Board Diversity and Firm Performance Volatility*

Mariassunta Giannetti
Stockholm School of Economics, CEPR and ECGI

Mengxin Zhao
University of Alberta

December 2015

Diverse directors may have diverse preferences over firms' policies or even objectives. As shown by Arrow (1951), diverse individual preferences may fail to univocally aggregate in collective preferences and may consequently lead to arbitrary and volatile decisions. Using the board of directors as a laboratory, we test whether diversity leads to higher performance volatility. We show that firms with more diverse boards have greater stock return and fundamental volatility suggesting that board diversity indeed makes decision-making more erratic. Also, firms with diverse boards have less persistent strategies and analysts make larger forecast errors in predicting their performance supporting the conjecture that board members' diverse preferences lead to arbitrary and hard to predict decisions. Consistent with the presence of conflicts in the boardroom, we find that executive and director turnovers are higher in firms with diverse boards. These firms also have more board meetings. We find no evidence that our results may be driven by firm risk-taking or complexity.
Keywords: Board; Diversity; Volatility

* Contact information: Mariassunta Giannetti, Department of Finance, Stockholm School of Economics, PO Box 6501, Sveavagen 65, S 11 383 Stockholm, Sweden, email: Mariassunta.Giannetti@hhs.se; Mengxin Zhao, Department of Finance and Statistical Analysis, School of Business University of Alberta, Edmonton, Alberta, Canada T6G, email: mengxin.zhao@ualberta.ca. We thank Ron Masulis, David McLean and participants at the Ackerman Conference on Corporate Governance at Bar Ilan University, the University of Lancaster, and the Hong Kong Baptist University. Giannetti acknowledges financial support from the Tom Hedelius and Jan Wallander Foundation.

The board of directors is entrusted with crucial economic decisions. The quality of decision-making is likely to depend as much on skills, reputation and other characteristics of the directors as on the interaction between the directors. However, while a growing literature explores the effects of director characteristics on firm outcomes, existing theoretical and empirical research has largely neglected that interaction between board members with different characteristics may also matter. This is unsurprising because researchers generally do not observe what occurs within the boardroom and other interactions between directors.[1]

This paper uses an "indirect" approach to overcome data limitations and to explore how director interaction in the boardroom affects corporate decision-making. We rely on the conclusions of social psychology studies (Page, 2007) showing that individuals with different cultures, educations and experiences tend to have different preferences, perspectives, and beliefs. We then explore how board diversity affects firm performance volatility to infer its effect on the decision-making process.

Social psychology studies highlight that the interaction between individuals with diverse perspectives may affect the decision process in different ways. Diverse individuals may find more and better solutions to complex problems and enhance firm performance. By using different predictive models, they may also make more accurate forecasts. In addition, as several studies of group decision-making suggest, it takes more effort for a larger group to reach consensus, and thus the final decisions of larger groups reflect more compromises and are less extreme than those of smaller groups (Sah and Stiglitz, 1986, 1991; Adams and Ferreira, 2010). Diversity, by increasing the range of

[1] A notable exception is Schwartz-Ziv and Weisbach (2013), who analyze the minutes of boards of eleven business companies.

perspectives, may reinforce the effects of group size. Thus, we could expect that board diversity not only improves firm performance, but also decreases the volatility of performance.

However, diverse individuals also have different preferences and values that may frustrate the decision-making process. Not only might diverse directors have troubles communicating and getting along, but they may also disagree on what the pressing problems of the firm are, and on which policies optimize the firm's objectives. Under these circumstances, as highlighted by Arrow (1951), individuals have incentives to misrepresent their preferences and manipulate the agenda. As a consequence, the voting results of rational individuals may be arbitrary and unpredictable.[2] Instead of leading to less extreme decisions, differences in preferences between directors could create conflicts within the boardroom, decrease the directors' effort and engagement, and lead to unpredictable decisions. Thus, if these effects prevail, the performance of firms with diverse boards may be highly variable.

