Director Heterogeneity and its Impact on Board Effectiveness

A thesis presented

by

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ABSTRACT

In the first section of the dissertation, I examine whether boards that are heterogeneous along six dimensions—age, gender, race, tenure, rank, and function—perform their most critical tasks better than boards that are more homogeneous. Using director information obtained from multiple sources and supplemented by extensive hand-collection, I estimate board heterogeneity along each of the dimensions and two aggregate measures of board heterogeneity: demographic and occupational. I find that occupationally diverse boards exhibit significantly higher CEO performance-turnover sensitivity, greater likelihood of significantly improved performance following CEO replacement, and lower excess compensation. The findings are mainly driven by tenure and rank heterogeneity. There is no evidence that any dimension of the demographic heterogeneity impacts board effectiveness in a statistically meaningful way.

In the second section of the dissertation, I explore why certain dimensions of heterogeneity seem to impact board effectiveness more than others. Focusing on gender, I show that director heterogeneity improves board effectiveness for the subset of firms that committed to diversity prior to regulatory pressures, but not for the subset of firms that changed the director mix in response to external calls for diversity. This finding points to tokenism as the likely explanation for lack of impact of demographic heterogeneity on boards' ability to act effectively. Consequently, it suggests that imposing regulatory pressures on firms to increase the level of

diversity may not make boards more effective: although director heterogeneity can improve board effectiveness, such improvement may not be achieved if heterogeneity is adopted in response to regulatory pressures rather than voluntarily.

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CHAPTER 1

INTRODUCTION

The impact of team diversity on task quality has long been studied in management literature. For the most part, management literature provides results that vary with the context: the nature of the task, the setting, and the circumstances under which such diversity is explored. Though there are findings that point to both, the upside and the downside, of the diversity, the financial regulatory agencies have focused on encouraging firms to diversify their boards. The regulators' position on the importance of board diversity has mainly been shaped by the studies conducted by diversity advocates. Though management scholars have found diversity to be effective under certain circumstances, it is not clear that the benefits will be availed in the governance setting. Boards are unique in a sense that they face pressures from multiple sources, mainly the investors and the management. Given the amount of effort and resourced dedicated to promoting and increasing board diversity, it is important to understand whether, and if so, what type of diversity impacts boards' ability to execute their tasks effectively. It is the goal of this study to provide some answers to this question.

In the second chapter, I examine whether boards that are heterogeneous along six dimensions—age, gender, race, tenure, rank, and function—perform their most critical tasks better than boards that are more homogeneous. First, I obtain data from publically available sources on director age, gender, and tenure. I use RiskMetrics to obtain limited amount of race data and BoardEx for employment and position history of each director. Then, I turn to the web and publications featuring prominent minority business leaders for hand-collection of additional race data. Following a supplemental hand-collection effort of director employment history data, I

use a classification scheme to categorize the rank and functional director experience. Finally, I estimate board heterogeneity along each of the six dimensions and two aggregate measures of board heterogeneity: demographic and occupational. While I find that occupationally diverse boards are more effective, there is no evidence that any dimension of the demographic heterogeneity impacts board effectiveness in a positive way.

In the third chapter, I further explore the role of demographic heterogeneity and attempt to explain why such heterogeneity does not seem to impact board effectiveness. I examine frequency of board meetings as a function of heterogeneity, change in qualifications of demographically-diverse directors, and role of firms' commitment to demographic diversity as the determinant of the impact of such diversity on boards' effectiveness. The findings seems to suggest that tokenism plays a role in boards' diversification along demographic lines, resulting in limited benefits of such diversity in firms whose effort to diversify is driven by less than genuine intentions.

In the fourth chapter, I present robustness analyses. First, examine whether the results hold if a different methods is employed to measure heterogeneity along each of the dimensions. Similarly, I examine the impact of using alternative dependent variables in the regression analyses. Second, I discuss endogeneity concerns embedded in exploring topic of this nature, and the ways in which I have addressed such concerns. Finally, I explore whether strong significance of the tenure heterogeneity can be attributed to alternative explanations.

The fifth chapter provides brief summary of the results, and offers some concluding remarks. The takeaway of this study is that perspective diversity, the underlying construct that the advocates of diversity promote as the end-goal and the supposed mechanism through which the diversity improves team performance, can come from a wide mix of directors' occupational

characteristics or from a mix of demographic characteristics under the right circumstances. The challenge is to ensure that the push for increased board diversity does not result in firms moving away from circumstances which allow the benefit of such diversity to be realized.

CHAPTER 2

DOES DIRECTOR HETEROGENEITY IMPACT BOARD EFFECTIVENESS?

2.1 Introduction

In December 2009, the U.S. Securities and Exchange Commission (SEC) approved a rule requiring firms to improve their proxy disclosures. Chief among the new requirements was the disclosure of information regarding board diversity.[1] In a speech following the enactment of the rule, SEC Commissioner Luis Aguilar emphasized the importance of director diversity referring to studies conducted by CalPERs and diversity-centered international reforms as proof that pursuit of board diversity is beneficial to a firm. Such evidence, however, is largely descriptive and does not account for the endogenous nature of board composition. With an increased focus on director diversity disclosures and mandates regarding board diversification, it is essential to understand how director heterogeneity along the dimensions suggested by the regulators affects boards' effectiveness.

Prior studies have examined the role of board diversity in the context of gender, finding mixed results (Erhardt et al., 2003; Carter et al., 2003; Farrell and Hersch, 2005; Adams and Ferreira, 2009). However, recent disclosure requirements and governance initiatives have expanded the scope of diversity. Though the SEC is agnostic on the type of diversity that firms choose to concentrate on, it provides some suggestions about the types of diversity warranting consideration. Following the SEC recommendations as well as prior research on diversity

[1] The final rule on the proxy disclosure enhancements can be accessed at www.sec.gov/rules/final/2009/33-9089.pdf.

(Milliken and Martins, 1996; Williams and O'Reilly, 1998), I explore age, gender, race, tenure, rank, and function heterogeneity. In addition to examining each type of diversity individually, I aggregate the diversity measures into two indexes: demographic heterogeneity index (age, gender and race) and occupational heterogeneity index (tenure, rank and function). The goal of this study is to provide evidence on whether board diversification along the dimensions proposed by the regulators, alone or in aggregate, increases boards' ability to effectively monitor management, and if so, to identify conditions under which such diversification is important.

The benefits of diversity can be realized through two mechanisms: greater access to information and resources and increased board independence via perspective diversification. Heterogeneous groups have better access to information. As a result, board heterogeneity ensures that directors are able to be effective, as such ability depends directly on the quantity and nature of information directors hold (Adams and Ferreira, 2007; Bebchuk and Weisbach, 2010). In addition to improving access to information, diversity increases independence. By allowing their members to voice their opinions more freely, diverse groups are less likely to succumb to management pressures. Consistent with this argument, prior management literature shows that perspective diversity leads heterogeneous groups to perform better at deliberations and tough discussions, leading to improved outcomes (Bantel and Jackson, 1989; Jehn et al., 1999; Goll et al., 2001) and making heterogeneous boards the "ultimate outsiders" (Carter et al., 2003).

Despite the proposed benefits of diversity, there is evidence that decisions made by heterogeneous groups may not result in better outcomes (Wagner et al., 1984; Simons and Peterson, 2000; Jackson et al., 1991). Prior research suggests that heterogeneity can adversely impact boards' effectiveness through increased internal conflict and divisiveness (Simons and Peterson, 2000), coordination and communications costs (Van den Steen, 2010), and failure to

reach agreement, leading to animosity and dissatisfaction (Wall and Nolan, 1986). The mixed evidence on the benefits of heterogeneity in work teams raises the question as to the optimal level of board heterogeneity. Hermalin and Weisbach (1998) argue that a board structure imposed by regulators is likely to be less effective than an endogenously chosen one, occurring in the absence of such regulation. If a board is diversified to conform to external pressures, such diversity may be irrelevant or value-destroying. Consequently, director heterogeneity may produce no effects, or effects opposite to those advocated by the regulators. Ultimately, it is unclear whether adopting a suggested increase in director heterogeneity should have a positive effect on boards' effectiveness.

While endogeneity in board composition is a concern in empirical studies, it is less likely to be an issue when examining the impact of board composition on the outcome of a particular task (Hermalin and Weisbach, 2003). To isolate the effects of board composition, I focus on two major observable tasks performed by boards: CEO replacement and CEO compensation. Weisbach (1988) and Hermalin (2005) posit that CEO replacement is one of the most important tasks of the board. Therefore, I investigate the incremental effect of board diversity on CEO performance-turnover sensitivity. Conditional on having replaced the CEO, I examine subsequent improvement in stock market performance as a function of board heterogeneity.

Since I focus on the role of heterogeneity in the context of specific tasks, endogeneity is less likely to pose a severe concern. Nonetheless, to minimize any remaining doubt associated with drawing causal inferences, I select the research design to address the main type of endogeneity of concern: the correlated omitted variable bias. To address time-invariant correlated omitted variable bias, I employ firm fixed-effect specification. Due to the nature of the tasks examined and the period over which the variables are measured, other types of endogeneity, such as

reverse causality and simultaneity, do not pose a serious threat to the inferences in the CEO performance-turnover sensitivity analysis. However, I further discuss the choice of specifications employed and consideration of all three types of endogeneity in the results section. Furthermore, I employee instrumental variable approach in the robustness section to validate results related to the role of compensation committee heterogeneity in CEO compensation decisions.

I find that heterogeneous boards are more likely to remove the CEO after poor performance. Conditional on replacing the CEO, firms with heterogeneous boards experience a greater increase in stock market performance. Similarly, heterogeneous compensation committees are less likely to award excess compensation to their chief executives.

While some dimensions of heterogeneity have a positive impact on board effectiveness, other dimensions do not seem to improve the quality of board decisions. The occupational diversity, mainly driven by tenure and rank heterogeneity, is strongly related to board effectiveness in turnover and compensation decisions. The demographic diversity, however, does not significantly impact boards' effectiveness. The results on gender diversity are inconsistent with prior studies, which show that gender diversity improves boards' effectiveness. Attempts to reconcile these findings generate an important insight. While gender-diverse boards of firms that commit to diversity early, and presumably voluntarily, are significantly more effective at monitoring, gender-diverse boards of firms adding diversity later, and presumably as a response to external pressures, show no benefit of such a strategy. It suggests that increasing diversity can improve boards' effectiveness if firms diversify their boards to take advantage of the benefits of diversity, rather than to engage in window-dressing.

My study contributes to the literature on board composition in the following three ways. First, the study shows whether board heterogeneity along the dimensions emphasized by the SEC

improves boards' governance outcomes and demonstrates which dimensions of heterogeneity are more important. By introducing other dimensions of heterogeneity currently targeted by regulators, I extend the current literature on board composition and board diversity, most of which focuses exclusively on gender, and provide insight into the relative importance of various sources of diversity advocated.

Second, I distinguish between board heterogeneity that was voluntary adopted and heterogeneity which was arguably imposed as a response to external demands. By focusing on a period starting two years after the Sarbanes-Oxley Act and its accompanying governance reforms, I capture a shift in director heterogeneity that is less likely to be endogenous. During this period, many firms presumably increased diversity as a response to external pressures. Using pre-SOX data to identify firms with a pre-regulatory commitment to diversity, I focus on the post-SOX period to assess the effect of heterogeneity on the subset of firms with a pre-regulatory versus post-regulatory commitment to diversity. The findings indicate that regulatory efforts to require firms to increase diversity may not be effective absent firms' commitment to reaping the benefits of diversity. Board diversity for window-dressing purposes is unlikely to be effective in improving governance. This finding seems to support Hermalin and Weisbach's (1998) claim that directors imposed on a firm by regulators are likely to be less effective than those picked through an endogenous selection process.

Finally, I introduce a way to measure heterogeneity that is new in this research context. Heterogeneity can be treated as a generalized concept or each dimension can be treated as a distinct theoretical construct (Pelled, 1996). For each construct of diversity, I use a measure that assesses not only the variety but also the balance of director characteristics. Although this method of measuring the individual constructs of heterogeneity has been used in management

literature, it has not been previously used in this setting. In addition to the individual constructs of diversity, I create a heterogeneity index. This index measures boards' diversity along multiple dimensions simultaneously, providing a method for assessing the role of multi-dimensional diversity.

The remainder of this chapter is organized as follows. Section 2.2 discusses relevant literature and the motivation for the study, and develops the hypotheses. Section 2.3 describes the sample used in the study, along with the source of the data. Section 2.4 covers the research design and empirical results. Chapter three picks up the analysis and provides additional insight into why certain dimensions of diversity matter more. Chapter four presents robustness tests and chapter five concludes the paper with a brief summary of the findings.

2.2 Prior literature and hypothesis development

2.2.1 Diversity and team performance

There are many dimensions along which individuals within a group can differ. While some of these differences are observable, others are not. The SEC, in its final ruling, noted that each company was given flexibility to define diversity. The goal of diversity was to reflect "perspective diversity" and increase access to resources and the talent pool. It gave the flexibility to determine the type of observable characteristics that would bring about such diversity.

There are two major mechanisms through which diversity is believed to impact group performance: perspective diversity and better access to information and resources. The benefit of the first mechanism, perspective diversity, is that it generates better discussions and deliberations (Jehn et al., 1999), and creates a culture of communication and questioning (van Knippenberg et al., 2004). As a result, diverse groups achieve better outcomes than homogeneous groups that do

not engage in such debates. Perspective diversity also increases independence: heterogeneous directors are likely to ask questions that would not come from a homogeneous group. Diverse boards are considered the "ultimate outsiders" (Carter et al., 2003).

The benefit of the second mechanism, better access to information and resources, improves boards' ability to carry out their duties. The amount and nature of information that directors have has great impact on their effectiveness (Bebchuk and Weisbach, 2010). Boards are a primary linkage mechanism between the firm and its external sources of dependency (Hillman et al., 2007). By bringing a group of diverse individuals together, boards gain access to broader sets of information, knowledge, skills, and talent (Zald, 1969; Pfeffer, 1973; Pfeffer and Salancik, 1978). The source of the benefit is directors' human capital and relationship capital (Hillman and Dalziel, 2003).

Despite the purported benefits of diversity, heterogeneous groups face several well-known obstacles to effective functioning. These include: lack of cohesiveness (Jackson et al., 1991); inability to reach satisfactory agreement, leading to excessive conflict and animosity (Simons and Peterson, 2000); coordination issues (Van den Steen, 2010); and diversion of time toward persuasion and fighting (Baranchuk and Dybvig, 2009). The same factors that can make a board more effective can also prove to be its downfall. For this reason, diversity is often deemed a double-edged sword (Milliken and Martins, 1996).

Consistent with the lack of clear expectations for the effect of diversity in board settings, prior studies have found mixed results. Adams and Ferreira (2009), one of the first comprehensive studies of the effect of board diversity, focused on gender diversity. They found that diverse boards are better at disciplining the CEO. Erhardt et al. (2003) and Carter et al. (2003) focused on gender and racial diversity, and found that firms with diverse boards had

higher stock valuations. More recently, Gul et al. (2011) documented that gender-diverse boards improved stock-price informativeness, mainly in firms with weak governance. However, results of a study by Farrell and Hersch (2005) suggested that adding women to the board does not affect firm value. Consistent with their findings, Adams and Ferreira (2009) show that, after accounting for endogeneity, gender does not affect accounting profits or firm value.

Prior evidence is therefore unclear on whether diversity improves boards' ability to perform their duties effectively. One of the limitations of some of the earlier studies is they focus on the impact of diversity on firm performance. In this study, I examine the role of board diversity in the context of major tasks performed by boards: CEO replacement and compensation granting practices.

2.2.2. CEO turnover and board heterogeneity

One of a board's most important tasks is selecting and replacing the CEO (Hermalin, 2005). Prior research has shown that firms with boards that are better monitors are more likely to replace the CEO following poor stock performance (Weisbach, 1988; Yermack, 1996). Weisbach (1988) also shows that performance-turnover sensitivity is heightened for boards with more independent directors. Performance-turnover sensitivity is explored as a function of other board characteristics, such as gender (Adams and Ferreira, 2009), monitoring intensity (Faleye et al., 2011), and the presence of founders on the board (Li and Srinivasan, 2011).

If diverse boards engage in better dialogues and tougher discussions, as asserted by the literature, their ability to monitor the CEO is likely to be higher. Since perspective diversity is believed to increase the true independence of the board, heterogeneous boards should be more willing to replace the CEO when firm performance is poor. However, prior findings indicate that diversity can have a counter-effect by leading to disagreement and lack of coordination. To the

extent that a board is unsure whether to replace its CEO, perspective heterogeneity can lead to prolonged indecisiveness and disagreement about the best course of action. This, in turn, can lead to a decreased sensitivity of the board to firm performance. The board's indecisiveness can result in slower reactions to performance signals. Since benefits and costs of board diversity may exist, my hypothesis is non-directional: Firms with heterogeneous boards are equally effective compared to firms with less heterogeneous boards. Therefore, I hypothesize that:

H1: Heterogeneous board is no more likely to replace the firm's CEO following weak performance than a more homogeneous board.

