-2.10</i>				<i>-0.82</i>							
Number of obs.	5597	5597	4827	3855	5597	5597	4827	3872						
R <sup>2</sup>	0.24	0.24	0.25	0.31	0.21	0.21	0.22	0.25						
Adj. R <sup>2</sup>	0.21	0.21	0.21	0.27	0.18	0.18	0.18	0.21						

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%

Panel B: Heterogeneity in director expertise

Dependent variable:	Heterogeneity (industry expertise)				Heterogeneity (expertise in firm type)			
	I	II	III	IV	V	VI	VII	VIII
Firm size	0.059 *** 16.38	0.047 *** 11.23	0.001 ** 2.26	0.045 *** 9.22	-0.003 -1.44	-0.004 * -1.70	-0.004 -1.44	-0.002 -0.51
Growth opportunities	-0.048 *** -3.61	-0.045 *** -3.42	0.001 0.34	-0.026 -1.47	0.006 0.58	0.007 0.63	0.006 0.50	0.031 * 1.88
Firm age	0.016 *** 3.24	0.011 ** 2.09	3.3E-04 0.40	0.008 1.41	-0.003 -1.06	-0.003 -1.24	-0.002 -0.55	-0.005 -1.52
Product market concentration	0.077 0.91	0.055 0.57	0.137 *** 3.47	0.247 ** 2.29	-0.082 * -1.84	-0.005 -0.10	0.014 0.24	0.019 0.28
Firm risk	-0.166 * -1.76	-0.192 ** -2.06	-0.019 -1.44	-0.141 -0.98	0.163 ** 2.22	0.156 ** 2.14	0.093 1.32	0.140 1.52
Industry asset tangibility	0.045 0.50	0.041 0.47	-0.008 -0.19	0.116 1.05	-0.118 -1.64	-0.108 -1.48	-0.140 * -1.75	0.071 0.94
High tech	-0.077 ** -2.43	-0.075 ** -2.44	2.4E-04 0.12	-0.086 ** -2.32	0.016 1.13	0.017 1.14	0.016 0.91	0.034 ** 2.13
Num companies in the industry		-0.009 -0.35	0.027 ** 2.12	0.022 0.67		0.049 ** 2.53	0.058 *** 2.65	0.039 1.47
S&P 500		0.068 *** 5.63	0.002 1.02	0.057 *** 4.48		0.007 1.03	0.002 0.30	0.002 0.24
Number of segments			2.9E-05 0.03				-0.005 -1.00	
Number of obs.	5597	5597	4827	3872	5597	5597	4827	3749
R <sup>2</sup>	0.31	0.32	0.56	0.32	0.12	0.13	0.14	0.11
Adj. R <sup>2</sup>	0.28	0.29	0.54	0.28	0.09	0.09	0.09	0.06

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%



**Table 3. Board heterogeneity and firm value: Univariate evidence**

Means of firm value and main corporate decision variables by quartile of heterogeneity. Sample selection criteria and variable definitions are shown in Table 1.