Whether board, and in general group, diversity increases or decreases performance volatility is ultimately an empirical question that we address in this paper. We measure board diversity along a number of dimensions (including ethnic diversity, gender diversity, age diversity, diversity in directors' industry experience, and education diversity) and show that firms with more diverse boards have greater stock return and fundamental volatility, suggesting that board diversity makes decision-making more erratic. Consistent with this conjecture, we find that the strategies of firms with diverse boards are less persistent over time and conform less with those of the industry peers. We

[2] Page (2007, Ch. 10) describes the problems that may arise in the aggregation of preferences of diverse groups.

also find that executive turnover and director turnover are higher in firms with diverse boards. In these firms, turnover appears largely unrelated to firm performance indicating that there may be conflicts in the boardroom. Firms with diverse boards also have more board meetings suggesting difficulties in the decision making process. Finally, analysts make larger forecast errors in predicting the performance of firms with diverse boards supporting the conjecture that the diverse preferences of board members lead to arbitrary and hard to predict decisions.

There is no evidence that our findings may be driven by higher complexity or opacity of firms with diverse boards, as the dispersion of analyst forecasts does not depend on board diversity. We also find no evidence that firms with diverse boards take more risk, as these firms do not have higher leverage, do not invest more, and do not make more acquisitions.

To go beyond the association between volatility and board diversity and provide evidence consistent with a causal interpretation of the empirical evidence, we concentrate on variation in the diversity of the directors' ancestral origins. Even though ethnic diversity is only one of the many features of a diverse board, focusing on this aspect may help us to mitigate endogeneity problems for two reasons. First, while the directors' skills are likely to be optimally selected depending on a firm's challenges and investment opportunities, the ethnic composition of the board is likely to reflect the ethnic composition of the location where the firms' headquarters are located, as board of directors are largely selected locally and the headquarters' locations are chosen early on in firms' lifecycles (Knyazeva, Knyazeva, and Masulis (2013)). Thus, concentrating on ethnic diversity allows us to focus on a dimension of board composition that is less likely

to be the primary driver of the decision to hire the director, but rather depends on the local supply of potential directors. Second, since directors' ethnicities appear to reflect the composition of the population in the MSA where a firm is headquartered, for this dimension of diversity, we are able to construct instruments for board composition based on the geographical location of a firm's headquarters.

Our finding that board diversity is positively associated with firm performance volatility is confirmed if we exploit only variation in board diversity across MSAs, due to different composition of the MSA population. Importantly, our results hold also if we use orthogonal variation in board diversity within MSAs, indicating that differences in firm characteristics across MSAs cannot drive our findings.

Our paper is related to several strands of literature. First, we contribute to a growing literature exploring the effects of board expertise and structure on performance (e.g., Coles, Daniel, and Naveen (2008), Klein (1998), Field, Lowry, and Mkrtchyan (2013)). Adams, Hermalin, and Weisbach (2010) provide a recent survey of this literature. Different from earlier literature, we focus on differences between board members rather than on their expertise.

Our findings help to rationalize the ambiguous empirical evidence on the effect of board diversity on firm performance. A number of papers find either no or a negative effect of gender diversity on performance without considering that board diversity can increase performance volatility (e.g., Ahern and Dittmar (2012); Adams and Ferreira (2009)). Results are similarly mixed and puzzling in studies that explore other dimensions of diversity, such as industry experience.[3] Our results indicate that the

[3] See, for instance, Cole, Daniel, and Naveen (2015), Adams, Akyol, and Verwijmeren (2013), Anderson, Reeb, Upadhyay, and Zhao (2011) and Knyazeva, Knyazeva and Raheja (2009).

inconclusive empirical evidence depends on the fact that board diversity increases firm volatility.

Second, we contribute to the understanding of group decision-making. Existing empirical studies have shown that groups seem to take less extreme decisions and to make more precise forecasts than individuals. For instance, Barber, Heath and Odean (2003) show that groups of investors make more reasonable choices than individual investors when trading. Adams and Ferreira (2010) show that groups of bettors make more precise forecasts of ice break-up dates than individual bettors. Firms with executive teams that are most likely to make decisions as a group appear to have less volatile performance than firms with a powerful CEO who makes decisions in autonomy (Adams, Almeida and Ferreira, 2005). Similarly, large boards are associated with lower firm performance volatility, arguably because, having to make compromises, large groups make less extreme decisions (Cheng, 2008). None of these studies consider how the diversity of the members of a group affects group decision-making.