2.2.3 Excess compensation and compensation committee heterogeneity

Another context in which boards' monitoring ability is often examined is that of CEO compensation. Boards considered better monitors are found to award less excess compensation to their CEOs. Adams and Ferreira (2009) examine compensation practices of gender-diverse boards, but find no evidence that such boards award less overall compensation to the CEO. Their findings are attributed to the infrequent appointment of women to the compensation committees and the complexity of CEO contracts.

I use CEO compensation as another setting in which to examine the role of director heterogeneity. If heterogeneous compensation committees engage in better discussions regarding appropriate CEO compensation and if such committees are more independent, the CEOs of such firms would be less overcompensated. However, if perspective diversity makes the committee indecisive regarding the appropriate level of compensation, I would not expect the heterogeneous compensation committee to be any more effective at setting appropriate level of compensation compared to a homogeneous committee. Specifically, I hypothesize that:

H2: A heterogeneous compensation committee is no more likely to award excess compensation to the CEO than a more homogeneous compensation committee.

2.2.4 Board heterogeneity and post-CEO replacement firm performance

Forced CEO turnover is only one aspect of the CEO replacement process. In addition to removing underperforming CEOs, boards have the task to select a new CEO. To assess whether heterogeneous boards are better at selecting the right candidate, I examine change in firm's market performance conditional on CEO turnover. Using the percentage change in market value from the end of the year before the CEO's departure to the end of the year following the incoming CEO's arrival as the measure of the increase in firm market performance, I examine the role of heterogeneity in such performance change.

If a board's diversity increases its independence, I would expect a heterogeneous board to have a more open approach to the candidate search and to reach out to a broader pool of candidates. Furthermore, if a heterogeneous board has greater access to information, resources, and talent, I expect it to select a better candidate to fill the position. The possible costs of diversity, though still a concern, are expected to be less relevant in this setting. A scenario where the board does not agree on the right candidate is plausible, but it is difficult to imagine that such disagreement would result in selecting a worse candidate. Unlike the board's effectiveness in removing the underperforming CEO, which could be negatively affected by conflict if the board delays its decision and under-reacts to public signals of performance, its effectiveness on the replacement decision should not be negatively affected by the debate process. Consequently, I expect that firms with heterogeneous boards will be make better CEO replacement decisions, resulting in a higher increase in firm market value following such replacement. More precisely, I hypothesize:

H3: Firms with heterogeneous boards are more likely to experience a significant increase in market value following CEO replacement relative to firms with more homogeneous boards.

2.3 Data

2.3.1 Sample selection

A five-year sample, from 2004 to 2008, is selected from the universe of the ExecuComp firms. From this sample, I eliminate firms if they are not covered by BoardEx, do not have required financial information in Compustat, stock price information in CRSP, or demographic director information. The final sample consists of 8,214 firm-year observations and 1,985 unique firms. Since not all variables are available throughout the analyses, my sample forms an unbalanced panel and the number of actual observations differs by test.

The primary source of the director characteristics data is BoardEx. For each director in the sample, I collect employment, education, age, gender, and tenure information from Boardex, financial information from Compustat, and the required compensation data from ExecuComp. Information about CEOs (age, tenure, gender, turnover, role duality) is obtained from ExecuComp and supplemented by data available in RiskMetrics. The data on ethnicity of each director is highly limited. Though RiskMetrics provides some racial demographics, a typical board has incomplete data – only some of the directors have this information. Since it is necessary to know the race of each director on a board to compute the board's racial heterogeneity score, I supplement the RiskMetrics data with extensive hand-collection. I utilize web sources and publications on prominent racial minority business leaders to which I match names of the directors. I verify the correctness of each match in case of highly common names. This method of hand-collecting racial data limits the size of the sample for the racial diversity

measure. Ultimately, full racial information is available for 2,970 (36%) out of the 8,214 board-years.

2.3.2 Heterogeneity variables

I construct variables for six dimensions of heterogeneity: age, gender, race, tenure, rank, and function. Since age and tenure are continuous variables, board heterogeneity along these dimensions is measured as a coefficient of variation. Coefficient of variation is defined as:

$$CV_{it} = \sigma_{it}/\mu_{it}$$

The other four dimensions – gender, race, rank, and function – are categorical variables and I use the Blau index (Blau, 1977) of diversity to measure their heterogeneity. The blau index is defined as:

$$BI_{it} = 1 - \sum_{j=1}^{S} p_{jit}^2$$

Where BI_{it} is the Blau index for firm *i* in year *t*, *j* is the number of categories an individual can belong to (i.e. gender = 2), and p is the proportion of directors on board *i* that belong to category *j* at time *t*. The Blau index is the most frequently used approach for measuring diversity in work group heterogeneity studies (Harrison and Klein, 2007). The statistical interpretation of the Blau index, ranging from 0 to 1, is the chance that two randomly selected individuals from a group belong to different categories (Harrison and Klein, 2007). This approach is appropriate for measuring diversity of a group where the variable of interest is categorical (i.e. male/female) and no group member belongs to multiple categories simultaneously.

To measure rank and function heterogeneity, I first classify each director's employment background. BoardEx provides comprehensive director employment history. Using this information supplemented by the hand-collected data where BoardEx information is insufficient

to make an appropriate classification[2], I categorize each director's rank into one of six categories. To create a function heterogeneity measure, I classify each director's experience into one of six major categories. See Appendix A for the classification scheme.[3]

In addition to studying each dimension of heterogeneity independently, I create two aggregate index measures. Two difficulties emerge when trying to combine the individual measures. First, measurement method is not consistent across the five categories. The diversity measure for categorical variables is calculated using the Blau index, and for continuous variables using the coefficient of variation. Second, the Blau index of diversity can theoretically only approach 1 (fully heterogeneous) as the number of categories becomes sufficiently large. For variables such as gender, which has only two categories, the maximum range of the Blau index is from 0 to 0.5. Therefore, the Blau index is not comparable across dimensions with different number of categories (Harrison and Klein, 2007). Summing up Blau index across variables with an unequal number of categories weighs the variable with greater number of categories more heavily. To tackle these issues, I first scale all individual measures of diversity (age, gender, race, tenure, rank, and function) by the median of their respective categories, and then combine them into one of the two index variable – demographic heterogeneity index or functional heterogeneity index:

$$\text{Board Diversity Index}_{\text{Type}}\ (\text{BDI})_{it} = \left(\sum_{j=1}^{n} DiversityCategory_{jit} / \widetilde{DiversityCategory_{J}} \right)/n$$

[2] BoardEx provides employment title and name of the firm at which the position was held. In many instances, it is not clear from the name of the firm what type of experience the director acquired. In such instances, I supplement the BoardEx information with research into the nature of the firm. For example, a director whose title states "Partner" at Jones Associates cannot be classified because the type of business in which the firm operates in unclear. Supplemental research leads to additional information which lets me classify this experience appropriately (in this case, I find out that Jones Associates is a stock-brokerage firm).

[3] To ensure that results are not driven by number and type of categories constructed, I recreate the measure with larger number of categories and finer classification. Results are unaffected by the choice of number of categories. Refer to robustness section for further discussion on alternative measures used.

Where type is one of the two index types (demographic or occupational), n is the number of categories available for the board and that particular index type, and the diversity categories are CV(Age), Blau(Gender), Blau(Race), for the demographic index, and CV(Tenure), Blau(Rank) and Blau(Function), for the occupational index.

The standard approach for aggregating the Blau index across categories, widely used in social networks research, is to scale each category by its theoretical maximum (Marsden, 1990; Harrison and Klein, 2007). Since I add different types of measures together (coefficient of variation and Blau across categories), I opt to scale each dimension by its median so as not to force an assumption of theoretical maximum for coefficient of variation dimensions. An example of the methodology is presented in Appendix A.

2.3.3 Descriptive statistics

Table 1 presents descriptive statistics of the sample. Panel A shows financial characteristics of the sample firms. The selected firms are large; mean and median market capitalizations for a sample firm are $7.1 billion and $1.7 billion, respectively, reflecting ExecuComp's focus on large firms. The median firm in the sample is a growth firm, with book-to-market ratio of 0.46, and profitable, with return on assets (ROA) of 4.8%. There is a large variation in leverage, with 0.05 and 0.33 at the 25^{th} and 75^{th} percentiles, respectively. Similarly, for the annual stock returns, -18% and 19.4% are the 25^{th} and 75^{th} percentiles.

Table 1

Sample summary statistics

The sample consists of an unbalanced panel of 1,985 unique firms over the five year period from 2004 to 2008, for a total of 8,214 firm-years. In order to be includd in the sample, each firm had to be in BoardEx and Execucomp, and meet the minimum data requirement. Financial data is from Compustat, stock returns from CRSP, governance from Risk Metrics, compensation and CEO characteristics from ExecuComp, board characteristics from BoardEx. Variable definitions are as follows: firm size is natural log of assets, book to market is ratio of (total assets-total liabilities) to market value of equity, return on assets is net income before extraordinary items divided by average total assets, leverage is (long + short term debt) divided by total assets, ROA and stock volatility is standard dividation of the two variables over the prior 3 years, market value is market value of equity and annual returns are CRSP value-weighted portfolio adjusted returns over the prior year, compounded monthly. CEO gender is indicator variable set to 1 if CEO is female, CEO tenure is number of years at the CEO post, CEO's Pay Slice is % of total compensation earned by top five disclosed earners attributed to the CEO, CEO duality is indicator variable set to 1 if CEO is also company's Chairman, board size is natural log of the number of board directors, board independence is the percentage of directors considered outsiders (independent). All diversity variables are described in Appendix A.

Panel A - Firm Characteristics

Variable	n	Mean	Median	25th percentile	75th percentile
Firm Size	8,214	7.689	7.556	6.490	8.745
Log(Sales)	8,214	7.312	7.196	6.223	8.335
Book to Market	8,129	0.537	0.455	0.284	0.670
Return on Assets	8,214	0.044	0.048	0.016	0.087
Leverage	8,186	0.212	0.191	0.047	0.326
ROA Volatility	8,195	0.047	0.050	0.016	0.093
Stock Volatility	8,214	0.112	0.098	0.073	0.135
Market Value	8,211	7,066	1,726	699	5,001
Annual Returns	8,214	0.039	(0.004)	(0.184)	0.194

Panel B - Board & CEO Characteristics

	n	Mean	Median	25th percentile	75th percentile
CEO Age	8,203	55.188	55.000	50.000	60.000
CEO Gender	8,214	0.025	0.000	0.000	0.000
CEO Tenure	8,007	6.981	5.000	2.000	9.000
CEO's Pay Slice	8,107	0.375	0.377	0.301	0.445
CEO Duality	8,214	0.528	1.000	0.000	1.000
Insider Ownership	8,102	0.759	0.798	0.647	0.914
Board Size	8,214	2.206	2.197	2.079	2.398
Board Independence	8,214	0.938	1.000	0.889	1.000

Panel C - Diversity Characteristics

	n	Mean	Median	25th percentile	75th percentile
Age Heterogeneity	8,214	0.109	0.105	0.083	0.131
Gender Heterogeneity	8,214	0.179	0.198	0.000	0.298
Ethnic Heterogeneity	2,970	0.163	0.165	0.000	0.245
Demographic Heterogeneity Index	8,214	0.960	1.000	0.607	1.275
Tenure Heterogeneity	8,214	0.644	0.638	0.481	0.798
Rank Heterogeneity	8,214	0.510	0.541	0.444	0.612
Function Heterogeneity	8,214	0.574	0.611	0.500	0.667
Occupational Heterogeneity Index	8,214	0.964	1.000	0.853	1.087

Since the CEO and incumbent members of the board have a say in nominating incoming directors, the structure of the board and characteristics of the CEO may affect board heterogeneity. For this reason, the study controls for CEO characteristics throughout. Panel B of Table 1 presents descriptive statistics of such variables. Only 2.5% of the firms in the sample

have a female CEO. The median CEO tenure is 5 years. For about half of the sample, the CEO and Chairman role is not separated. Most board members (94%) are independent and the average board has 9 directors. On average, 38% of the compensation awarded to the top five earners is allocated to the CEO.

Panel C of the table shows heterogeneity characteristics. There is little variation in director age diversity, as measured by the coefficient of variation. The 25th percentile of age diversity is 0.08 and the 75th percentile is 0.13. Function heterogeneity is another source of diversity with little cross-sectional variation. The other three dimensions of diversity exhibit more cross-sectional variation, indicating that boards across the largest U.S. firms differ more along the gender, race, tenure, and rank dimensions, compared to the age and function dimensions. It is interesting to note, however, that despite the calls for increased diversity, firms in the 25th percentile of board diversity still have no female or racial minority board members.

Table 2 provides additional information about differences in firm characteristics between firms with highly homogenous versus highly heterogeneous boards. In Panel A of Table 2, firms are split into high and low diversity groups based on the demographic heterogeneity of their boards. Homogeneous (heterogeneous) boards are those in the lowest (highest) diversity quartile. Firms with heterogeneous boards are significantly larger, older, and more complex, as measured by the number of geographic and business segments. Compared to firms with homogeneous boards, firms with heterogeneous boards are more likely to have a CEO who is a female, younger and with a shorter tenure at the firm. The accounting performance of such firms is not significantly different from firms with homogeneous boards, but the stock performance is significantly weaker and less volatile. Finally, heterogeneous boards are larger and relatively less independent.

Table 2

Summary statistics - high verus low heterogeneity

This table shows differences in firm and governance characteristics between low heterogeneity and high heterogeneity firms. The low heterogeneity firms are those which are in the lowest quartile and the high heterogeneity are the firms in the top quartile on each of the dimensions of heterogeneity, as well as the overall heterogeneity index. Heterogeneity is defined in Appendix A. Market adjested returns are monthly-compounded returns for the firm less those for the value-weighted CRSP portfolio. Firm age is number of years since the firm became public. All other variables were previously defined in table 1 and in Appendix B.

Panel A - Demographic Heterogeneity

	Demographic Heterogeneity Index			Age Heterogeneity			Gender Heterogeneity			Ethnic Heterogeneity		
Variable	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff
Firm Characteristics												
Firm Size	6.89	8.23	0.00 ***	7.82	7.32	0.00 ***	6.83	8.17	0.00 ***	7.68	9.33	0.00 ***
Log(Sales)	6.54	7.92	0.00 ***	7.44	6.95	0.00 ***	6.47	7.86	0.00 ***	7.43	8.96	0.00 ***
Book to Market	0.53	0.52	0.59	0.53	0.56	0.02 **	0.55	0.53	0.10	0.50	0.47	0.04 **
Leverage	0.19	0.24	0.00 ***	0.21	0.20	0.70	0.18	0.23	0.00 ***	0.21	0.25	0.00 ***
Business Segments	2.61	3.45	0.00 ***	3.18	2.70	0.00 ***	2.51	3.47	0.00 ***	3.25	4.46	0.00 ***
Geographic Segments	2.56	2.27	0.00 ***	2.52	2.32	0.01 ***	2.58	2.45	0.10	2.80	2.78	0.88
Firm Age	18.38	25.96	0.00 ***	26.07	17.90	0.00 ***	16.94	26.34	0.00 ***	24.93	38.75	0.00 ***
Firm Performance												
ROA	0.05	0.04	0.54	0.05	0.04	0.01 ***	0.04	0.05	0.13	0.06	0.05	0.04 **
ROA Volatility	0.05	0.05	0.89	0.05	0.05	0.14	0.04	0.05	0.15	0.06	0.05	0.01 **
Stock Volatility	0.13	0.10	0.00 ***	0.11	0.12	0.00 ***	0.13	0.10	0.00 ***	0.10	0.08	0.00 ***
Market Value	2437	11825	0.00 ***	8102	4726	0.00 ***	2359	10407	0.00 ***	5277	22075	0.00 ***
Returns - 1 year	0.07	0.02	0.00 ***	0.06	0.04	0.09 *	0.06	0.03	0.00 ***	0.03	0.00	0.02 **
Returns - 2 year	0.28	0.09	0.00 ***	0.18	0.14	0.15	0.25	0.11	0.00 ***	0.13	0.03	0.00***
CEO Characteristics												
CEO Age	56.01	54.25	0.00 ***	56.47	53.66	0.00 ***	55.41	54.66	0.00 ***	55.54	55.86	0.33
CEO Gender	0.02	0.05	0.00 ***	0.02	0.02	0.57	0.02	0.05	0.00 ***	0.01	0.04	0.00***
CEO Tenure	8.76	5.95	0.00 ***	7.20	7.17	0.92	8.55	5.83	0.00 ***	7.34	5.30	0.00***
CEO's Pay Slice	0.38	0.37	0.47	0.38	0.37	0.00 ***	0.37	0.37	0.44	0.39	0.39	0.79
CEO Duality	0.48	0.58	0.00 ***	0.58	0.44	0.00 ***	0.46	0.59	0.00 ***	0.51	0.74	0.00***
Governance Characteristics												
Institutional Ownership	0.77	0.76	0.06 *	0.75	0.77	0.00 ***	0.77	0.76	0.34	0.79	0.75	0.00***
Board Size	2.05	2.28	0.00 ***	2.20	2.17	0.00 ***	2.04	2.26	0.00 ***	2.18	2.40	0.00***
Board Independence	0.95	0.94	0.00 ***	0.95	0.93	0.00 ***	0.94	0.95	0.03 **	0.94	0.93	0.01***