Heterogeneity (director ownership)	Quartile 1 (Lowest)		Quartile 2		Quartile 3		Quartile 4 (Highest)	
	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean
Market-to-book	1399	1.334	1400	1.411	1399	1.391	1399	1.560
ROA	1399	0.128	1400	0.125	1399	0.126	1399	0.121
CEO incentive pay	842	34.719	971	35.846	1004	36.270	1061	38.980
CEO total pay	1208	0.246	1190	0.236	1145	0.268	1128	0.283
Cash	1399	0.226	1400	0.300	1399	0.327	1399	0.495
Dividends	1389	1.398	1393	1.115	1393	0.998	1397	0.741
Capex	1399	4.939	1400	5.044	1399	5.179	1399	4.746
Leverage	1398	0.249	1397	0.237	1395	0.221	1393	0.208
Heterogeneity (board appointments)	Quartile 1 (Lowest)		Quartile 2		Quartile 3		Quartile 4 (Highest)	
	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean
Market-to-book	1409	1.542	1393	1.423	1395	1.398	1400	1.332
ROA	1409	0.136	1393	0.124	1395	0.130	1400	0.110
CEO incentive pay	1164	37.455	1019	37.905	920	35.888	775	34.287
CEO total pay	1250	0.294	1199	0.246	1180	0.243	1042	0.244
Cash	1409	0.274	1393	0.343	1395	0.314	1400	0.418
Dividends	1408	0.912	1386	1.004	1383	1.201	1395	1.135
Capex	1409	5.239	1393	5.135	1395	4.891	1400	4.642
Leverage	1406	0.211	1387	0.219	1391	0.228	1399	0.257
Heterogeneity (industry expertise)	Quartile 1 (Lowest)		Quartile 2		Quartile 3		Quartile 4 (Highest)	
	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean
Market-to-book	1503	1.684	1338	1.576	1398	1.329	1358	1.083
ROA	1503	0.108	1338	0.123	1398	0.131	1358	0.140
CEO incentive pay	1040	39.148	947	36.263	982	33.654	909	37.084
CEO total pay	1169	0.337	1078	0.300	1176	0.244	1248	0.160
Cash	1503	0.582	1338	0.369	1398	0.238	1358	0.137
Dividends	1498	0.531	1332	0.737	1394	1.116	1348	1.920
Capex	1503	5.336	1338	5.099	1398	4.859	1358	4.582
Leverage	1495	0.200	1335	0.218	1396	0.239	1357	0.262
Heterogeneity (expertise in firm type)	Quartile 1 (Lowest)		Quartile 2		Quartile 3		Quartile 4 (Highest)	
	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean
Market-to-book	1400	1.535	1398	1.325	1399	1.343	1400	1.492
ROA	1400	0.130	1398	0.131	1399	0.131	1400	0.107
CEO incentive pay	1062	35.017	1010	35.644	935	36.744	871	39.343
CEO total pay	1187	0.270	1206	0.248	1184	0.241	1094	0.274
Cash	1400	0.277	1398	0.244	1399	0.291	1400	0.535
Dividends	1394	1.071	1391	1.183	1394	1.150	1393	0.846
Capex	1400	5.181	1398	4.639	1399	5.040	1400	5.049
Leverage	1396	0.223	1394	0.234	1396	0.228	1397	0.231

**Table 4. Board heterogeneity and firm value: Multivariate results**

Ordinary least squares regressions of firm value on board heterogeneity and controls. Sample selection criteria and variable definitions are shown in Table 1. Robust t-statistics (with clustering by firm) are italicized.