Third, our work is related to a growing body of evidence documenting the effect of diversity (and cultural diversity in particular) on economic outcomes. A number of existing influential studies have explored the effects of ethnic diversity on cities' macroeconomic outcomes (Alesina and La Ferrara, 2005). Ethno-linguistic diversity has also been shown to lead to more diverse opinions and trading (Chang, Hong, Tiedens, Zhao, 2013). To the best of our knowledge, however, there exists no micro-econometric evidence on how diversity, and ethnic diversity in particular, affects interaction in small groups and firm decision processes. In turn, this is important not only for our

understanding of corporate governance, but also to provide a micro-foundation to studies showing the effect of ethnic diversity on macroeconomic outcomes.

A related line of research focuses on cultural differences. Giannetti and Yafeh (2012) show that the bigger the cultural differences between the country of the syndicate's lead bank and the country of the borrower, the less favorable are the loan terms for the borrower. Siegel, Licht, Schwartz (2011) explore the effects of national cultural differences on international investment. Ahern, Daminelli and Fracassi (2014) document that national cultural differences decrease the frequency of international mergers and mergers gains. While most of the existing literature explores national cultural differences, we infer individual culture from the directors' background.

Finally, our paper helps to understand the determinants' of stock idiosyncratic volatility. Idiosyncratic stock-return volatility is a large component of stock total volatility (Morck, Yeung, and Yu, 2000; Campbell, Lettau, and Xu, 2001), which may be affected by corporate policies and characteristics. Existing studies have stressed the role of competition and uncertainty about managerial characteristics (Irvine and Pontiff, 2006; Pan, Wang and Weisbach, 2015). We highlight the role of board decision-making in increasing firm performance volatility.

1. Board Diversity and Firm Performance Volatility

Existing studies of group decision-making highlight the role of differences in beliefs and perspectives (cognitive models). Under these conditions groups make more precise forecasts than individuals. Sah and Stiglitz (1986, 1991) show in a formal model that, because group members may disagree, group decision-making entails a

diversification-of-opinions effect. The final group decision is a compromise, which reflects the different opinions of the group members. In this context, larger groups having to compromise may not only lead to more precise forecasts, but also to less extreme corporate policies. These theories predict that large and possibly diverse groups should decrease corporate volatility.

Existing literature on group decision-making has neglected that diverse individuals may have different preferences and values. However, preference diversity is often considered crucial to obtain other types of diversity in knowledge, education, experiences, etc. (Page, 2007). Individuals are believed to differ in how they represent and interpret different situations and look for different solutions precisely because they have different preferences.

While different preferences and beliefs can be neglected when groups have to make quantitative forecasts (like, for instance, the ice break-up dates in Adams and Ferreira (2010)), they may have a large impact on the relation between diversity and firm performance volatility when groups have to coordinate on more complex, multi-faceted decisions, such as corporate strategies.

In this case, not only diverse individuals may have troubles in communicating and getting along, but even more importantly, as highlighted in the seminal work of Arrow (1951), diverse individual preferences may fail to aggregate into collective preferences. This result is stated in the Arrow's Impossibility Theorem. Failure to aggregate individual preferences in an univocal way is more likely to arise if preferences are more diverse (and are not single-peaked over an unique continuous variable of choice). In this case, the Arrow's impossibility theorem implies that preferences are not independent of

irrelevant alternatives. Thus, members of the group can introduce new alternatives and manipulate outcomes.

For all these reasons, we should not expect a diverse group of individuals to behave with the same kind of coherence that we may hope from an individual, thus reverting Sah and Stiglitz' result. In particular, board decisions will depend on the dynamics of discussions.

The implications of Arrow's impossibility theorem for board decision-making hinge upon differences in directors' preferences. Different directors may care to a different extent about firms' different stakeholders (e.g., long-term shareholders, short-term shareholders, debt-holders, the environment, the local community, the workers, etc.). Even if all directors aim to maximize the firm's long-term value, they may have different preferences over corporate policies to implement to achieve this objective. In all these cases, board discussions aiming to aggregate directors' preferences may lead to unpredictable outcomes and increase corporate volatility. In what follows, we test the empirical relevance of this effect.

2. Data Sources and Sample Construction

2.1 The director sample

Our director data are from the Corporate Library's Board Analyst, commercialized by the GMI Ratings Company. This database provides annual corporate governance information on over 3,000 US companies starting from 2001. Coverage is increasing over time with only S&P1,500 companies being covered at the beginning of the sample period and all Russell 3,000 companies being included starting from 2006.