Table 2 - Con't

Panel B - Occupational Heterogeneity

	Occupational Heterogeneity Index			Tenure Heterogeneity			Rank Heterogeneity			Function Heterogeneity		
Variable	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff
Firm Characteristics												
Firm Size	7.60	7.64	0.47	7.54	7.72	0.00 ***	8.12	7.36	0.00 ***	7.32	7.88	0.00 ***
Log(Sales)	7.21	7.31	0.02 **	7.07	7.44	0.00 ***	7.78	6.95	0.00 ***	7.05	7.49	0.00 ***
Book to Market	0.52	0.55	0.02 **	0.54	0.55	0.63	0.49	0.55	0.00 ***	0.52	0.54	0.15
Leverage	0.20	0.20	0.89	0.21	0.21	0.84	0.22	0.20	0.01 ***	0.19	0.22	0.00 ***
Business Segments	2.84	3.23	0.00 ***	2.77	3.33	0.00 ***	3.45	2.92	0.00 ***	2.92	3.37	0.00 ***
Geographic Segments	2.47	2.63	0.05 *	2.16	2.69	0.00 ***	2.59	2.47	0.15	2.81	2.49	0.00 ***
Firm Age	19.86	25.14	0.00 ***	15.85	26.76	0.00 ***	28.11	20.07	0.00 ***	20.86	25.40	0.00 ***
Firm Performance												
ROA	0.05	0.04	0.08 *	0.05	0.04	0.29	0.05	0.05	0.53	0.05	0.04	0.44
ROA Volatility	0.05	0.05	0.44	0.05	0.05	0.22	0.05	0.05	0.07 *	0.05	0.05	0.80
Stock Volatility	0.11	0.11	0.29	0.11	0.11	0.94	0.11	0.11	0.00 ***	0.12	0.11	0.00 ***
Market Value	7092	6731	0.51	6259	7384	0.04 **	11658	4410	0.00 ***	4455	8556	0.00 ***
Returns - 1 year	0.05	0.04	0.37	0.06	0.03	0.04 **	0.04	0.04	0.68	0.04	0.05	0.76
Returns - 2 year	0.21	0.13	0.01 ***	0.22	0.13	0.00 ***	0.16	0.17	0.72	0.18	0.14	0.05**
CEO Characteristics												
CEO Age	55.09	55.46	0.12	54.75	55.42	0.00 ***	55.60	55.17	0.06*	55.45	55.13	0.16
CEO Gender	0.03	0.02	0.17	0.02	0.03	0.50	0.03	0.03	0.57	0.03	0.02	0.12
CEO Tenure	7.10	7.11	0.97	6.80	6.67	0.56	6.36	7.69	0.00 ***	7.87	6.77	0.00 ***
CEO's Pay Slice	0.37	0.37	0.15	0.37	0.37	0.90	0.38	0.37	0.35	0.38	0.38	0.46
CEO Duality	0.54	0.48	0.00 ***	0.52	0.49	0.10	0.59	0.49	0.00 ***	0.52	0.54	0.18
Governance Characteristics												
Institutional Ownership	0.77	0.75	0.05 **	0.77	0.74	0.00 ***	0.75	0.77	0.09*	0.76	0.75	0.15
Board Size	2.13	2.25	0.00 ***	2.13	2.24	0.00 ***	2.23	2.18	0.00 ***	2.13	2.26	0.00 ***
Board Independence	0.95	0.93	0.00 ***	0.95	0.93	0.00 ***	0.94	0.94	0.72	0.95	0.93	0.00 ***

In Panel B of Table 2, firms are split into high and low diversity groups based on occupational heterogeneity of their boards. While firms with boards with high demographic heterogeneity relative to firms with boards with low demographic heterogeneity are significantly different along many important dimensions, as seen in panel A of the table, firms with boards with high occupational heterogeneity relative to firms with boards with low occupational heterogeneity differ along fewer dimensions, and to a lesser extent. Firms in these two groups have similar size, performance, and CEO characteristics. The characteristics along which firms with highly occupationally diverse boards differ from firms with occupationally non-diverse boards include complexity (more complex), firm age (older), CEO duality (less frequent), board size (larger), board independence (lower) and institutional ownership (lower). The magnitude of differences between the low/high occupational heterogeneity firms, however, is smaller relative to the magnitude of differences between the low/high demographic heterogeneity firms.

Table 3 displays a correlation matrix of major variables used throughout the study. Any variables that are highly correlated are not used in a same regression specification. It is interesting to note that the individual measures of heterogeneity are not highly correlated.

Table 3
Correlation table

		Firm Size	Log(Sales)	Book to Market	Leverage	ROA Volatility	Stock Volatility	Market Value	Annual Returns	CEO Age	CEO Gender	CEO Tenure	CEO's Pay Slice	CEO Duality	Insider Ownership	Board Size	Board Independence	Age Heterogeneity	Gender Heterogeneity	Ethnic Heterogeneity	Demographic Heterogeneity Index	Tenure Heterogeneity	Rank Heterogeneity	Function Heterogeneity	Occupational Heterogeneity Index
		Firm Characteristics								**Board Characteristics**												**Diversity Characteristics**			
Firm Characteristics	Firm Size	1.00																							
	Log(Sales)	0.85	1.00																						
	Book to Market	0.06	-0.06	1.00																					
	Leverage	0.20	0.10	0.08	1.00																				
	ROA Volatility	-0.08	0.05	-0.47	-0.23	1.00																			
	Stock Volatility	-0.34	-0.29	0.09	-0.13	-0.10	1.00																		
	Market Value	0.63	0.63	-0.17	-0.04	0.14	-0.19	1.00																	
	Annual Returns	-0.01	0.01	-0.29	-0.10	0.20	0.00	0.04	1.00																
Board & CEO Characteristics	CEO Age	0.08	0.05	0.04	0.05	-0.04	-0.10	0.05	0.00	1.00															
	CEO Gender	0.02	0.02	0.00	0.03	0.00	0.02	0.02	-0.01	-0.06	1.00														
	CEO Tenure	-0.09	-0.12	0.04	-0.03	0.02	0.08	-0.06	-0.01	0.37	-0.03	1.00													
	CEO's Pay Slice	-0.01	0.02	-0.07	0.07	0.06	-0.03	-0.06	0.06	0.02	-0.01	0.01	1.00												
	CEO Duality	0.23	0.23	-0.01	0.08	0.02	-0.15	0.11	0.02	0.30	0.00	0.23	0.11	1.00											
	Insider Ownership	-0.27	-0.19	0.04	-0.02	0.03	0.13	-0.25	0.02	-0.10	-0.02	0.01	0.06	-0.06	1.00										
	Board Size	0.56	0.51	-0.02	0.15	-0.05	-0.31	0.36	-0.03	0.09	0.03	-0.16	-0.02	0.13	-0.26	1.00									
	Board Independence	-0.06	-0.04	0.01	-0.01	-0.02	0.10	-0.04	0.01	-0.04	0.04	0.01	0.06	0.02	0.06	-0.09	1.00								
Diversity Characteristics	Age Heterogeneity	-0.15	-0.13	-0.01	-0.04	-0.02	0.10	-0.09	-0.02	-0.19	-0.01	0.00	-0.07	-0.15	0.11	-0.03	-0.11	1.00							
	Gender Heterogeneity	0.27	0.32	-0.04	0.11	-0.03	-0.22	0.16	-0.06	-0.01	0.07	-0.15	-0.03	0.10	-0.05	0.30	0.00	0.03	1.00						
	Ethnic Heterogeneity	0.36	0.37	-0.04	0.10	-0.05	-0.14	0.25	-0.04	0.01	0.08	-0.10	0.00	0.19	-0.07	0.27	-0.05	-0.04	0.28	1.00					
	Demographic Heterogeneity Index	0.35	0.39	-0.05	0.11	-0.06	-0.19	0.24	-0.07	-0.04	0.09	-0.15	-0.03	0.14	-0.05	0.34	-0.06	0.22	0.73	0.82	1.00				
	Tenure Heterogeneity	0.02	0.05	-0.04	0.01	0.02	-0.01	0.02	0.00	-0.01	0.05	-0.05	0.00	-0.02	-0.04	0.13	-0.08	0.15	0.01	-0.01	0.03	1.00			
	Rank Heterogeneity	-0.19	-0.21	0.09	-0.04	-0.05	0.11	-0.17	-0.03	-0.04	0.00	0.09	-0.04	-0.13	0.06	-0.08	0.01	0.13	0.03	-0.13	-0.04	0.07	1.00		
	Function Heterogeneity	0.16	0.13	-0.02	0.04	0.02	-0.14	0.11	0.02	0.05	-0.02	0.00	-0.02	0.06	-0.05	0.17	-0.05	0.04	0.11	0.17	0.19	0.03	0.10	1.00	
	Occupational Heterogeneity Index	-0.02	-0.02	0.01	0.00	0.00	-0.01	-0.03	-0.01	0.00	0.02	0.02	-0.02	-0.05	-0.01	0.12	-0.07	0.19	0.07	0.00	0.08	0.73	0.60	0.48	1.00

2.4 Empirical results

2.4.1 Board heterogeneity and CEO turnover

To explore performance-turnover sensitivity in the context of more broadly defined diversity, I estimate the following model:

$$CEOTurn_{it} = \beta_0 + \beta_1 StockReturn_{it-1} + \beta_2 Heterogeneity_{it} + \beta_3 StockReturn_{it-1} * Heterogeneity_{it} + \beta_{4-7} GovernanceControls + \beta_{8-12} FirmControls + \beta_{12-16} CEOControls + IndustryDummies_i + YearDummies_{it} + \varepsilon \quad \textbf{(1)}$$

I define CEO turnover (*CEOTurn*) as a dummy variable equal to 1 if the CEO leaves the post involuntarily in year *t.* In addition to including clearly identified involuntary departures, I include all CEO turnovers attributed to retirement if the CEO was no older than 60 years of age at the time of departure.[4] My measure of stock performance (*StockReturn*) is each firm's annual return in *t-1* minus the CRSP value-weighted index during the same period, both compounded monthly.[5] Heterogeneity measures (*Heterogeneity*) are defined in Appendix A. Consistent with prior research, I control for firm performance and CEO characteristics that may affect the likelihood of CEO turnover, such as CEO age (*CEOAge*), gender (*CEOGender*), tenure (*CEOTenure*), CEO power proxied by CEO pay slice (*CEOPaySlice*) (Bebcuck et al, 2011), and the duality of the CEO/Chairman role (*CEODuality*). Additionally, I control for firm characteristics and some governance characteristics, such as board independence (*BoardIndep*),

[4] Since some prior studies use 65 instead of 60 as the cut-off age prior to which a CEO departure is deemed involuntary, I check the robustness of my findings by using the alternative cut-off. The results are similar and all the heterogeneity variables are significant at the originally reported probability levels.

[5] To examine the possibility that performance-turnover sensitivity is affected by the choice of market index used to adjust firm's raw returns, I recalculate market-adjusted returns using the equally-weighted index and median industry (two-digit sic) returns. Results using the two alternative measures of market-adjusted returns are qualitatively the same and heterogeneity variables are still significant at originally reported levels. Using equally-weighted or median industry returns instead of value-weighted index to adjust raw returns does not affect my results.

board size (*BoardSize*), and percentage of shares held by the institutional investors, factors previously shown to affect the likelihood of CEO turnover.

Table 4a and 4b presents the results of hypothesis 1, which states that a heterogeneous board is no more likely to replace the firm's CEO following weak performance than a homogeneous board. Table 4a focuses on the demographic measures of heterogeneity while Table 4b covers occupational measures of heterogeneity. Each table shows a multivariate analysis of CEO performance-based turnover as a function of board heterogeneity and other variables hypothesized to affect performance-turnover sensitivity. The variable of primary interest is the interaction term of heterogeneity and stock returns. Boards considered better monitors are expected to have a significantly negative coefficient β_3. The first specification for each dimension of diversity in Tables 4a and 4b shows logit model estimates while the second specification shows the linear probability model with firm fixed effects. Since it is difficult to interpret coefficients of interaction terms in logit regressions, the coefficient and p-value of the interaction term of interest is shown as corrected marginal effect (Norton Wang Ai (2004)).

Results show that boards with occupational heterogeneity are more performance sensitive and consequently, more likely to replace the CEO following negative stock performance. The results are driven primarily by tenure and rank heterogeneity dimensions. The β_3 coefficient estimate for occupational heterogeneity is negative and statistically significant at the 1% level (p-value 0.000). For tenure and rank heterogeneity, the β_3 coefficient is negative and statistically significant at the 1% level as well (p-values of 0.001 and 0.004, respectively). While boards with occupational heterogeneity are more performance sensitive, boards with demographic heterogeneity do not exhibit any increase in performance sensitivity. The β_3 coefficient is not

significant for demographic heterogeneity in aggregate, or for any of the demographic heterogeneity measures individually.

Table 4a

CEO performance-turnover sensitivity and board heterogeneity

This table shows logistic and linear probability model with firm fixed effects regressions of CEO turnover on firm performance, governance characteristics, CEO characteristics and board hetergeneity. Return is market adjusted for the year using CRSP value-weighted index, compounded mothly. Board independence is the % of directors considered unaffiliated. Heterogeneity is defined in the Appendix A. Board size is ln(# directors) on the board. Closely held shares is the percentage of shares held by the top management, CEO gender is indicator variable equal to 1 when CEO is a female, 0 otherwise. CEO tenure is the # of years the current CEO had been at the position. CEO pay slice is the % of total pay earned by the disclosed earners captured by the CEO. CEO duality is a dummy equal to 1 if CEO is also the Chairman. Firm size is ln(total assets). Business and geographic segments are # of reporting business and geographic segments, respectively. Return volatility is standard diviation of stock returns over the proceeding three year period. Standard errors for the regressions without firm fixed effects are clustered at the firm level. Number in parentheses are two-sides p-values. Significance is denoted by ***, **, and * for 1%, 5% and 10%, respectively. Marginal effects of heterogeneity for the logit specification are calculated using Norton Wang Ai (2004) method.