Dependent variable:	Market-to-book					
	I	II	III	IV	V	VI
Heterogeneity (director ownership)	-0.009 ** <i>-2.31</i>	-0.008 ** <i>-2.20</i>			-0.010 ** <i>-2.54</i>	-0.009 ** <i>-2.40</i>
Heterogeneity (board appointments)	-0.159 *** <i>-4.24</i>	-0.007 <i>-0.19</i>			-0.077 <i>-2.05</i>	0.028 <i>0.78</i>
Heterogeneity (industry expertise)			-1.064 *** <i>-6.90</i>	-1.059 *** <i>-6.87</i>	-1.025 *** <i>-6.51</i>	-0.766 *** <i>-4.93</i>
Heterogeneity (expertise in firm type)			-0.008 <i>-0.06</i>	-0.005 <i>-0.04</i>	-0.013 <i>-0.10</i>	-0.035 <i>-0.27</i>
Cash flow	0.984 *** <i>3.96</i>	0.762 *** <i>3.13</i>	1.054 *** <i>4.20</i>	0.968 *** <i>3.90</i>	0.999 *** <i>4.03</i>	0.808 *** <i>3.34</i>
Firm size	0.301 *** <i>7.25</i>	0.345 *** <i>7.90</i>	0.326 *** <i>7.70</i>	0.319 *** <i>7.50</i>	0.337 *** <i>7.90</i>	0.364 *** <i>8.18</i>
Growth opportunities	0.296 *** <i>3.95</i>	0.229 *** <i>3.19</i>	0.260 *** <i>3.37</i>	0.245 *** <i>3.16</i>	0.265 *** <i>3.45</i>	0.211 *** <i>2.88</i>
Firm risk	2.863 *** <i>3.06</i>	3.037 *** <i>3.26</i>	2.580 *** <i>2.76</i>	2.670 *** <i>2.85</i>	2.668 *** <i>2.86</i>	2.816 *** <i>3.03</i>
Firm age	-0.108 *** <i>-2.71</i>	-0.128 *** <i>-3.03</i>	-0.114 *** <i>-2.89</i>	-0.118 *** <i>-3.01</i>	-0.109 *** <i>-2.76</i>	-0.110 *** <i>-2.83</i>
Institutional ownership		0.007 *** <i>4.66</i>		0.005 *** <i>3.26</i>		0.006 *** <i>4.52</i>
Board size	-1.556 *** <i>-10.22</i>	-1.510 *** <i>-10.06</i>	-1.208 *** <i>-8.53</i>	-1.176 *** <i>-8.23</i>	-1.312 *** <i>-8.94</i>	-1.330 *** <i>-9.00</i>
Board independence	-0.074 <i>-0.40</i>	0.147 <i>0.75</i>	-0.041 <i>-0.22</i>	-0.127 <i>-0.69</i>	0.172 <i>0.90</i>	0.247 <i>1.28</i>
Director ownership	0.097 *** <i>3.81</i>	0.115 *** <i>4.59</i>			0.101 *** <i>3.99</i>	0.122 *** <i>4.79</i>
Busy directors		-1.255 *** <i>-7.81</i>				-1.033 *** <i>-6.49</i>
Industry expertise				-0.335 <i>-1.33</i>		0.091 <i>0.37</i>
Number of obs.	5597	5597	5597	5597	5597	5597
R <sup>2</sup>	0.27	0.29	0.27	0.28	0.28	0.30
Adj. R <sup>2</sup>	0.24	0.26	0.24	0.25	0.25	0.26

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%

**Table 5. Board heterogeneity and firm value: Additional measures**

Ordinary least squares regressions of firm value on board heterogeneity and controls. Sample selection criteria and variable definitions are shown in Table 1. Robust t-statistics (with clustering by firm) are italicized. In Columns I of Panel B, explanatory variables are lagged one year.

*Panel A: Alternative measures of industry expertise*

Dependent variable:	Market-to-book			
	I	II	III	IV
Heterogeneity (director ownership)	-0.008 ** <i>-2.07</i>	-0.009 ** <i>-2.29</i>	-0.009 ** <i>-2.31</i>	-0.008 ** <i>-2.17</i>
Heterogeneity (board appointments)	0.006 <i>0.16</i>	-0.005 <i>-0.14</i>	-0.009 <i>-0.27</i>	-0.006 <i>-0.16</i>
Heterogeneity (field of expertise)	-0.792 *** <i>-3.66</i>			
Heterogeneity (industry of occupation)		-0.109 ** <i>-2.07</i>		
Heterogeneity (industry expertise (key))			-0.742 *** <i>-4.58</i>	
Heterogeneity (executive expertise)				-0.370 ** <i>-2.05</i>
Heterogeneity (expertise in firm type)	-0.022 <i>-0.17</i>	-0.022 <i>-0.18</i>	0.006 <i>0.05</i>	-0.006 <i>-0.05</i>
Cash flow	0.782 *** <i>3.23</i>	0.784 *** <i>3.25</i>	0.781 *** <i>3.22</i>	0.766 *** <i>3.15</i>
Firm size	0.353 *** <i>7.97</i>	0.348 *** <i>7.90</i>	0.362 *** <i>8.12</i>	0.348 *** <i>7.93</i>
Growth opportunities	0.222 *** <i>3.08</i>	0.223 *** <i>3.11</i>	0.209 *** <i>2.90</i>	0.227 *** <i>3.15</i>
Firm risk	2.908 *** <i>3.14</i>	2.954 *** <i>3.17</i>	2.926 *** <i>3.14</i>	2.983 *** <i>3.22</i>
Firm age	-0.108 *** <i>-2.78</i>	-0.110 *** <i>-2.81</i>	-0.107 *** <i>-2.76</i>	-0.111 *** <i>-2.83</i>
Institutional ownership	0.007 *** <i>4.69</i>	0.006 *** <i>4.56</i>	0.006 *** <i>4.61</i>	0.007 *** <i>4.66</i>
Board size	-1.465 *** <i>-9.84</i>	-1.505 *** <i>-10.03</i>	-1.338 *** <i>-8.87</i>	-1.503 *** <i>-9.92</i>
Board independence	0.151 <i>0.78</i>	0.133 <i>0.69</i>	0.229 <i>1.18</i>	0.126 <i>0.63</i>
Director ownership	0.121 *** <i>4.75</i>	0.119 *** <i>4.70</i>	0.121 *** <i>4.74</i>	0.118 *** <i>4.62</i>
Busy directors	-1.198 *** <i>-7.52</i>	-1.274 *** <i>-7.85</i>	-1.085 *** <i>-6.72</i>	-1.193 *** <i>-7.28</i>
Industry expertise	0.568 ** <i>2.21</i>	0.286 <i>1.16</i>	0.195 <i>0.78</i>	
Executive expertise				-0.071 <i>-0.33</i>
Number of obs.	5597	5597	5597	5597
R <sup>2</sup>	0.29	0.29	0.29	0.29
Adj. R <sup>2</sup>	0.26	0.26	0.26	0.26