From Board Analyst, we extract data on director names, age, tenure, other directorships, board size, board independence, whether the CEO is also the founder of the company, and gender up to 2012. Thus, our final sample period is 2001-2012. As is common practice, we exclude firms in financial industries with SIC code in the 6000s.

We complement Board Analyst with information on stock prices and returns from CRSP and financial statements from COMPUSTAT. In some tests, we merge our main dataset with information on analyst forecasts from IBES, executive turnover from EXECUCOMP, director turnover from Board Analyst, and firms' patents from the NBER patent database.

Our final dataset covers an unbalanced sample of 3,056 firms for a total of 13,104 firm-year observations. At the director level, we have information on 33,706 unique directors for a total number of 309,324 director-year observations.

2.2 Measuring Board Diversity

Individuals, and board directors in particular, may differ along a number of dimensions. Education, experiences, ethnicities and gender may all affect directors' beliefs, perspectives and preferences.

Below, we discuss in turn why we expect different types of diversity to matter and introduce the proxies we use in the empirical analysis. The final measure of board diversity that we use in the paper is obtained as the first principal component of the different dimensions of diversity described below.

2.2.1 Ethnicity or Ancestry

Arguably, differences in preferences and values between board members are more directly captured by ethnic diversity. A number of recent papers show that culture has a

large component of intergenerational transmission and that the attitudes of individuals are shaped by the attitudes of the parents (Algan, and Cahuc, 2010; Fernandez, 2011; Dohmen, Falk, Huffman, and Sunde, 2012). For instance, Alesina, Giuliano, and Nunn (2013) show that an individual's deeply held values, such as the role of women in society, are related to the form of agriculture practiced in the ancestral country in the pre-industrial period.[4] Ancestry has also been shown to affect the culture of immigrants to the US after several generations (e.g., Guiso, Sapienza and Zingales, 2006).

Since culture is related to beliefs, preferences and decision-making heuristics, individuals with different ancestries are likely to have different perspectives, values, and preferences, which may be reflected in their contributions to the board. Importantly, ancestry can be categorized using a practice, consolidated among demographers, geographers and geneticists (Mateos, 2014), but also used by economists (see, for instance, Pan, Siegel and Wang, 2014), of establishing ethnicity (ancestry) through names.[5]

Social norms and customs affecting naming conventions reflect culture and should be related to an individual's culture, precisely because culture is transmitted between generations. Therefore, we classify the full names of directors in our sample using an algorithm provided by geographers of the University College of London,

[4] When plough agriculture is practiced, men have an advantage in farming. Societies in which the soil made optimal plough agriculture, and the resulting gender-based division of labor, developed beliefs that the natural place of women is within home. Interestingly, plough use in the area of ancestral origin is still related to views on gender roles and actual labor force participation among the descendants of immigrants in the U.S. and in Europe.

[5] Research in demography, health, and genetics makes increasing use of names to classify populations and establish their hereditary characters and group identities. The US government has been a key player in the use of this approach to population classification. It commissioned such an analysis in the first decades of the twentieth century to inform migration policies and later on to ascribe ethnicity in the resident populations. The Census Bureau has been involved in the development and validation of these techniques over several decades, lending official support to the use of this method.

Onomap. Onomap provides a global classification of first names and last names into categories of cultural, ethnic, and linguistic origin. Such classification has been subject to extensive valuations and has been applied in published work in a variety of fields, including history, linguistic, geography, and population genetics.

Onomap relies on a very extensive database of 300 million people's names from 26 countries in four continents, assembled from publicly available telephone directories and electoral services for a project developed at the University College of London. It builds on earlier efforts to use names, and last names in particular, to classify the population ethnic origin, and it follows the same method of the Dictionary of American Family Names to classify names. However, differently from the latter and other classifications that rely only on last names, Onomap exploits the patterns of cross-occurrences between forenames and surnames to establish ethnicity. This advancement has been possible through the recent availability of digital registers containing almost the entire populations, including full first and last names. For this reason, Onomap can be considered superior to the name classifications used in previous studies in economics (e.g., Kerr, 2008).