	Dependent Variable = 1 if CEO replaced, 0 otherwise							
	Demographic Heterogeneity							
	(1) Heterogeneity Index		(2) Age Heterogeneity		(3) Gender Heterogeneity		(4) Ethnicity Heterogeneity	
CEO Turnover	Logit	LPM FFE	Logit	LPM FFE	Logit	LPM FFE	Logit	LPM FFE
Returns	-0.892***	-0.025***	-0.907***	-0.026***	-0.889***	-0.026***	-0.970***	-0.029
	[0.000]	[0.005]	[0.000]	[0.003]	[0.000]	[0.004]	[0.003]	[0.145]
Heterogeneity	0.294**	-0.014	-2.743**	-0.030	1.112***	-0.038	1.166*	0.038
	[0.013]	[0.395]	[0.049]	[0.864]	[0.001]	[0.432]	[0.052]	[0.706]
Returns * Heterogeneity	0.006	0.009	-0.17	-0.047	0.022	-0.002	0.027	0.155
	[0.922]	[0.663]	[0.318]	[0.826]	[0.537]	[0.975]	[0.925]	[0.278]
Board_Independence	0.671	0.002	0.488	-0.002	0.517	0.005	-0.092	-0.156
	[0.259]	[0.981]	[0.419]	[0.979]	[0.384]	[0.953]	[0.932]	[0.258]
Returns * Board_Indep	-4.010***	-0.243**	-4.121***	-0.242**	-4.139***	-0.241**	-6.708	-0.155
	[0.007]	[0.012]	[0.004]	[0.013]	[0.006]	[0.013]	[0.160]	[0.539]
Board_Size	0.034	0.045	0.149	0.043	0.001	0.043	0.576	0.077
	[0.884]	[0.160]	[0.517]	[0.192]	[0.995]	[0.177]	[0.170]	[0.189]
Institutional_Ownership	-0.265	-0.028	-0.258	-0.028	-0.273	-0.028	-0.604*	-0.070
	[0.175]	[0.303]	[0.192]	[0.303]	[0.164]	[0.307]	[0.092]	[0.244]
Firm_Size	0.004	-0.021	0.009	-0.021	-0.001	-0.020	-0.126*	-0.019
	[0.916]	[0.147]	[0.828]	[0.146]	[0.988]	[0.153]	[0.065]	[0.487]
Return_Volatility	2.350**	0.176	2.320**	0.173	2.479***	0.173	0.386	0.635**
	[0.011]	[0.159]	[0.011]	[0.166]	[0.007]	[0.167]	[0.856]	[0.017]
Business_Segments	0.045**	0.008**	0.044**	0.008**	0.044**	0.008**	0.061**	0.007
	[0.014]	[0.018]	[0.016]	[0.018]	[0.016]	[0.018]	[0.036]	[0.137]
Geographic_Segments	0.023	0.007	0.023	0.007	0.022	0.007	0.000	-0.001
	[0.230]	[0.109]	[0.230]	[0.108]	[0.254]	[0.109]	[0.991]	[0.925]
CEO_Age	-0.046***	-0.011***	-0.050***	-0.011***	-0.047***	-0.011***	-0.057***	-0.014***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
CEO_Gender	-0.379	-0.157***	-0.345	-0.158***	-0.388	-0.156***	0.294	-0.081
	[0.246]	[0.000]	[0.291]	[0.000]	[0.234]	[0.000]	[0.485]	[0.192]
CEO_Tenure	-0.011	0.018***	-0.012	0.018***	-0.010	0.018***	0.015	0.023***
	[0.188]	[0.000]	[0.139]	[0.000]	[0.212]	[0.000]	[0.219]	[0.000]
CEO_Pay_Slice	-4.120***	-0.252***	-4.163***	-0.252***	-4.152***	-0.252***	-4.068***	-0.260***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
CEO_Duality	0.131	0.025**	0.148	0.025**	0.129	0.025**	0.285	0.048**
	[0.201]	[0.042]	[0.147]	[0.044]	[0.208]	[0.042]	[0.112]	[0.026]
Constant	0.707	0.664***	0.599	0.671***	0.874	0.666***	1.611	0.732***
	[0.314]	[0.000]	[0.400]	[0.000]	[0.217]	[0.000]	[0.206]	[0.006]
Year/Industry/Firm FE	Y/Y/N	Y/-/Y	Y/Y/N	Y/-/Y	Y/Y/N	Y/-/Y	Y/Y/N	Y/-/Y
Number of Observations	7,856	7,856	7,856	7,856	7,856	7,856	2,938	2,938
(Pseudo) R-squared	0.0780	0.067	0.0776	0.067	0.0791	0.067	0.0798	0.090

Table 4b
CEO performance-turnover sensitivey and board heterogeneity

	Dependent Variable = 1 if CEO replaced, 0 otherwise							
	Occupational Heterogeneity							
	(1) Heterogeneity Index		(2) Tenure Heterogeneity		(3) Rank Heterogeneity		(4) Function Heterogeneity	
CEO Turnover			Logit	LPM FFE	Logit	LPM FFE	Logit	LPM FFE
Returns	-0.961***	-0.026***	-0.914***	-0.028***	-0.922***	-0.023***	-0.982***	-0.028***
	[0.000]	[0.003]	[0.000]	[0.001]	[0.000]	[0.009]	[0.000]	[0.002]
Heterogeneity	0.060	0.021	0.227	0.028	-0.408	0.009	-0.178	-0.061
	[0.830]	[0.500]	[0.294]	[0.195]	[0.213]	[0.846]	[0.611]	[0.221]
Returns * Heterogeneity	-0.208**	-0.179***	-0.124**	-0.115***	-0.184**	-0.174***	-0.082	-0.045
	[0.014]	[0.000]	[0.015]	[0.001]	[0.031]	[0.004]	[0.263]	[0.463]
Board_Independence	0.695	-0.005	0.778	-0.005	0.612	-0.001	0.661	0.003
	[0.243]	[0.953]	[0.189]	[0.953]	[0.303]	[0.986]	[0.265]	[0.973]
Returns * Board_Indep	-4.706***	-0.313***	-4.050***	-0.286***	-4.441***	-0.264***	-4.212***	-0.248**
	[0.000]	[0.002]	[0.003]	[0.004]	[0.004]	[0.007]	[0.004]	[0.011]
Board_Size	0.064	0.034	0.046	0.030	0.142	0.041	0.125	0.047
	[0.792]	[0.305]	[0.849]	[0.360]	[0.537]	[0.207]	[0.592]	[0.145]
Institutional_Ownership	-0.229	-0.030	-0.223	-0.031	-0.243	-0.028	-0.257	-0.027
	[0.244]	[0.259]	[0.260]	[0.253]	[0.213]	[0.299]	[0.190]	[0.311]
Firm_Size	0.021	-0.019	0.022	-0.018	0.011	-0.021	0.016	-0.021
	[0.600]	[0.175]	[0.570]	[0.197]	[0.773]	[0.134]	[0.691]	[0.141]
Return_Volatility	2.115**	0.164	2.250**	0.163	2.213**	0.169	2.261**	0.172
	[0.023]	[0.190]	[0.015]	[0.194]	[0.015]	[0.177]	[0.014]	[0.169]
Business_Segments	0.042**	0.008**	0.043**	0.008**	0.043**	0.008**	0.045**	0.008**
	[0.022]	[0.017]	[0.020]	[0.017]	[0.019]	[0.018]	[0.016]	[0.018]
Geographic_Segments	0.024	0.006	0.023	0.007	0.024	0.006	0.024	0.006
	[0.213]	[0.114]	[0.251]	[0.105]	[0.222]	[0.126]	[0.222]	[0.115]
CEO_Age	-0.048***	-0.011***	-0.049***	-0.011***	-0.048***	-0.011***	-0.048***	-0.011***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
CEO_Gender	-0.289	-0.160***	-0.331	-0.164***	-0.334	-0.158***	-0.327	-0.158***
	[0.370]	[0.000]	[0.302]	[0.000]	[0.310]	[0.000]	[0.312]	[0.000]
CEO_Tenure	-0.013*	0.018***	-0.013	0.018***	-0.012	0.018***	-0.012	0.018***
	[0.100]	[0.000]	[0.117]	[0.000]	[0.128]	[0.000]	[0.123]	[0.000]
CEO_Pay_Slice	-4.136***	-0.253***	-4.138***	-0.251***	-4.150***	-0.254***	-4.110***	-0.252***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
CEO_Duality	0.161	0.026**	0.163	0.026**	0.150	0.025**	0.149	0.025**
	[0.117]	[0.035]	[0.114]	[0.035]	[0.141]	[0.044]	[0.141]	[0.041]
Constant	0.534	0.680***	0.577	0.682***	0.475	0.681***	0.437	0.658***
	[0.454]	[0.000]	[0.419]	[0.000]	[0.498]	[0.000]	[0.534]	[0.000]
Year/Industry/Firm FE	Y/Y/N	Y/-/Y	Y/Y/N	Y/-/Y	Y/Y/N	Y/-/Y	Y/Y/N	Y/-/Y
Number of Observations	7,856	7,856	7,856	7,856	7,856	7,856	7,856	7,856
(Pseudo) R-squared	0.0819	0.069	0.0804	0.069	0.0794	0.068	0.0770	0.067

Among the endogeneity concerns associated with attributing CEO performance-turnover sensitivity to director heterogeneity, omitted variable bias is most relevant. I seek to mitigate this concern by controlling for factors previously shown to affect performance-turnover sensitivity, namely factors that could be correlated with board heterogeneity. To further address the issue of

omitted time-invariant variables, I also use a firm fixed-effect specification. To the extent that the correlated omitted variable is time-invariant, firm fixed effect specification should eliminate any concerns related to this type of endogeneity. Simultaneity and reverse causality are unlikely to be a significant concern in this test, since board composition is observed at the beginning of the year, CEO turnover is observed during the entire year, and stock performance is measured over the prior year. The timing of the variable measurement makes it unlikely that results are driven by those two types of endogeneity.

After accounting for the possibility of an omitted time-invariant variable by estimating the firm-fixed effect model, the results are even stronger. The results from firm fixed effect regressions show that firms with boards that are heterogeneous along tenure (p-value 0.001), rank (p-value 0.004) and overall heterogeneity (p-value 0.019) dimensions exhibit an increase in the likelihood of replacing the CEO compared to more homogeneous boards as the firms' market-adjusted performance for the prior year decreases.

The economic significance of such increased performance-turnover sensitivity is large, given that average CEO turnover in the sample is 6.6%. One standard deviation (0.377) decrease in stock returns increases the likelihood of CEO turnover in a firm whose board's occupational heterogeneity index is in the 5^{th} percentile by 4.96% compared to 9.81% in a firm with a heterogeneity index in the 95^{th} percentile. The same decrease in stock performance increases the likelihood of CEO turnover by 1.07% for a board with tenure heterogeneity in the 5^{th} percentile compared to 5.03% for a board with tenure heterogeneity in the 95^{th} percentile. Finally, one standard deviation decrease in stock returns increases the likelihood of CEO turnover by 1.60% for a board with rank heterogeneity in the 5^{th} percentile compared to 4.80% for a board with such heterogeneity in the 95^{th} percentile. While firms with occupationally-diverse boards show

increase CEO performance-turnover sensitivity, same cannot be said of firms with demographically-diverse boards. There is no significant relation between demographic diversity, whether in aggregate or individually, and CEO performance-turnover sensitivity.

2.4.2 Board heterogeneity and excess compensation

I examine the role of the five sources of heterogeneity on total excess compensation and the likelihood of awarding excess compensation to the CEO. To derive excess compensation, I first estimate normal compensation using the following model:

$$\ln(CEOTotalComp)_{it} = \beta_0 + \beta_{1-3}GovernanceControls + \beta_{4-11}FirmControls_{it} + \beta_{12-16}CEOControls_{it} + YearDummies_{it} + IndustryDummies_i + \varepsilon \quad \textbf{(2)}$$

I regress the natural log of total compensation (*ln*(*CEOTotalComp*)) on the factors believed to be the determinants of CEO compensation, such as firm characteristics, firm performance, performance volatility, two-digit SIC industry codes, and year-fixed effects. Using coefficient estimates from model (2), I calculate excess compensation as the difference between the actual and predicted total compensation. Since compensation is determined at the committee level, I construct and use compensation committee-level heterogeneity variables for this analysis. Using excess compensation as the dependent variable, I estimate the following model:

$$Excess\_Comp_{it} = \beta_0 + \beta_1 Heterogeneity_{it} + \beta_2 BoardSize_{it} + \beta_3 BoardIndep_{it} + \beta_4 InsiderOwner_{it} + YearDummies_{it} + IndustryDummies_{it} + \varepsilon \quad \textbf{(2a)}$$

Table 5 examines the role of heterogeneity in awarding excess CEO compensation (*Excess_Comp*). Panel A shows results of estimating model (2a). In panel B of the table, I re-

estimate the model (2a) above as a logistic regression, replacing the dependent variable with a binary variable equal to 1 when excess compensation is awarded (residual > 0) and 0 otherwise:

$$Excess\_Comp\_Dummy_{it} = \beta_0 + \beta_1 Heterogeneity_{it} + \beta_2 BoardSize_{it} + \beta_3 BoardIndep_{it} + \beta_4 InsiderOwner_{it} + YearDummies_{it} + IndustryDummies_{it} + \varepsilon \quad \textbf{(2b)}$$

The results in Table 5 indicate that occupationally-diverse compensation committees award less excess compensation, and are less likely to award any excess compensation at all. The results are primarily driven by tenure and rank heterogeneity. The coefficient on occupational heterogeneity is negative in models 2a and 2b and statistically significant at the 5% level (p-values 0.016 and 0.021, respectively). Similarly, tenure heterogeneity is negatively associated with excess compensation (p-value 0.007) and the likelihood of awarding any excess compensation (p-value 0.03). The coefficient on rank heterogeneity is negative and statistically significant at the 5% level in model 2a and at the 10% level in model 2b (p-values 0.043 and 0.057, respectively), indicating that boards heterogeneous in rank award less excess compensation, and are less likely to award any excess compensation. Function heterogeneity is not significantly associated with decreased likelihood of excess. The analysis controls for other board characteristics, such as board size, independence, and percentage of shares held by institutions.

As in prior instances, demographic heterogeneity does not seem to impact compensation awarding practices. The coefficient on occupational diversity is negative, but not statistically significant (p-value of 0.707 and 0.55). Age, gender and race heterogeneity seem not to be significant determinants of excess compensation.

Table 5

Excess compensation and compensation committee heterogeneity

This table presents regression of excess compensation on board characteristics and compensation committee heterogeneity. Excess compensation is obtained from the residuals of the first regression. First stage regression model is specified as follows:

$$ln(CEOTotalComp)_{it} = \beta_0 + \beta_1 FirmSize_{it} + \beta_2 FirmGrowth_{it} + \beta_3 ROA_{it} + \beta_4 ROAVolatility_{it} + \beta_5 StockReturn_{it} + \beta_6 StockRetVolatility_{it} + \beta_7 BusinessSegment_{it} + \beta_8 GeographicSegment_{it} + \beta_9 CEOAge_{it} + \beta_{10} CEOGender_{it} + \beta_{11} CEOTenure_{it} + \beta_{12} CEODuality_{it} + \beta_{13} CEOTitleLength_{it} + YearDummies_{it} + IndustryDummies_i + LocationDummies_i + \varepsilon$$

Panel A shows OLS regressions where excess compensation is the residual amount from regression 1. Panel B shows logistic regressions, where excess compensation is defined as an indicator variable set to 1 for residual from first regression greater than 0, and 0 otherwise. First stage regression (1) includes two digit industry SIC codes, year dummies and firm location dummies. Heterogeneity is defined in Appendix A. Board size is natural log of the total number of board directors. Board independence is the percentage of directors considred unaffiliated. Institutional ownership is the percentage of shares held by institutional investors.Two-sided p-values are in parentheses. Robust standard errors are clustered at the firm and year level. Significance level is denoted by ***, **, and * for 1%, 5% and 10%, respectively.

	Dependent variable (Excess_Comp) = total excess compensation							
	Demographic Heterogeneity				Occupational Heterogeneity			
PANEL A	(1) Heterogeneity Index	(2) Age Heterogeneity	(3) Gender Heterogeneity	(4) Ethnic Heterogeneity	(1) Heterogeneity Index	(2) Tenure Heterogeneity	(3) Rank Heterogeneity	(4) Function Heterogeneity
Heterogeneity	-0.004	-0.338	-0.001	0.006	-0.081**	-0.103***	-0.096**	0.017
	[0.707]	[0.125]	[0.992]	[0.963]	[0.016]	[0.007]	[0.043]	[0.728]
Board_Size	0.032	0.035	0.031	0.179**	0.045	0.049	0.033	0.030
	[0.546]	[0.521]	[0.568]	[0.027]	[0.403]	[0.363]	[0.536]	[0.581]
Board_Independence	0.011	0.010	0.011	0.421**	0.004	0.005	0.012	0.012
	[0.934]	[0.943]	[0.938]	[0.030]	[0.975]	[0.968]	[0.929]	[0.929]
Institutional_Ownership	0.289***	0.287***	0.289***	0.295***	0.286***	0.288***	0.286***	0.289***
	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]
Constant	-0.291	-0.208	-0.301	-0.827**	-0.218	-0.251	-0.233	-0.306
	[0.310]	[0.479]	[0.292]	[0.028]	[0.450]	[0.375]	[0.418]	[0.281]
Year/ Industry FE	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
Observations	7,421	7,421	7,421	2,823	7,421	7,421	7,421	7,421
R-Squared	0.036	0.037	0.036	0.137	0.038	0.038	0.037	0.036

Table 5 - Con't

	Dependent variable (Excess_Comp_Dummy) = 1 if excess compansation awarded, 0 otherwise							
PANEL B	(1) Heterogeneity Index	(2) Age Heterogeneity	(3) Gender Heterogeneity	(4) Ethnic Heterogeneity	(1) Heterogeneity Index	(2) Tenure Heterogeneity	(3) Rank Heterogeneity	(4) Function Heterogeneity
Heterogeneity	-0.023	-0.735	-0.045	-0.208	-0.251**	-0.265**	-0.303*	-0.020
	[0.550]	[0.283]	[0.802]	[0.640]	[0.021]	[0.030]	[0.057]	[0.901]
Board_Size	-0.150	-0.151	-0.156	0.343	-0.115	-0.111	-0.152	-0.158
	[0.401]	[0.399]	[0.382]	[0.263]	[0.519]	[0.535]	[0.394]	[0.376]
Board_Independence	0.156	0.150	0.154	1.216*	0.133	0.138	0.158	0.150
	[0.711]	[0.721]	[0.714]	[0.097]	[0.751]	[0.742]	[0.706]	[0.721]
Institutional_Ownership	1.000***	0.995***	1.000***	1.263***	0.990***	0.997***	0.990***	0.999***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Constant	-0.316	-0.275	-0.342	-14.179***	-0.134	-0.380	-0.095	-0.341
	[0.787]	[0.816]	[0.769]	[0.000]	[0.909]	[0.744]	[0.936]	[0.770]
Year/ Industry FE	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
Observations	7,420	7,420	7,420	2,755	7,420	7,420	7,420	7,420
Pseudo R-Squared	0.0331	0.0332	0.0330	0.0774	0.0339	0.0338	0.0336	0.0330

In economic terms, compensation committees in the 95th percentile of the occupational heterogeneity index are 0.777 times as likely to award excess compensation as compensation committees with homogenous index (5th percentile). Equivalently, homogeneous compensation committees are 1.29 times more likely to award excess compensation compared to the more heterogeneous counterparts. Firms with compensation committees homogeneous along the rank and tenure dimensions are 1.22 and 1.28 times more likely, respectively, to award some excess compensation to their CEO compared to the firms with boards heterogeneous along the two dimensions.