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%

Panel B: Alternative measures of the dependent variable

Dependent variable:	Market-to-book	Market-to-book (II)	Market-to-book (III)
	I	II	III
Heterogeneity (director ownership)	-0.009 ** -2.15	-0.012 ** -2.42	-0.009 ** -2.18
Heterogeneity (board appointments)	-0.040 -0.96	0.016 0.35	0.014 0.35
Heterogeneity (industry expertise)	0.335 -0.562 ***	0.730 -0.966 ***	0.723 -0.745 ***
Heterogeneity (expertise in firm type)	-3.23 -0.123 -0.71	-5.10 0.031 0.17	-4.56 0.023 0.17
Cash flow	0.772 *** 3.22	1.442 *** 4.45	0.803 *** 3.12
Firm size	0.131 *** 3.41	0.490 *** 7.56	0.385 *** 7.57
Growth opportunities	0.126 1.47	0.795 *** 5.85	0.215 *** 2.79
Firm risk	0.769 1.00	4.520 *** 2.94	3.121 *** 3.15
Firm age	-0.077 ** -2.00	-0.182 *** -3.32	-0.108 *** -2.64
Institutional ownership	0.006 *** 3.81	0.008 *** 4.68	0.006 *** 4.39
Board size	-0.885 *** -5.32	-1.663 *** -8.74	-1.416 *** -8.80
Board independence	0.038 0.19	0.344 1.44	0.317 1.51
Director ownership	0.099 *** 2.87	0.138 *** 4.62	0.122 *** 4.26
Busy directors	-0.559 *** -3.66	-1.251 *** -6.13	-1.089 *** -6.23
Industry expertise	0.176 0.56	0.047 0.15	0.134 0.53
Number of obs.	3905	5597	5092
R <sup>2</sup>	0.27	0.30	0.29
Adj. R <sup>2</sup>	0.23	0.27	0.26