The algorithm allows us to classify the directors' full names in several categories. It provides the likely geographical area of origin of the directors' names. The areas of origin are classified as Africa, Americas, British Isles, Central Asia, Central Europe, Diasporic, East Asia, Eastern Europe, Middle East, Northern Europe, South Asia, and Southern Europe.

The algorithm provides alternative classifications, which include the ethnic group (including the following categories: White-British, White-Irish, White-Any Other White

Background, Asian or Asian British-Indian, Asian or Asian British-Pakistani, Asian or Asian British-Bangladeshi, Asian or Asian British-Any other, Black or Black British-Caribbean, Black or Black British-African, Other Ethnic Group-Chinese, Other Ethnic Group-Any Other Ethnic Group) or the religious origin (Bhuddist, Christian, Hindu, Jewish, Muslim, Sikh) that are most likely to be associated with a name.[6]

Table 1 describes the ancestral origins of the 33,706 directors represented in our sample firms starting from 2001 to 2011. Panel A classifies the directors' names based on the geographic area of origin of the ancestors. An overwhelming majority of the directors has British origins, as almost 80% of the directors' names are associated to ancestors from the British Isles, a proportion much larger than the U.S. population with ancestors from these areas. This group is followed by individuals of European origin, predominantly Central Europe, followed by Southern Europe, and, to a much lower extent, Eastern Europe and Northern Europe. A number of other directors are of diasporic origin, indicating that they are Jewish, and from East Asia.

Panel B and C provide an analogous description of the directors' ethnic group and the religion of the ancestors. White individuals and individuals of Christian origins followed by Jewish appear to hold most board seats in listed companies.

Based on the above alternative categories and existing literature (Alesina and La Ferrara, 2005), we define measures of board ethnic diversity capturing the probability that two randomly selected directors belong to two different groups for geographical area of origin, ethnic group or religion using an Herfindahl-based index as follows:

$$Diversity_{f,t} = 1 - \sum_{1}^{n} s_{i,f,t}^{2},$$

[6] If a name cannot be reliably classified, it is applied to the category unclassified and we ignore it for the purpose of building our indexes of diversity which we describe below.

where $s_{i,f,t}$ is the share of board members of group *i* among all board members of firm *f* at time *t*.

Panel A of Table 2 provides indexes of board diversity in terms of the directors' ancestral geographical origin, ethnic group, and religion. It also describes the diversity of the board along other dimensions, such as director age, tenure, number of directorships, and industry experience. There appears to be large dispersion in the measures of diversity across the sample firms. This reflects that in some firms all directors have British origins, are white, and have Christian ancestry. In others, over 25% of the directors have different geographical origin.

2.2.2 Demographic characteristics

Differences in directors' characteristics, such as age and gender, are also expected to increase diversity of opinions and preferences in the boardroom. For instance, older individuals are known to be less risk taking and may prefer stability to change. Similarly, women are generally found to be more risk averse (e.g., Sapienza, Zingales and Maestripieri, 2009) and to be more concerned about the well-being of others compared to men (e.g., Beutel and Marini, 1995).

Thus, directors' preferences are expected to be more heterogeneous if directors have dissimilar ages and genders. We measure the director age heterogeneity using the coefficient of variation of the directors' ages and gender diversity as the percentage of female directors in a board.

2.2.3 Education and Experience

Finally, we consider directors' heterogeneity in education and experiences. Educational backgrounds provide directors with different perspectives and cognitive

models. These differences may be the result of different preferences and also affect preferences over corporate policies.

Similarly to differences in age, differences in education and number of directorships between board members may also reflect the directors' ability to stir discussions and votes in their favor or to form coalitions that may make board decisions unpredictable.

We measure differences in education based on the level of education and types of degrees that a firm's directors have earned. In particular, we construct two Herfindhal-based indices, which capture dispersion in the type of degrees as well as dispersion in the rank of the schools directors have attended. For degrees, we focus on MBA degree, Law degree, non-MBA-Law graduate degrees, and undergraduate degrees. We capture school rank using the proportion of directors that attended top 25 undergraduate programs, the proportion of directors that attended top 25 MBA programs, the proportion of directors that attended both top undergraduate and MBA programs, and the proportion of directors that did not attend any top 25 programs. We obtain rankings from U.S. News and World Report 2012 among U.S. universities and from Financial Times for overseas universities.