2.4.3 Board heterogeneity and post-CEO replacement performance

To examine whether heterogeneous boards are more effective at selecting the new CEO, I estimate change in firm market value post-CEO replacement, as a function of heterogeneity and other hypothesized determinants of firm market value. Specifically, I estimate the following regression:

$$MV\_Increase_{it} = \beta_0 + \beta_1 Heterogeneity_{it} + \beta_{2-4} GovernanceControls_{it} + \beta_{5-11} FirmControls_{it} + \beta_{12-16} CEOControls_{it} + YearDummies_{it} + IndustryDummies_{it} + \varepsilon \quad \textbf{(3)}$$

The dependent variable, *MV_Increase*, is a dummy variable equal to 1 if the % change in market value, as measured from the end of the year t-1 to the end of the year t+1 following the year during which the CEO is replaced, is in the top quartile of all firms with CEO turnover, and 0 otherwise. A positive coefficient on β_1 would indicate that firms with heterogeneous boards are more likely to experience a significant increase in firm performance following the arrival of the new CEO. To the extent that such an increase in market value is attributable to market perception

of the CEO's quality as well as actions undertaken by the new CEO during the year, I would conclude that boards of such firms performed better at selecting the right candidate.

Findings in Table 6 suggest this is, indeed, the case. The table shows that occupationally-diverse boards are significantly more likely (p-value 0.016) to experience an increase in market value that is in top quartile of all firms undergoing leadership change. The results are mainly driven by tenure and function diversity (p-values of 0.022 and 0.064, respectively). The findings are consistent with the prediction that heterogeneous boards are more effective in CEO selection due to access to a broader set of resources, information, and greater talent pool, as well as increased independence. Consistent with prior results, demographic diversity of the board does not seem to impact firm's likelihood to experience significant improvement in market value following arrival of a new CEO. Though coefficients on gender and age diversity are positive, they are not significant in the statistical terms.

In economic terms, the results of the occupational diversity seem meaningfully large. The results indicate that compared to a board which is in the 5^{th} percentile of occupational heterogeneity measure, a board which is in the 95^{th} percentile would have 3.2 times higher odds of experiencing a significant increase in market value after the appointment of a new CEO.

Table 6

Board heterogeneity and change in performance following CEO replacement

This table presents estimation of the likelihood of large improvement in firm performance (market value) following CEO replacement, as a function of board heterogeneity and other hypothesized determinants of performance change surrounding CEO departure. Dependent variable is 1 if firm's % increase in market value is in the top quartile for all firms replacing CEO, and 0 otherwise. Percentage increase in market value is measured starting at the beginning of the year during which CEO is replaced (t) to the end of the year following CEO replacement (t+1). Heterogeneity is defined in the Appendix A. Board size is natural log of the number of board directors. Board independence is the percentage of directors considered unaffiliated. Institutional ownership is the % of float shares held by institutions. Firm size is natural log of total assets. Book to market is the ratio of book value to market value of equity. ROA and stock volatility is standard dividation of the two variables over the prior 3 years. Returns are CRSP value-weighted portfolio adjusted returns over the year before CEO replacement, compounded monthly.CEO controls (gender, tenure, age, title, duality) are included, but not shown for brevity. Business and geographic segments are number of reporting business and geographic segments, respectively. Regression includes year and industry fixed effects. Number in parentheses are two-sided p-values. Robust standard errors are clustered at the firm level. Significance is denoted by ***, **, and * for 1%, 5% and 10%, respectively.

	Dependent Variable = Market_Value_ Improvement							
	Demographic Heterogeneity				Occupational Heterogeneity			
Heterogeneity	(1) Heterogeneity Index	(2) Age Heterogeneity	(3) Gender Heterogeneity	(4) Ethnic Heterogeneity	(1) Heterogeneity Index	(2) Tenure Heterogeneity	(3) Rank Heterogeneity	(4) Function Heterogeneity
Heterogeneity	0.151	4.732	0.418	-7.400	1.882**	1.257**	0.606	2.975*
	[0.654]	[0.190]	[0.687]	[0.234]	[0.016]	[0.022]	[0.573]	[0.064]
Board_Size	0.345	0.300	0.367	1.411	-0.007	0.157	0.352	-0.038
	[0.622]	[0.660]	[0.590]	[0.519]	[0.992]	[0.816]	[0.596]	[0.958]
Board_Independence	1.056	1.386	0.969	0.797	1.255	1.386	0.997	1.196
	[0.468]	[0.361]	[0.507]	[0.860]	[0.382]	[0.344]	[0.489]	[0.416]
Institutional_Ownership	0.276	0.304	0.275	3.657**	0.310	0.322	0.280	0.290
	[0.598]	[0.560]	[0.599]	[0.040]	[0.548]	[0.529]	[0.593]	[0.584]
Firm_Size	-0.028	-0.005	-0.030	-0.636	0.025	-0.001	-0.006	-0.039
	[0.822]	[0.968]	[0.810]	[0.263]	[0.841]	[0.994]	[0.964]	[0.756]
Book_to_Market	1.041**	0.970*	1.055**	4.352	0.894*	0.952*	1.011**	1.054**
	[0.040]	[0.057]	[0.038]	[0.138]	[0.077]	[0.056]	[0.050]	[0.040]
ROA_Volatility	-0.973	-0.979	-0.977	23.452***	-1.146	-0.945	-1.086	-0.820
	[0.175]	[0.188]	[0.170]	[0.002]	[0.118]	[0.178]	[0.156]	[0.283]
$Returns_{t-1}$	5.186***	5.212***	5.181***	15.425***	5.363***	5.313***	5.201***	5.185***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Return_Volatility	8.105***	7.939***	8.143***	29.771*	8.803***	8.527***	8.072***	8.233***
	[0.003]	[0.004]	[0.003]	[0.086]	[0.002]	[0.003]	[0.003]	[0.004]
Business_Segments	0.085	0.085	0.084	0.106	0.083	0.081	0.085	0.077
	[0.131]	[0.136]	[0.131]	[0.466]	[0.134]	[0.154]	[0.130]	[0.168]
Geographic_Segments	0.039	0.037	0.041	0.410	0.020	0.018	0.040	0.045
	[0.494]	[0.509]	[0.470]	[0.189]	[0.727]	[0.747]	[0.475]	[0.428]
Constant	-1.079	0.559	-1.353	-58.845***	-13.551	-9.902	-2.111	-1.904
	[0.961]	[0.980]	[0.951]	[0.005]	[0.593]	[0.689]	[0.925]	[0.930]
CEO Controls	Included	Included	Included	Included	Included	Included	Included	Included
Year + Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	687	687	687	214	687	687	687	687
R-squared	0.387	0.388	0.387	0.652	0.395	0.394	0.387	0.390

CHAPTER 3

WHEN DOES GENDER DIVERSITY MATTER?

3.1 Introduction

The chapter two of the study provided some compelling evidence on the impact of occupational board heterogeneity on its ability to effectively monitor the CEO. At the same time, there is little to no evidence that any dimension of demographic heterogeneity increases boards' ability to monitor the CEO, as measured by the CEO performance-turnover sensitivity and the likelihood of overcompensating the CEO. Although the current regulatory push to increase board diversity and to disclose the process through the goal is achieved has defined board heterogeneity very broadly, the largest and most vocal proponents of heterogeneous boards have mainly focused on the demographic component of board diversification. Purported benefits of board gender-diversification have been discussed and promoted widely through numerous studies conducted by the organizations such as CalPERS and Catalyst. Furthermore, early studies examining the effects of board gender diversity on its effectiveness using the pre-SOX period of the 1990s to early 2000s demonstrated some benefits of diversifying along those lines. Yet, this study fails to find similar benefits of demographic diversity in the more recent years.

Given that chapter two of this study points to the more important role of the occupational diversity while the diversity activists push mainly for the increase in demographic diversity, it is crucial to understand the conditions under which demographic diversity seems to matter. The goal of this chapter 3 is to explore this question, with the emphasis on gender diversity as the demographic diversity of interest.

3.2 The role of gender diversity in board effectiveness

The basic premise behind diversity is the notion that such diversity is associated with differences in information, knowledge, and perspectives, benefiting the group performance (Knippenberg and Schippers, 2007). Such diversity can come from occupational sources, but also from demographic differences of group members. Indeed, prior management literature has shown that demographic diversity is a good proxy for perspective diversity of group members (Kilduff et al, 2000).

In this study, results indicate that gender diversity does not impact boards' ability to monitor the CEO. The findings on gender diversity are not fully consistent with prior research. Adams and Ferreira (2009), using a sample of firms from 1998 to 2003, show that gender diverse boards are, on average, better at monitoring: their performance-turnover sensitivity is stronger. I do not find such results. The lack of finding on gender diversity can be attributable to multiple factors. Out of those factors, four stand out as candidate explanations:

i) Gender diversity has undesirable properties leading to less effective functioning of groups. Some prior studies (i.e. Jehn et al, 1999) show that demographic diversity may produce results opposite of those expected. While occupational diversity can enhance group's ability to interact and brainstorm, demographic diversity can make group members keenly aware of their differences and uncomfortable expressing their opinions, making the interaction and discussions less likely.

ii) While diversity produces desirable results by creating perspective diversity, gender diversity itself may be a poor proxy for perspective diversity. The differences in perspectives between female and male directors may be much

smaller relative to differences between an average female and a male employee. Hence, even though gender diversity may be an effective way to introduce perspective diversity in a workgroup setting, it may be ineffective in governance setting.

iii) Alternatively, female directors may bring different perspective, but their ability to express their opinion could be hampered if in a setting that does not value and expect active participation of all directors equally. This may be true in firms who recruit female directors to meet social, regulatory or investor expectations.

iv) Finally, the lack of effect could be caused by hiring less qualified or experienced female directors. If many female directors are less qualified for the position relative to their male counterparts, they may not have the ability to contribute to firm governance.

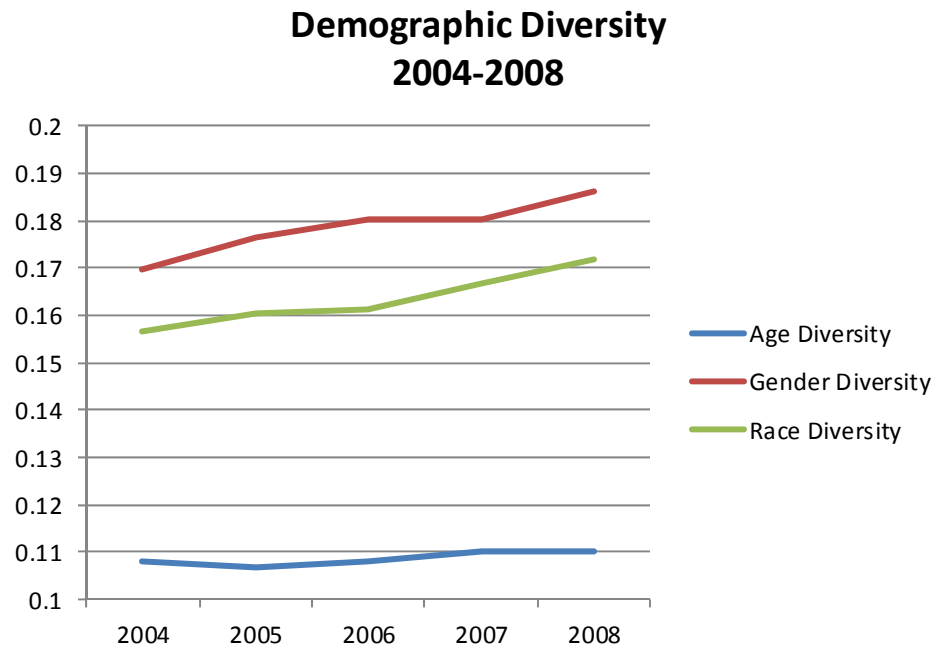
Though any of these four reasons can be responsible for the lack of results on gender, it is not very likely that reasons i) and ii) can explain why gender-diverse boards are no more effective in monitoring the CEO relative to gender homogenous boards. If explanations i) or ii) were true, one would not expect prior studies to find strong results on the effectiveness of gender-diverse boards. If gender diversity is an undesirable trait in board setting, or if gender diversity is not a good proxy for perspective diversity, then prior studies examining effectiveness of gender-diverse boards should have found no effect of gender diversity as well.

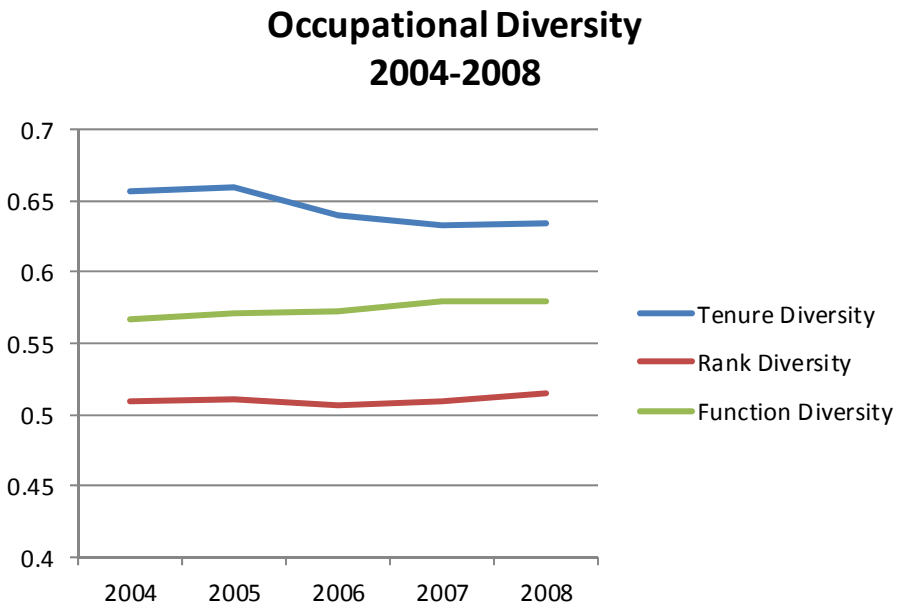
3.3 The role of firm commitment to gender diversity

I explore further whether point iii) provides a credible explanation for finding no effect of gender-diverse boards. The debate on the benefits of including women in governance has

gathered steam in recent years. Consequently, firms have focused on recruiting female directors to join their boards. While occupational heterogeneity has remained fairly stable over the past years, demographic heterogeneity experienced a noticeable increase. Figure 3, below, demonstrates changes in demographic and occupational diversity over the sample period.

Figure 1





If firms recently added gender diversity to their boards as a window-dressing measure, rather than to reap the benefits of increasing diversity, one would expect to find no impact of such diversification. If the female directorships are given as a token in order to conform to external expectations and pressures, without expectation or encouragement of meaningful dialogue, increasing gender diversity may not produce the desired results.

To explore this hypothesis further, I first examine how each dimension of heterogeneity impacts frequency of board meetings. If heterogeneity brings along perspective diversity which is expressed, it should translate into more frequent or lengthier board meetings. Since neither the content nor the length is known, I focus the analysis on the frequency of board meetings.

As the results in Table 7 show, gender diversity does not impact frequency of board meetings. This is also the case for other forms of demographic diversity. Occupational diversity, however, is associated with more frequent board meetings. The results are very strong for tenure and rank heterogeneity, the two dimensions of occupational diversity most significantly associated with improved CEO monitoring in this study. In economic terms, one standard deviation increase in occupational diversity translates into 0.33 additional board meetings a year.