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%

Panel C: 2SLS estimation

Dependent variable	Market-to-book		
	I	II	III
Heterogeneity (director ownership)	-0.063 <sup>***</sup> -4.74		-0.044 <sup>***</sup> -2.88
Heterogeneity (industry expertise)		-5.990 <sup>***</sup> -6.71	-5.780 -6.49
Cash flow	0.893 <sup>***</sup> 3.61	0.865 <sup>***</sup> 2.98	0.854 <sup>***</sup> 3.01
Firm size	0.301 <sup>***</sup> 7.31	0.519 <sup>***</sup> 8.60	0.526 <sup>***</sup> 8.68
Growth opportunities	0.286 <sup>***</sup> 3.78	0.087 0.77	0.103 0.94
Firm risk	2.909 <sup>***</sup> 3.12	2.110 <sup>**</sup> 2.11	2.200 <sup>**</sup> 2.23
Firm age	-0.115 <sup>***</sup> -2.87	-0.136 <sup>***</sup> -3.07	-0.148 <sup>***</sup> -3.36
Institutional ownership	0.006 <sup>***</sup> 4.44	0.005 <sup>**</sup> 2.54	0.004 <sup>**</sup> 2.11
Board size	-2.253 <sup>***</sup> -9.11	0.121 0.50	-0.555 -1.63
Board independence	-0.064 -0.34	1.309 <sup>***</sup> 4.08	1.336 <sup>***</sup> 4.14
Director ownership	0.170 <sup>***</sup> 5.95	0.121 <sup>***</sup> 4.09	0.158 <sup>***</sup> 4.84
Industry expertise	0.069 0.26	-1.060 <sup>***</sup> -3.11	-0.926 <sup>***</sup> -2.67
Number of obs.	5597	5597	5597
F-stat, Heterogeneity (director)	42.78 <sup>***</sup>		36.72 <sup>***</sup>
F-stat, Heterogeneity (industry expertise)		17.75 <sup>***</sup>	15.27 <sup>***</sup>
IV relevance (Anderson c/corr LR stat)	251.69 <sup>***</sup>	216.38 <sup>***</sup>	194.72 <sup>***</sup>

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%

**Table 6. Board heterogeneity and firm decisions**

Ordinary least squares regressions of firm performance and decisions on board heterogeneity and controls. Sample selection criteria and variable definitions are shown in Table 1. Robust t-statistics (with clustering by firm) are italicized.