The finding that gender-diverse boards meet no more frequently than gender-homogenous boards could indicate that firms adding women to the board do so without the intention of availing the benefits of richer discussions. To investigate this further, I examine the impact of gender diversity on a subset of firms "committed" to gender diversity. Long before organizations such as Catalyst set out to promote board diversity around 2003, there were firms with female directors. In my sample, I identify all firms with more than one female director by 2001 and label those firms "committed." All other firms are labeled as "non-committed." Using the early years to identify firm types and current data to estimate the impact of diversity for the two subsamples,

I compare the impact of board gender diversity on its effectiveness (CEO performance-turnover sensitivity, excess compensation) in committed versus non-committed firms.

Table 7

Board heterogeneity and frequency of board meetings

This table presents OLS regression of number of board meetings held during the year on board heterogeneity and other hypothesized determinants of meeting frequency. Dependent variable is number of board meetings during year t. All control variables are included as in prior tables, but are collapsed here for brevity. Regression includes firm and year industry fixed effects. Standard errors are clustered at the firm level. Number in parentheses are two-sided p-values. Significance is denoted by ***, **, and * for 1%, 5% and 10%, respectively.

	Dependent Variable = # Board Meetings							
	Demographic Heterogeneity				Occupational Heterogeneity			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Heterogeneity	Heterogeneity Index	Age Heterogeneity	Gender Heterogeneity	Ethnic Heterogeneity	Heterogeneity Index	Tenure Heterogeneity	Rank Heterogeneity	Function Heterogeneity
Heterogeneity	0.123	-1.211	0.468	-0.686	1.748***	1.047***	1.558***	0.650
	[0.405]	[0.505]	[0.291]	[0.326]	[0.000]	[0.000]	[0.000]	[0.135]
Board_Size	-1.087***	-1.031***	-1.099***	-0.933**	-1.404***	-1.223***	-1.190***	-1.119***
	[0.002]	[0.004]	[0.002]	[0.038]	[0.000]	[0.001]	[0.001]	[0.001]
Board_Independence	1.362*	1.286*	1.307*	2.118**	1.630**	1.485**	1.449*	1.426*
	[0.069]	[0.089]	[0.081]	[0.044]	[0.030]	[0.048]	[0.052]	[0.058]
Firm_Size	0.330***	0.333***	0.327***	0.467***	0.371***	0.356***	0.364***	0.335***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Book_to_Market	0.245	0.243	0.246	0.189	0.202	0.221	0.207	0.242
	[0.192]	[0.197]	[0.191]	[0.528]	[0.274]	[0.232]	[0.267]	[0.196]
ROA	-3.900***	-3.931***	-3.909***	-5.437***	-3.898***	-3.844***	-4.011***	-3.910***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
CEO_Age	0.003	0.001	0.003	0.013	0.003	0.002	0.003	0.003
	[0.754]	[0.907]	[0.773]	[0.372]	[0.750]	[0.874]	[0.714]	[0.793]
CEO_Gender	0.649	0.664	0.643	1.403**	0.679	0.634	0.715	0.673
	[0.222]	[0.208]	[0.226]	[0.046]	[0.192]	[0.223]	[0.176]	[0.201]
CEO_Tenure	-0.065***	-0.066***	-0.065***	-0.073***	-0.067***	-0.066***	-0.068***	-0.066***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
CEO_Pay_Slice	0.641	0.627	0.638	0.151	0.632	0.665	0.597	0.634
	[0.200]	[0.212]	[0.203]	[0.811]	[0.203]	[0.182]	[0.232]	[0.205]
CEO_Duality	-0.454***	-0.448***	-0.456***	-0.575***	-0.407***	-0.406***	-0.435***	-0.448***
	[0.000]	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0.000]	[0.000]
Constant	5.999***	6.276***	6.160***	0.979	4.899***	5.764***	5.321***	5.749***
	[0.000]	[0.000]	[0.000]	[0.508]	[0.002]	[0.000]	[0.001]	[0.000]
Year + Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observatio	7,389	7,389	7,389	2,908	7,389	7,389	7,389	7,389
R-squared	0.100	0.100	0.100	0.174	0.107	0.105	0.104	0.101

Results of the analysis are shown in Table 8. In the committed group, there is significant association between gender diversity and increased CEO performance-turnover sensitivity as well as a decreased likelihood of excess compensation. No such results are found in the non-committed group. I find that the difference in the impact of gender between the two subsamples is statistically significant (chi-squared 5.11, p-value 0.024 for performance-turnover sensitivity and chi-squared 3.23, p-value 0.073 for excess compensation).

Table 8

Gender diversity: committed versus non-committed firm and the impact on monitoring effectiveness

This table shows seemingly unrelated estimates of two outcomes (CEO turnover and excess compensation) as a function of gender diversity estimated across two samples: firms with early committement to gender diversity ("committed") and firms with late committement ("non-committed"). Committed firms are those firms which had more than one female on board by 2001, and non-committed firms are those firms which did not have more than one female on board at that time. Coefficients on gender diversity are compared across the two firm types. The chow test represents the difference between those coefficients. Return is market adjusted return for the year using CRSP value-weighted index, compounded mothly. Heterogeneity is defined in Appendix A. Board size is natural log of number of directors on the board, board independence is the % of directors considered unaffiliated with the firm and institutional owership is the % of firms' float-adjusted shares held by institutional investors. All other control variables shown in prior tables are included here, but not shown for brevity. Numbers in parentheses are two-sided p-values. Standard errors in models without firm fixed effects are clustered at the firm level. Significance is denoted by ***, **, and * for 1%, 5% and 10%, respectively.

	Dependent Variable							
	(1) CEO_turnover				(2) Excess_Comp_Dummy			
	Logit		LPM Firm Fixed Effect		Logit		LPM Firm Fixed Effect	
	Non-commited	Committed	Non-commited	Committed	Non-commited	Committed	Non-commited	Committed
Returns	-0.867***	0.167	-0.042***	0.023				
	[0.000]	[0.785]	[0.000]	[0.589]				
Gender_Heterogeneity	1.051***	-0.755	0.044*	-0.080	0.049	-0.972*	0.010	-0.186*
	[0.006]	[0.492]	[0.054]	[0.196]	[0.812]	[0.067]	[0.832]	[0.060]
Returns * Gender_Heterogeneity	1.402	-8.676**	0.032	-0.609**				
	[0.247]	[0.043]	[0.603]	[0.044]				
Board_Independence	0.601	1.624	0.046	0.091	0.164	1.718	0.040	0.339
	[0.366]	[0.335]	[0.177]	[0.406]	[0.715]	[0.238]	[0.706]	[0.238]
Returns * Board_Independence	-4.776***	3.144	-0.244***	0.095				
	[0.001]	[0.545]	[0.003]	[0.769]				
Board_Size	-0.006	-0.009	-0.005	-0.036	-0.299	0.408	-0.072	0.092
	[0.983]	[0.987]	[0.746]	[0.345]	[0.133]	[0.466]	[0.130]	[0.392]
Institutional_Ownership	-0.277	0.413	-0.028*	0.021	0.971***	1.252***	0.231***	0.250***
	[0.208]	[0.349]	[0.059]	[0.515]	[0.000]	[0.001]	[0.000]	[0.001]
Early_Commitement vs. Late_Commitment [Prob > χ2]	**χ2 (1) =5.11 [0.024]**		**χ2 (1) =4.33 [0.038]**		**χ2 (1) =3.23 [0.073]**		**χ2 (1) =3.18 [0.074]**	
Controls	Included	Included	Included	Included	Included	Included	Included	Included
Year/Industry/Firm FE	Yes/Yes/No	Yes/Yes/No	Yes/-/Yes	Yes/-/Yes	Yes/Yes/No	Yes/Yes/No	Yes/-/Yes	Yes/-/Yes
Observations	6,502	1,349	6,502	1,349	7,424	7,424	6,129	1,292
Pseudo R-squared	0.096	0.071	0.044	0.042	0.021	0.022	0.055	0.254

To address the concern that findings are driven by other differences between committed and non-committed firms that are correlated with gender diversity, I re-estimate the model with firm a fixed-effect. Holding the firm constant yields same results. Committed firms benefit from the increase in gender diversity even in the recent years, while non-committed firms seem to derive no benefit from such increase in diversity.

The results suggest that gender diversity has a significant impact on firms that seek not to merely comply with external demands for diversity, but to reap the benefits of diverse boards. This finding provides partial explanation for the mixed evidence on the role of gender diversity. Adams and Ferreira (2009) and Carter et al. (2003) use a sample period before external pressures to increase gender diversity were in effect. At that time, firms increased diversity "voluntarily": the choice to add women to the board was largely endogenous and likely driven by internal needs. The results in this study using the pooled sample show no benefit of gender diversity. Since the sample of firms used in the study spans 2004 to 2008, a period after gender initiatives became more prominent, it is likely that firms added diversity during this period to respond to external pressures. This result is also largely consistent with Farrell and Hersch's (2005) view that additions of women to the board are mere window-dressing, and with findings by Ahern and Dittmar (2011), which show that mandated gender quota in Norway resulted in value reductions for affected firms.

3.4 Do committed firms have better qualified female directors?

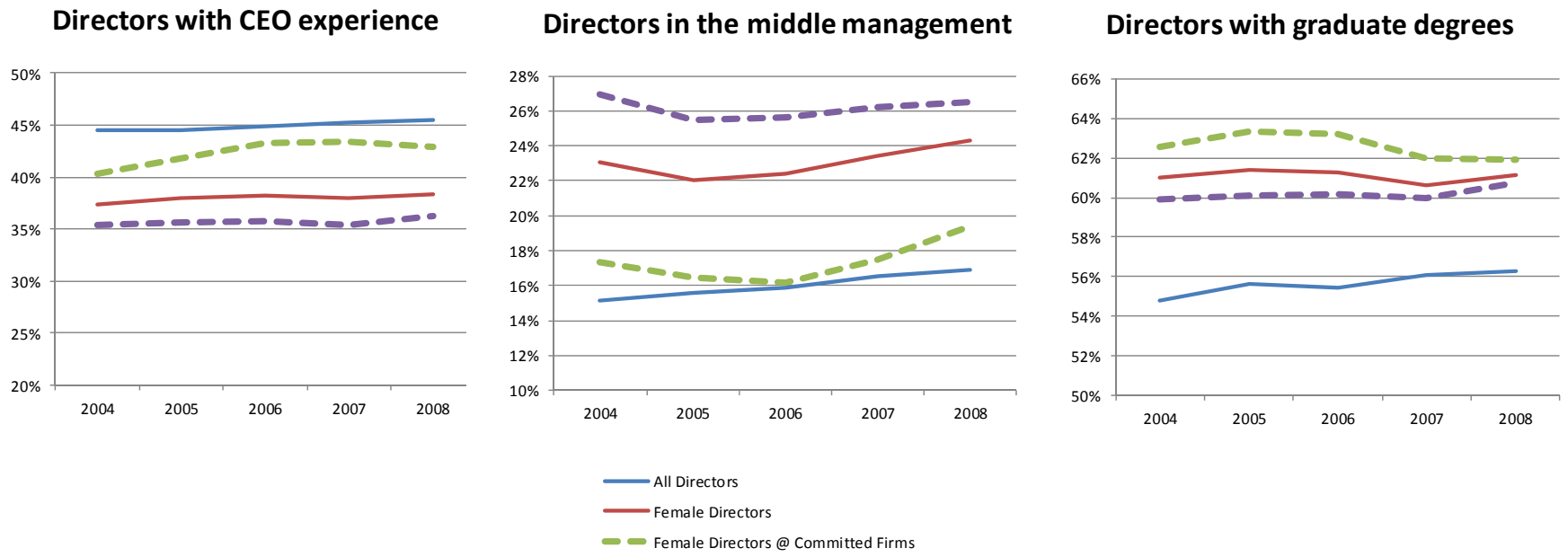
The study by Ahern and Dittmar (2011), however, attributes the negative effect of gender quote in Norway to firms' inability to recruit qualified female directors in a short period of time. Their findings support point iv) as the explanation for lack of results on gender in Norway. The

earlier findings in Tables 7 and 8 are not inconsistent with that explanation. It could be that what is identified as commitment in my sample is correlated with more qualified female directors. Firms adding female directors early on had the first pick of female directors to recruit and they may have selected the most qualified candidates to their boards. Furthermore, such firms may have better access to other qualified female directors as potential later hires through networks of the current female directors. To explore the possibility that the results in Table 8 are attributable to "committed" firms' superior ability to attract qualified female directors, rather than to the "commitment" itself, I examine how qualifications of female directors changed over time.

Each graph presents two comparisons: experience and education of female versus male directors, and the same for female directors in "committed" versus "non-committed" firms. The first graph indicates that fewer female than male directors have CEO background. However, the figure remains steady over the five-year period. The dotted line represents female directors from committed and non-committed firms. The percentage of female directors who have had CEO experience in the committed group is comparable to the portion of male directors with CEO experience, and is increasing over the five-year period. The percentage of female directors from CEO ranks is lower in the non-committed group, though it remains stable over time.

The second graph presents portion of female and male directors from middle-management ranks (i.e. general managers, controllers). More female directors come from such ranks compared to male directors. However, the difference is mostly limited to the subset of non-committed firms. In the subset of committed firms, portion of female directors from lower ranks is similar to the portion of male directors from the lower ranks. The last graph in Figure 1 presents educational achievement of the directors. It is noteworthy to mention that larger portion of female directors hold graduate degrees, relative to male directors.

Figure 2


Directors with CEO experience
50%
45%
40%
35%
30%
25%
20%
2004
2005
2006
2007
2008
Directors in the middle management
28%
26%
24%
22%
20%
18%
16%
14%
12%
10%
2004
2005
2006
2007
2008
Directors with graduate degrees
66%
64%
62%
60%
58%
56%
54%
52%
50%
2004
2005
2006
2007
2008
All Directors
Female Directors
Female Directors @ Committed Firms

The data seems to indicate that the push towards increasing number of female directors has not resulted in dilution of qualifications and experience of the incoming directors. The qualifications of women on board and their experience as CEOs have remained high. There seems to be a difference in the type of women that "committed" firms attract to the board relative to the "non-committed" firms, however. Female directors in committed firms are more experienced and educated, and likely more powerful in the business community. The results in Table 8 indicate that gender-diversity in the "committed" group of firms impacts boards' effectiveness, even after including firm-fixed effects. This result, combined with the data regarding the difference in experience and education of female directors in the two groups, leads to two possible explanations: 1) only highly qualified, and likely powerful, female directors are effective, which is why the results are concentrated in the subset of "committed" firms, or 2) the "enabling" environment in this subset of firms allows for the diversity benefits to be availed.

3.5 Director qualifications versus firm commitment: what drives the effect?

To distinguish between the two explanations, I compare effectiveness of boards in the "committed" subset of firms without any female director from the CEO ranks to the effectiveness of boards in the "non-committed" subset of firms with one or more female directors from the CEO ranks. Results of the analysis are presented in Table 9. The findings indicate that it is not the qualification of female directors which determines the effectiveness, but rather the enabling environment of the subsample of firms labeled as "committed". As results show, gender diversity impacts boards' effectiveness for this subset of firms even when there is no female director from CEO ranks on the board. Conversely, gender diversity has no impact on the subset of "non-committed" firms despite the presence of female directors from CEO ranks on the board.

Table 9

Gender diversity: committed firms without female directors with CEO experience versus non-committed firms with female directors with CEO experience

This table shows seemingly unrelated estimates of two outcomes (CEO turnover and excess compensation) as a function of gender diversity estimated across two samples: firms with early committement to gender diversity ("committed") that do not have any female directors from CEO ranks and firms with late committement ("non-committed") that do have female directors from CEO ranks. Committed versus noncomitted classification was defined in Table 8. The chow test represents the difference between those coefficients. Return is market adjusted return for the year using CRSP value-weighted index, compounded mothly. Heterogeneity is defined in Appendix A. Board size is natural log of number of directors on the board, board independence is the % of directors considered unaffiliated with the firm and institutional owership is the % of firms' float-adjusted shares held by institutional investors. All other control variables shown in prior tables are included here, but not shown for brevity. Numbers in parentheses are two-sided p-values. Standard errors in models without firm fixed effects are clustered at the firm level. Significance is denoted by ***, **, and * for 1%, 5% and 10%, respectively.

	Dependent Variable							
	(1) CEO_turnover				(2) Excess_Comp_Dummy			
	Logit		LPM Firm Fixed Effect		Logit		LPM Firm Fixed Effect	
	Non-commited with CEO-ranked female director	Committed without CEO-ranked female director	Non-commited with CEO-ranked female director	Committed without CEO-ranked female director	Non-commited with CEO-ranked female director	Committed without CEO-ranked female director	Non-commited with CEO-ranked female director	Committed without CEO-ranked female director
Returns	-0.582	-0.507	-0.031	-0.036				
	[0.344]	[0.588]	[0.367]	[0.581]				
Gender_Heterogeneity	1.023	-1.057	0.059	-0.026	-0.184	-2.480**	-0.033	-0.324*
	[0.473]	[0.535]	[0.478]	[0.814]	[0.677]	[0.029]	[0.719]	[0.051]
Returns * Gender_Heterogeneity	1.223	-10.845*	0.074	-0.722*				
	[0.769]	[0.084]	[0.771]	[0.074]				
Board_Independence	0.007	0.643	0.011	0.052	-0.955	1.021	-0.181	-0.001
	[0.997]	[0.835]	[0.913]	[0.789]	[0.387]	[0.726]	[0.433]	[0.998]
Returns * Board_Independence	-8.044*	-1.186	-0.511*	-0.352				
	[0.050]	[0.895]	[0.078]	[0.504]				
Board_Size	0.550	-0.846	0.030	-0.072	0.015	-1.168	0.007	-0.100
	[0.402]	[0.444]	[0.448]	[0.316]	[0.974]	[0.305]	[0.944]	[0.596]
Institutional_Ownership	-0.189	0.194	-0.015	0.000	0.269	0.775	0.063	0.132
	[0.695]	[0.802]	[0.660]	[0.993]	[0.473]	[0.319]	[0.428]	[0.314]
Early_Commitement vs. Late_Commitment [Prob > χ2]	**χ2 (1) =2.56 [0.109]**		**χ2 (1) =2.79 [0.095]**		**χ2 (1) =3.57 [0.059]**		**χ2 (1) =2.34 [0.126]**	
Controls	Included	Included	Included	Included	Included	Included	Included	Included
Year/Industry/Firm FE	Yes/Yes/No	Yes/Yes/No	Yes/-/Yes	Yes/-/Yes	Yes/Yes/No	Yes/Yes/No	Yes/-/Yes	Yes/-/Yes
Observations	1,620	460	1,620	488	1,495	372	1,564	459
Pseudo R-squared	0.086	0.125	0.028	0.026	0.116	0.218	0.088	0.220

The difference in coefficients, as estimated using Chow-test, is only marginally significant, it is clear that only the subset of “committed” firms derives any benefit from gender diversification, regardless of the qualifications of the directors appointed to the board.

CHAPTER 4

ROBUSTNESS ANALYSES

In this chapter, I discuss some of the additional analyses performed to ensure that the results are robust to alternative specifications and research design.

4.1 Alternative heterogeneity measures

Due to the concern that results may be driven by the measurement of the diversity, I construct alternative diversity measures. Since age and tenure diversity is originally measured as the coefficient of variation, which is sensitive to large group outliers, I recreate these two measures using the Blau index. First, I transform the continuous variables into categorical variables. For alternative measures of age heterogeneity, I assign each director into one of six age categories. To ensure that results are not driven by the arbitrary choice of age categories, I repeat the exercise again with three categories only.[6] Regardless of the variable choice, the results of the analyses are virtually unchanged. The finding that age diversity does not seem to improve boards' effectiveness in a statistically significant way is robust to multiple methods of measuring diversity and does not seem to be an artifact of the measurement methodology.

I follow similar approach to examine robustness of tenure heterogeneity measure. First, I transform the continuous tenure variable into a categorical variable with six tenure categories.[7] Analysis using the Blau measure yields very similar results: tenure diversity has a positive effect on boards' effectiveness, which is both statistically and economically significant.

[6] The six age categories are under 40, 40-49, 50-59, 60-69, 70-79, and 80 and over and the three age categories are under 50, 50-69 and 70 and older.
[7] The six tenure categories are less than 1 year, 1-5 years, 5-10, 10-15, 15-20, 20-30 and more than 30 years.

For gender diversity, I create three alternative measures: 1) percentage of women on the board, 2) indicator variable equal to 1 if the board has a female director and 0 otherwise, and 3) indicator variable equal to 1 if the board has multiple (more than 1) women on the board, and 0 otherwise. Regardless of the variable used in the analysis, the results are qualitatively the same. There is no evidence that gender diversity improves boards' effectiveness, other than for committed firms.

To test robustness of the rank diversity measure, I recreate the variable by collapsing the six original categories into three: c-level executive, non-executive upper management and lower-management/non-management. Using the blau measure of rank diversity with three categories instead of six generates very similar results and leads to the same inferences as the original analysis. The findings indicate that rank diversity is associated with better governance outcomes, and that such result is robust to alternative measurements of rank heterogeneity.

Finally, I examine the robustness of the findings regarding the impact of functional diversity on governance quality. The initial functional diversity construct was obtained by classifying each director's primary work experience into one of six functional areas, described in Appendix A. Since the Blau index is highly sensitive to the number of categories, the original classification is highly condensed and high-level to avoid creating a variable which is correlated with board size. However, in order to test the findings with a more fine classification of directors' functional experience, I recreate the variable three more times by expanding the number of function categories first into ten, fourteen and twenty. Though coefficients vary depending on the specification used, the direction of the coefficients and the statistical significance do not. In each instance, function diversity is not related to quality of governance outcomes in a statistically

meaningful way. The robustness tests indicate that initially reported findings are not driven by the nature of the variable measurement.

4.2 Alternative other measures

4.2.1 CEO turnover

CEO turnover is originally defined as 1 when CEO leaves the post and 0 otherwise, if the CEO turnover is listed as involuntary, or if the CEO is above the age of 60. This approach is widely used in studies to separate voluntary CEO involuntary CEO turnover from the voluntary departures. Some prior studies use 65 instead of 60 as the cut-off age after which a CEO departure is deemed as involuntary. In order to verify that my results are not driven by the choice of the cut-off age, I replicate the analyses in Tables 4. Table 10 shows results of the analysis with this new measure of forced CEO turnover.

Table 10

CEO performance-turnover sensitivity and board heterogeneity: CEO age 65 proxy

This table shows linear probability model with firm fixed effects regressions of CEO turnover on firm performance, governance characteristics, CEO characteristics and board hetergeneity. CEO age of 65 or under, rather than 60 or under as in prior tests, is used to proxy for involuntary turnover. All variables are as defined earlier. Number in parentheses are two-sides p-values. Significance is denoted by ***, **, and * for 1%, 5% and 10%, respectively.

	Dependent Variable = 1 if CEO replaced, 0 otherwise				Dependent Variable = 1 if CEO replaced, 0 otherwise			
	Demographic Heterogeneity				**Occupational Heterogeneity**			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Heterogeneity Index	Age Heterogeneity	Gender Heterogeneity	Ethnicity Heterogeneity	Heterogeneity Index	Tenure Heterogeneity	Rank Heterogeneity	Function Heterogeneity
CEO Turnover	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE
Returns	-0.018*	-0.019*	-0.019*	0.006	-0.019*	-0.021**	-0.017	-0.024**
	[0.075]	[0.061]	[0.072]	[0.796]	[0.057]	[0.038]	[0.106]	[0.027]
Heterogeneity	-0.007	0.017	-0.043	0.027	0.003	0.006	0.020	-0.046
	[0.695]	[0.935]	[0.459]	[0.827]	[0.929]	[0.822]	[0.713]	[0.428]
Returns * Heterogeneity	0.009	-0.096	0.011	0.108	-0.195***	-0.120***	-0.160**	-0.099
	[0.699]	[0.702]	[0.866]	[0.532]	[0.000]	[0.002]	[0.024]	[0.172]
Board_Independence	-0.092	-0.093	-0.088	-0.069	-0.098	-0.100	-0.094	-0.090
	[0.314]	[0.308]	[0.339]	[0.680]	[0.284]	[0.276]	[0.303]	[0.326]
Returns * Board_Indep	-0.297***	-0.297***	-0.297***	-0.323	-0.374***	-0.344***	-0.316***	-0.313***
	[0.009]	[0.009]	[0.009]	[0.292]	[0.001]	[0.003]	[0.006]	[0.006]
Board_Size	0.061	0.058	0.061	0.081	0.058	0.057	0.057	0.063*
	[0.107]	[0.128]	[0.106]	[0.255]	[0.143]	[0.144]	[0.134]	[0.098]
Inst_Ownership	-0.044	-0.044	-0.044	-0.027	-0.047	-0.047	-0.045	-0.044
	[0.162]	[0.164]	[0.164]	[0.708]	[0.140]	[0.138]	[0.160]	[0.164]
Year/Industry/Firm FE	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y
Number of Observations	7,856	7,856	7,856	2,938	7,856	7,856	7,856	7,856
(Pseudo) R-squared	0.097	0.097	0.097	0.119	0.099	0.099	0.098	0.098

Results of the analysis are very similar and the coefficients of performance-turnover sensitivity are significant at the same levels as originally reported. I use the new variable to verify robustness of the results in Tables 8 and 9, as well. Again, results are very similar to the original results, with coefficients significant at the same probability levels as originally reported.

4.2.2 Stock performance

To examine the possibility that turnover-performance sensitivity is sensitive to the choice of measure used for stock performance, I re-calculate the prior-year returns using raw returns and median industry (two-digit sic) returns, instead of the value-weighted index used in the original regressions. Results using the two alternative measures of returns are qualitatively the same and all heterogeneity variables are still significant at the same levels as originally reported. Table 11 reports results of the analysis done in Table 4, this time using the two alternative measures. Using raw returns or median industry-adjusted returns instead of value-weighted index-adjusted returns does not affect results in Table 4. Similar re-estimation is performed for Tables 8 and 9, and results are very similar to those reported originally.

4.3 Endogeneity concerns

Endogeneity is often considered a treat to results related to the impact of board composition on its effectiveness. The three types of endogeneity to consider include omitted variable bias, simultaneity and reverse causality. I use a three-step approach to mitigate endogeneity concerns. First, I examine heterogeneity in the context of specific tasks entrusted to the board: CEO replacement and compensation decisions. Hermalin and Weisbach (2003) argue that endogeneity is less of a concern when examining the role of board composition in the context of specific tasks. Therefore, instead of focusing on the role of board heterogeneity in the context of firm

Table 11

CEO performance-turnover sensitivity and board heterogeneity: alterantive stock performance measures

This table shows linear probability model with firm fixed effects regressions of CEO turnover on firm performance, governance characteristics, CEO characteristics and board hetergeneity. Alternative measures of stock returns are used: Panel A shows the regressional analysis using raw returns, while Panel B uses industry-adjusted returns. All variables are as defined earlier. Number in parentheses are two-sides p-values. Significance is denoted by ***, **, and * for 1%, 5% and 10%, respectively.

	Dependent Variable = 1 if CEO replaced, 0 otherwise				Dependent Variable = 1 if CEO replaced, 0 otherwise			
	Demographic Heterogeneity				**Occupational Heterogeneity**			
	(1) Heterogeneity Index	(2) Age Heterogeneity	(3) Gender Heterogeneity	(4) Ethnicity Heterogeneity	(1) Heterogeneity Index	(2) Tenure Heterogeneity	(3) Rank Heterogeneity	(4) Function Heterogeneity
CEO Turnover	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE
PANEL A - Raw Returns								
Returns	-0.022**	-0.023***	-0.022**	-0.019	-0.023***	-0.025***	-0.021**	-0.024***
	[0.013]	[0.007]	[0.012]	[0.337]	[0.006]	[0.003]	[0.015]	[0.007]
Heterogeneity	-0.013	-0.031	-0.037	0.043	0.020	0.028	0.009	-0.060
	[0.403]	[0.860]	[0.445]	[0.666]	[0.521]	[0.205]	[0.846]	[0.224]
Returns * Heterog.	0.017	-0.185	0.035	0.235**	-0.146***	-0.106***	-0.129**	-0.009
	[0.333]	[0.327]	[0.462]	[0.044]	[0.000]	[0.000]	[0.016]	[0.862]
Year/Industry/Firm FE	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y
# of Observations	7,856	7,856	7,856	2,938	7,856	7,856	7,856	7,856
(Pseudo) R-squared	0.067	0.067	0.067	0.091	0.069	0.069	0.067	0.067
PANEL B - Industry-Adjusted Returns								
Returns	-0.028***	-0.029***	-0.029***	-0.031	-0.029***	-0.031***	-0.026***	-0.031***
	[0.002]	[0.001]	[0.002]	[0.134]	[0.001]	[0.001]	[0.004]	[0.001]
Heterogeneity	-0.014	-0.032	-0.039	0.032	0.018	0.026	0.010	-0.061
	[0.382]	[0.852]	[0.423]	[0.751]	[0.554]	[0.230]	[0.836]	[0.217]
Returns * Heterog.	0.006	-0.017	-0.005	0.082	-0.165***	-0.103***	-0.170***	-0.048
	[0.754]	[0.941]	[0.928]	[0.583]	[0.000]	[0.003]	[0.007]	[0.459]
Year/Industry/Firm FE	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y
# of Observations	7,856	7,856	7,856	2,938	7,856	7,856	7,856	7,856
(Pseudo) R-squared	0.097	0.097	0.097	0.119	0.099	0.099	0.098	0.098

value or accounting performance, I focus my analysis on the three major tasks facing boards periodically.

The second way to deal with endogeneity is to employ research design to mitigate the risk of specific forms of endogeneity in each analysis. First type of endogeneity posing a threat to my results is time-invariant omitted variable bias. I mitigate the risk of such bias driving my results by utilizing firm-fixed effect approach in the analysis of CEO performance-turnover sensitivity. I am unable to use similar approach in the CEO compensation test as the composition of the compensation committee tends to be rather stable over the period examined in my study. Lack of variation in the compensation committee composition makes it difficult to employee firm fixed effect approach in the test of the role of compensation committee heterogeneity in awarding

excess compensation to the CEO. I address this issue using instrumental variable approach, discussed subsequently in this section.

The second type of endogeneity, which could pose a threat to the validity of the results, is reverse causality. Fortunately, this type of endogeneity is not likely to be a concern in this setting due to the timing of variable measurement. In each one of my tests, the composition of the board is measured prior to the board's undertaking of the task in question. Hence, the task outcome cannot be the determinant of board's composition in any of the tests.

The third type of endogeneity is simultaneity. Similar to time-invariant omitted variable bias, simultaneity resulting from firm-specific factors, which do not vary over the time of the sample period, affecting board composition and its effectiveness simultaneously is mitigated through firm-fixed effect specification.

To the extent that endogeneity is caused by factors within the firm which vary over the sample period, endogeneity may still pose a credible threat to the results. In order to address some of the concerns resulting from time-variant omitted variables, I re-estimate results using instrumental variable approach discussed below.

4.3.1 Instrumental variable analysis

The third approach to mitigating the risk to result validity stemming from endogeneity is to re-estimate the results using two-stage instrumental variable approach. Finding good instruments in this setting poses a credible challenge. Informed by the argument in Zald (1969), who argues that the location of organization determines board composition due to the available director supply, I use local demographics in the zip code of a firm's headquarters as instruments for its board composition. Using local demographics to instrument for board composition is also consistent with the resource dependency view of the board: the board serves as a way of

connecting the firm with the resources it needs to operate effectively (Pfeffer, 1973; Pfeffer and Salancik, 1978). To the extent that the board needs to understand the local environment, a firm's choice of director should be representative of the locality in which it operates. Local demographic structure has been used previously as an instrument in a related setting. Becker et al. (2010), for example, use local demographics as an instrument in examining the impact of large shareholders on corporate performance.

I use various variables or mix of such variables capturing local demographics and geography (such as number of business establishments, concentration of businesses per population, ratio of water to the land area, median household size, median female per household, female per employee ratio, ratio of household size to number of businesses, population density, etc.) to instrument for the board or committee heterogeneity dimension examined. Throughout the analysis, I ensure that the instruments selected are valid and relevant. Specifically, I test for weak instruments and instrument relevance, over-identification and joint significance. I have no ex-ante reason to believe that any of the instruments selected fails the instrument exogeneity criteria.