<i>Dependent variable</i>	ROA	CEO incentive pay	CEO total pay	Cash	Dividends	Capex	Capex+RD	Leverage	Leverage (market)	
	I	II	III	IV	V	VI	VII	VIII	IX	
Heterogeneity (director ownership)	-2.5E-04 <i>-0.72</i>	0.026 <i>0.29</i>	-0.002 <i>-1.75</i>	* <i>1.52</i>	0.004 <i>0.12</i>	0.001 <i>1.21</i>	0.017 <i>0.45</i>	0.012 <i>-0.65</i>	-3.5E-04 <i>0.53</i>	
Heterogeneity (board appointments)	-0.008 <i>-1.98</i>	** <i>-2.10</i>	** <i>0.028</i>	** <i>2.26</i>	0.030 <i>1.10</i>	0.022 <i>0.39</i>	-0.306 <i>-2.64</i>	*** <i>-0.223</i>	0.024 <i>3.93</i>	*** <i>0.013</i>
Heterogeneity (industry expertise)	0.013 <i>1.02</i>	-6.787 <i>-1.99</i>	** <i>-0.061</i>	** <i>-2.82</i>	** <i>0.306</i>	** <i>0.505</i>	-1.250 <i>-1.28</i>	-0.013 <i>-0.69</i>	0.001 <i>0.05</i>	
Heterogeneity (expertise in firm type)	-0.039 <i>-2.53</i>	** <i>1.940</i>	0.053 <i>0.93</i>	0.149 <i>1.47</i>	-0.256 <i>-1.46</i>	0.069 <i>0.18</i>	2.521 <i>3.12</i>	*** <i>0.005</i>	0.005 <i>-0.12</i>	-0.002 <i>-0.12</i>
Cash flow		6.009 <i>0.95</i>	-0.491 <i>-4.05</i>	*** <i>-3.29</i>	*** <i>2.187</i>	*** <i>6.42</i>	2.576 <i>1.23</i>	-23.583 <i>-4.60</i>	*** <i>-0.364</i>	*** <i>-0.341</i>
Firm size	0.031 <i>12.35</i>	*** <i>2.927</i>	*** <i>-0.108</i>	*** <i>-0.082</i>	*** <i>0.205</i>	*** <i>-0.122</i>	* <i>-0.442</i>	*** <i>0.022</i>	*** <i>0.009</i>	** <i>0.009</i>
Growth opportunities	0.034 <i>2.00</i>	** <i>-3.093</i>	** <i>-0.057</i>	** <i>0.082</i>	*** <i>-0.472</i>	** <i>0.585</i>	*** <i>1.547</i>	*** <i>0.016</i>	0.016 <i>1.24</i>	-0.003 <i>-0.28</i>
Institutional ownership	0.001 <i>5.47</i>	*** <i>0.183</i>	*** <i>-0.002</i>	** <i>-0.002</i>	* <i>-0.019</i>	*** <i>0.000</i>	** <i>-0.019</i>	** <i>0.001</i>	** <i>1.1E-04</i>	1.1E-04 <i>0.48</i>
Cash flow volatility	-0.557 <i>-4.35</i>	*** <i>42.662</i>	** <i>-0.233</i>	*** <i>2.645</i>	*** <i>0.179</i>	*** <i>5.136</i>	*** <i>25.198</i>	*** <i>-0.138</i>	*** <i>-0.209</i>	** <i>-0.209</i>
Firm age	-0.001 <i>-0.41</i>	-1.791 <i>-2.07</i>	** <i>-0.028</i>	*** <i>-0.039</i>	** <i>0.382</i>	*** <i>-0.032</i>	-0.043 <i>-0.25</i>	-0.006 <i>-1.20</i>	-0.007 <i>-1.54</i>	
Board size	-0.045 <i>-3.79</i>	*** <i>4.483</i>	-0.036 <i>-1.10</i>	-0.060 <i>-0.67</i>	0.437 <i>2.59</i>	** <i>-0.706</i>	* <i>-0.797</i>	0.018 <i>1.07</i>	0.085 <i>5.02</i>	*** <i>0.085</i>
Board independence	-0.008 <i>-0.51</i>	-2.414 <i>-0.57</i>	0.159 <i>3.36</i>	*** <i>0.126</i>	0.045 <i>1.03</i>	0.277 <i>0.21</i>	0.974 <i>0.58</i>	0.020 <i>1.08</i>	0.008 <i>0.75</i>	0.008 <i>0.34</i>
Director ownership	0.005 <i>2.27</i>	** <i>-2.108</i>	*** <i>0.004</i>	0.001 <i>0.11</i>	** <i>-0.071</i>	** <i>0.034</i>	* <i>-0.170</i>	** <i>0.009</i>	** <i>-0.002</i>	-0.002 <i>-0.84</i>
Busy directors	-0.049 <i>-3.71</i>	*** <i>9.063</i>	** <i>-0.024</i>	* <i>0.203</i>	** <i>0.523</i>	*** <i>-0.264</i>	0.864 <i>1.19</i>	0.019 <i>0.88</i>	0.063 <i>3.11</i>	*** <i>0.063</i>
Industry expertise	-0.026 <i>-1.06</i>	9.875 <i>1.49</i>	-0.079 <i>-0.97</i>	** <i>0.553</i>	** <i>-0.812</i>	*** <i>0.071</i>	3.596 <i>2.96</i>	*** <i>-0.031</i>	*** <i>-0.080</i>	** <i>-0.080</i>
MB x Heterogeneity (director ownership)						-0.011 <i>-1.82</i>	* <i>-0.032</i>	*** <i>-3.26</i>		

MB x Heterogeneity						-0.070	0.143		
(industry expertise)						-0.35	0.50		
Cash flow x Heterogeneity						0.010	0.469	***	
(director ownership)						0.14	2.85		
Cash flow x Heterogeneity						3.846	10.397	**	**
(industry expertise)						2.260	2.220		
Number of obs.	5597	3878	4671	5597	5572	5597	5597	5583	5585
R <sup>2</sup>	0.378	0.278	0.322	0.277	0.393	0.498	0.475	0.355	0.352
Adj. R <sup>2</sup>	0.352	0.237	0.289	0.246	0.366	0.475	0.452	0.327	0.324

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%