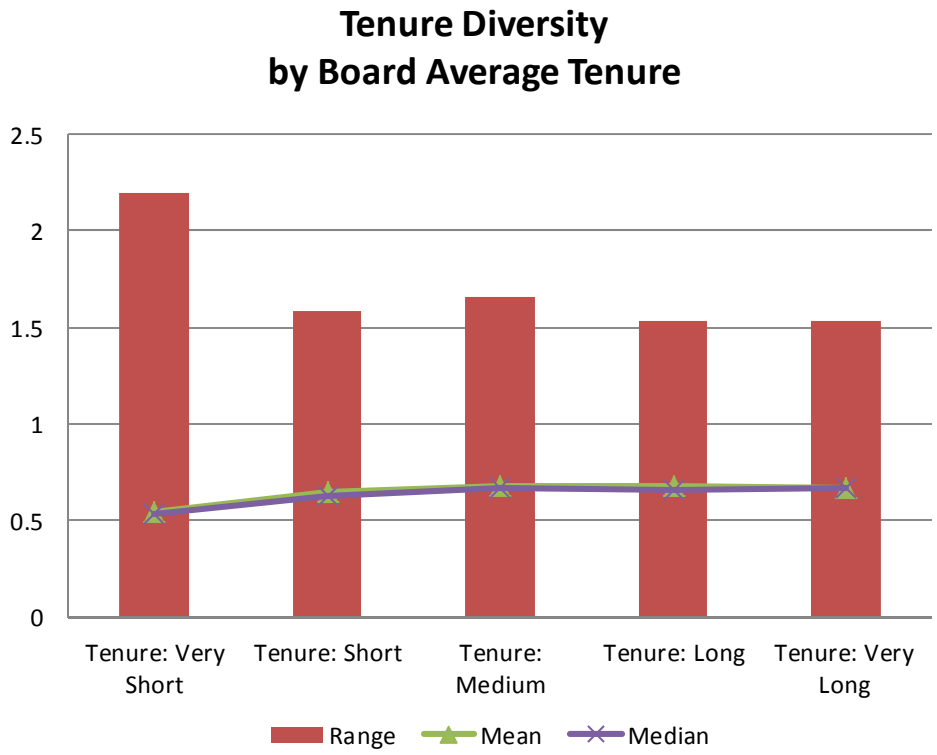
Using the two-stage instrumental variable approach, I re-estimate my analyses. All the dimensions of heterogeneity previously found to be significant determinants of board effectiveness continue to be significant at the similar levels as previously documented. In addition, gender seems to be more significant determinants of board's ability to compensate the CEO appropriately after taking into account the types of endogeneity not addressed in the CEO compensation analysis (p-value of 0.06). I take these results to indicate that my analyses are robust to the main types of endogeneity that could threaten the findings in this setting.

4.4 Additional analysis of tenure

One of the potential concerns for strong findings on tenure heterogeneity is that the results are driven by a subset of firms with recent turnover. This could indicate that managements shake-ups were preceded by director changes. This scenario could manifest itself in high tenure heterogeneity and subsequent CEO turnover, both due to performance. Said alternatively, CEO performance-sensitivity and board performance-sensitivity could be determined jointly or with a short time-lag (director ousting first, CEO subsequent). To ensure that results on tenure heterogeneity are not driven by recent director changes, I split the sample into two: boards with above-median average tenure and boards with below-median average tenure. I re-estimate the Tables 4 and 5 for the two samples separately. The results are virtually indistinguishable (Chow-test 0.83, p-value 0.365).

I also examine whether high tenure heterogeneity is concentrated in a subset of boards with short or long average tenure. Finding that tenure heterogeneity is associated with average tenure length could yield a different interpretation for the results. That does not seem to be the case, however. There is a low correlation between tenure heterogeneity and average tenure length on a board (0.133), and mean and median tenure heterogeneity is very similar across five categories of average board tenure length: very short, short, medium, long and very long. Figure 2 presents tenure heterogeneity distribution (min/max) and median and mean values in each category. Though the subset of firms with very low average director tenure has the greatest range of tenure heterogeneity, the mean and median is very comparable across all five categories.

Figure 3



To examine this further, I eliminate all boards from the sample with any director turnover in the prior year. This ensures that only relatively stable boards are considered in the analysis and eliminates the possibility that tenure heterogeneity is strongly associated with performance-turnover sensitivity because it captures recent director turnover followed by CEO removal. Removing all the boards with some director changes in the prior year leaves a sample of 2,510 firm-years. Even with the limited sample, the results are similar to those reported in the original analysis. The coefficient of interest is quantitatively similar and significant at the 10% level (p-value 0.056). Table 12 presents results of this additional analysis.

Table 12

CEO performance-turnover sensitivity and board heterogeneity: only firms without board changes in the past year

This table shows logistic model of CEO turnover on firm performance, governance characteristics, CEO characteristics and board hetergeneity. The sample is liimted to only firms without board changes in the prior year. All the variables are as defined earlier and included in the regression, but not shown for brevity. Number in parentheses are two-sides p-values. Significance is denoted by ***, **, and * for 1%, 5% and 10%, respectively. Marginal effects of heterogeneity for the logit specification are calculated using Norton Wang Ai (2004) method.

	Dependent Variable = 1 if CEO replaced, 0 otherwise
	Tenure Heterogeneity (Boards w/o prior year turnover)
CEO Turnover	Logit
Returns	-0.880**
	[0.013]
Heterogeneity	-0.021
	[0.962]
Returns * Heterogeneity	-0.140*
	[0.056]
Board_Independence	1.302
	[0.265]
Returns * Board_Indep	-2.696
	[0.259]
Board_Size	-0.076
	[0.886]
Institutional_Ownership	0.271
	[0.584]
Constant	0.637
	[0.694]
Year/Industry/Firm FE	Y/Y/N
Number of Observations	2,510
(Pseudo) R-squared	0.0887

4.5 Full-interaction analysis

Following the approach in Li and Srinivasan (2011), I interact all of the control variables in the CEO turnover analysis with stock performance. This approach eliminates any portion of the CEO performance-sensitivity which is attributable to other governance or firm characteristics, rather than to heterogeneity. The results using the full set of interaction variables are very similar, as shown in Table 13. Occupational heterogeneity is still significant at the 1%, as is the tenure heterogeneity. The only difference is that rank heterogeneity becomes significant at the 10% level (p-value 0.072) rather than the 5% significant level originally reported.

Table 13

CEO performance-turnover sensitivity and board heterogeneity

This table shows linear probability model with firm fixed effects regressions of CEO turnover on firm performance, governance characteristics, CEO characteristics and board hetergeneity. All control variables included in Table 4 are included here as well. In addition, each control variable is interacted with stock performance. Only governance variables, alone and interacted, are shown for brevity. Number in parentheses are two-sides p-values. Significance is denoted by ***, **, and * for 1%, 5% and 10%, respectively.

	Dependent Variable = 1 if CEO replaced, 0 otherwise				Dependent Variable = 1 if CEO replaced, 0 otherwise			
	Demographic Heterogeneity				**Occupational Heterogeneity**			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Heterogeneity Index	Age Heterogeneity	Gender Heterogeneity	Ethnicity Heterogeneity	Heterogeneity Index	Tenure Heterogeneity	Rank Heterogeneity	Function Heterogeneity
CEO Turnover	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE	LPM FFE
Returns	-0.046***	-0.046***	-0.047***	-0.084**	-0.047***	-0.047***	-0.045***	-0.048***
	[0.002]	[0.002]	[0.002]	[0.015]	[0.002]	[0.002]	[0.003]	[0.002]
Heterogeneity	-0.003	0.041	-0.033	0.060	0.017	0.026	0.011	-0.077
	[0.847]	[0.822]	[0.516]	[0.557]	[0.605]	[0.247]	[0.819]	[0.137]
Returns * Heterog.	-0.008	0.043	-0.060	0.023	-0.164***	-0.114***	-0.120*	-0.042
	[0.721]	[0.851]	[0.343]	[0.889]	[0.001]	[0.002]	[0.072]	[0.520]
Board_Independence	-0.020	-0.020	-0.015	-0.160	-0.027	-0.028	-0.022	-0.016
	[0.803]	[0.807]	[0.853]	[0.260]	[0.735]	[0.730]	[0.781]	[0.843]
Returns * Board_Indep	-0.231**	-0.230**	-0.223**	-0.084	-0.295***	-0.272**	-0.250**	-0.239**
	[0.029]	[0.030]	[0.035]	[0.760]	[0.006]	[0.011]	[0.018]	[0.024]
Board_Size	0.038	0.035	0.038	0.022	0.032	0.026	0.036	0.043
	[0.269]	[0.305]	[0.257]	[0.714]	[0.374]	[0.456]	[0.292]	[0.204]
Returns * Board_Size	0.026	0.022	0.031	0.067	0.056	0.044	0.034	0.024
	[0.571]	[0.626]	[0.498]	[0.535]	[0.221]	[0.327]	[0.446]	[0.587]
Institutional_Owners.	-0.000	-0.000	-0.000	-0.001**	-0.000	-0.000	-0.000	-0.000
	[0.493]	[0.502]	[0.483]	[0.033]	[0.541]	[0.532]	[0.509]	[0.528]
Returns * Inst Own.	-0.000	-0.000	-0.000	0.000	-0.000	-0.000	-0.000	-0.000
	[0.772]	[0.764]	[0.752]	[0.778]	[0.697]	[0.630]	[0.866]	[0.735]
Constant	0.051***	0.052***	0.051***	0.087***	0.051***	0.051***	0.052***	0.048***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Year/Industry/Firm FE	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y	Y/-/Y
# of Observations	7,856	7,856	7,856	2,938	7,856	7,856	7,856	7,856
(Pseudo) R-squared	0.073	0.073	0.073	0.099	0.075	0.075	0.074	0.073

CHAPTER 5

CONCLUSION

The results of this study are consistent with the assertion that diversity affects boards' effectiveness. Overall, heterogeneous boards are more effective at completing major tasks than homogeneous boards. The source of the effectiveness is occupational heterogeneity. Among the sources of diversity, tenure and rank seem to be more important than age, gender, or race. Tenure heterogeneity has the strongest effect on boards' effectiveness, suggesting that true independence may be best achieved through a mix of old and new perspectives.

This study has implications for firms and standard-setters alike. It suggests that board diversity can be beneficial, but it should not be viewed as a one-size-fits-all approach. While the study does not provide any evidence that diversity has negative consequences on boards' effectiveness, it does suggest that the "advertised" benefits may be more limited in scope than previously believed, if not implemented correctly. It challenges the notion that the observed director heterogeneity unconditionally improves firm performance, and suggests that perspective renewal (through tenure heterogeneity) may be a productive avenue for introducing meaningful board diversity.

The broader implication of the results is that while opinion diversity, which can come in many forms, improves boards' effectiveness, its positive impact may be limited to the group of firms willing and able to take it seriously. This finding has implications for governance-related debates putting pressure on firms to comply with the expanding list of best practices. It provides some support for assertions that regulatory-imposed board structures may not be more effective than those that are endogenously-chosen (Weisbach, 1988) and that governance regulations

resulting in “window-dressing” behavior by firms will be ineffective (Westphal and Zajac, 1998). While this study provides no evidence that diversity is value-destructive, even when adopted due to external pressures, it does suggest that the benefits of diversity can be derived only if diversity policies are implemented for the right reasons.

Appendix A

Panel A: Variable Definition - Heterogeneity Variables

Heterogeneity	Definition	Source of Data
Age Heterogeneity	Coefficient of variation (standard diviation / mean) of director's age for the board$_i$, during period t.	*BoardEx*
Gender Heterogeneity	Blau index of diversity (see below), where the two categories are male and female.	*BoardEx*
Ethnic Heterogeneity	Blau index of diversity (see below), where the four categories are Caucasian, African-American, Hispanic and Asian & Other.	*Risk Metrics, hand collection;*
Tenure Heterogeneity	Coefficient of variation (standard diviation / mean) of director's tenure for the board$_i$, during period t.	*BoardEx*
Rank Heterogeneity	Blau index of diversity (see below), where the six categories are 1) CEO, 2) Other C-suit executives, 3) Upper management, 4) Mid-management, 5) Lower management and 6) Non-management	*BoardEx; Proxy statements; Internet search*
Function Heterogeneity	Blau index of diversity (see below) where the six functional categories are: 1) Accounting and Finance 2) Legal, Compliance, Regulatory and Risk Managemenet 3) Sales, Customer Service and Marketing 4) Operations, Strategy, Strategy Consulting and Management 5) Science, Technology, Engineering, Manufacturing, and R&D 6) All Other	*BoardEx; Proxy statements; Internet search;*
Heterogeneity Index	Each individual measure is scaled by the sample median to make the measures comparable and ensure that each construct is equally represented in the aggregate measure. The standardized measures available for each firm are averaged to create the heterogeneity index.	*BoardEx; Proxy statements; Internet search*

Panel B: Example

Blau Index $1 - \sum_{i=1}^{s} p_i^2$ where p is proportion of directors in category i and s is the number of categories

Company Name	Directors	Age	Gender	Tenure	Position	Ethnicity	Experience
Affiliated Comp Svcs	Joseph O'Neill	63	M	9.6	CEO	Caucasian	Ops, Strategy & Mgmt
	Dennis McCuistion	67	M	0.8	Other C-Suit Exec	Caucasian	All Other
	Darwin Deason	70	M	16.2	CEO	Caucasian	Science, Technology, etc
	Frank Rossi	72	M	9.6	Other C-Suit Exec	Caucasian	Accounting and Finance
	J Kosberg	73	M	3.8	CEO	Caucasian	Ops, Strategy & Mgmt

Age Heterogeneity - Coefficient of Variation (CV): Standard Deviation / Mean= 4.06/69 =0.06	[Sample median is 0.105]
Gender Heterogeneity - Blau Index: 1 - $((0/5)^2+(5/5)^2) = 0$	[Sample median is 0.198]
Ethnic Heterogeneity - Blau Index: 1 - $((0/5)^2+(5/5)^2+(0/5)^2+(0/5)^2) = 0$	[Sample median is 0.165]
Demographic Heterogeneity Index: (Age Htrg/Sample Median + Gender Htrg/Sample Median + Ethnic Htrg/Sample Median)/3 =	0.190
Tenure Heterogeneity - Coefficient of Variation (CV): Standard Deviation / Mean = 5.96/8 = 0.744	[Sample median is 0.638]
Rank Heterogeneity - Blau Index: 1 - $((3/5)^2 + (2/5)^{2+} (0/5)^{2+} (0/5)^{2+} (0/5)^{2+} (0/5)^2) = 0.48$	[Sample median is 0.541]
Function Heterogeneity - Blau Index: 1 -$((2/5)^2+(1/5)^2+(1/5)^2+(1/5)^2+(0/5)^{2+}(0/5)^2)$ = 0.76	[Sample median is 0.611]
Occupational Heterogeneity Index: (Tenure Htrg/Sample Median + Rank Htrg/Sample Median + Function Htrg/Sample Median)/3 =	1.099

Affiliated Computer Services board is demographically less diverse and occupationally more diverse relative to a median board in the sample.

Appendix B
Variable Definition - Other Variables

Dependent Variables	Definition	Source of Data
CEO Turnover	Indicator variable equal to 1 if CEO is replaced in year t, 0 otherwise. The departures classified as "retirements" where CEO is above the age of 60 are not considered CEO replacements.	*ExecuComp*
Excess_Comp	Residuals from regression of total compensation (see specification description in table 4) on the hypothesized determinants of CEO pay.	*N/A*
Excess_Comp_Dummy	Indicator variable equal to 1 for observations where the residual (defined above) is greater than 0 (when some excess compensation is awarded), and 0 otherwise.	*N/A*
Market_Value_Improve	Indicator variable equal to 1 for observations where the % change in market value, measured from the end of period t-1 to end of the period t+1 (where t= year of CEO turnover) is in the top quartile of all firms undergoing CEO transition, and 0 otherwise.	*CRSP*
Control Variables	**Definition**	
Stock Returns	Market-adjusted (CRSP value-weigted) returns for year t-1, compounded monthly.	*CRSP*
Firm Size	Natural log of total assets in year t.	*Compustat*
Log(Sales)	Natural log of total revenue in year t.	*Compustat*
Book to Market	Ratio of book value (total assets - total liabilities) to market value of equity in year t.	*Compustat*
ROA	Net income excluding extraordinary items divided by average total assets in period t.	*Compustat*
Leverage	Sum of long and short-term debt divided by average total assets in year t.	*Compustat*
ROA Volatility	Standard deviation of annual ROA over the three year period preceeding year t.	*Compustat*
Stock Volatility	Standard deviation of monthly stock returns over three years prior to t.	*CRSP*
Market Value	Market value of equity at the end of the period t.	*Compustat*
CEO Age	Age of the CEO at the end of the period t.	*ExecuComp*
CEO Gender	Indicator variable equal to 1 if CEO is female, 0 otherwise.	*ExecuComp*
CEO Tenure	Number of years, measured at the end of year t, that the CEO has been at the position.	*ExecuComp*
CEO's Pay Slice	% of Total compensation paid to the top five earners claimed by the CEO.	*ExecuComp*
CEO Duality	Indicator variable equal to 1 if CEO is also company's Chairman, 0 otherwise.	*ExecuComp*
Institutional Ownership	Percentage of float shares held by the institutional investors in year t.	*Thomson Financial*
Board Size	Natural log of the number of directors on the board at the end of period t.	*BoardEx*
Board Independence	Percentage of the board directors considered unaffiliated in year t.	*BoardEx*
# of Geo. Segments	Number of reporting geographic segments measured in year t.	*Compustat*

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