Differences in perspectives and cognitive models may also arise from directors' work experience, which we capture using diversity in the directors' industry and board experiences. We proxy for diverse industry experience using the Herfindahl index of the number of directorships that a firm's directors hold in other two-digit sic code industries. We measure diversity in board experience using the coefficient of variation of the number of directorship of the firm's board members.

2.3 Measuring firm volatility and other firm characteristics

Our main outcome variables aim to capture firm performance volatility. Our main proxy captures the total stock return volatility and is defined using the standard deviation of monthly stock returns over 12 months from the recent fiscal year end. We show that results are robust to using an alternative proxy for overall stock return volatility, defined using the monthly standard deviation of stock returns over 24 months.

Since stock return volatility may reflects changes in both firm's expected cash flows and investors' discount rates, to focus on the volatility of cash flows, we define an alternative measure of fundamental volatility, which relies on earnings per share. Similarly to Irvine and Pontiff (2009), we measure the standard deviation of quarterly earnings shocks during months *t* to *t+12*. We assume that earnings follow a random walk, and measure an earnings shock as the difference between earnings per share in month t and month *t-12*. Measuring the shock over a 1-year period controls for seasonality. If a firm reports its earnings on a quarterly basis, then the 24-months earnings volatility is the standard deviation of eight earnings shocks. If a firm reports its earnings on a semi-annual basis, then earnings volatility is constructed using four earnings shocks.[7] We use the natural logarithm of this volatility measure as dependent variable of our regressions.

Finally, to capture that volatility arising from the effect of diversity on decision-making is more likely to arise from firm idiosyncratic factors rather than from exposure to systematic risk factors, we also define a measure of idiosyncratic volatility. The 24-month idiosyncratic volatility is computed as the residual of a four-factor Fama French model (including also Cahart's momentum factor) estimated on monthly returns.

[7] Results are similar if we measure earnings shocks using cash flows per share

3. Firm Characteristics and Board Diversity

Since different proxies for diversity may be correlated, we perform factor analysis to extract the relevant sources of variation. We find that three eigenvalues are larger then one, indicating that three factors capture all the relevant variation in the proxies for diversity. Panel A of Table 3 shows the factor loadings on the different diversity proxies associated with the three factors corresponding to the eigenvalues larger than one.

The first factor (principal component) mostly loads on the proxies for ethnic diversity; the second factor loads on diverse industry experience, while the third factor loads on diversity due to age and number of directorships. Thus, the first factor is most likely to capture differences in preferences and values; the second factor most likely captures differences in preferences and beliefs associated with different backgrounds, while the third factor captures asymmetries between directors.

In what follows, we focus on the first principal component, which captures mainly ethnic diversity, for several reasons. First, ethnicity, being directly related to preferences, is well suited to capture problems arising from the aggregation of highly diverse individual preferences we want to study.

Second, as explained in the introduction, director ethnicities are less likely to reflect firms' demand for director skills, and more likely to depend on the local supply of potential directors. It may also depend on social pressure faced by firms headquartered in MSAs with diverse boards to hire directors with different ethnic backgrounds. In either case, by being less likely to depend on firm's demand, our estimates of the effect of (ethnic) diversity on firm performance are less likely to be affected by endogeneity

problems when we use this proxy. Finally, as we show below, for this aspect of diversity, we are able to come up with an instrument.[8]

Panel B of Table 3 relates our diversity measure to predetermined firm characteristics. It appears that the most important determinants of board diversity are the extent of ethnic diversity in the MSA where the firm is headquartered and board size.

We proxy for ethnic diversity in the MSA where a firm is headquartered using data from decennial censuses and the 2006-2010 American Community Survey (ACS), which provides information on the number of individuals from different ethnic groups in a MSA. The surveys are carried out in 2000 and 2010. MSA diversity is measured using an index that has the same expression as our index of board diversity and increases in heterogeneity: a value of 0 for the index indicates complete homogeneity, while a value of 100 complete heterogeneity. We use the 2000 data to measure MSA diversity in the years 2001-2006 and the 2010 data for the years 2007-2012.

The ethnic groups considered in ACS are White, Black, Asia, Hispanic and others. While the ethnic group classification in the MSA does not perfectly match the finer ancestral origin classification in our data, this measure of ethnic diversity in the MSA has a large explanatory power for board diversity in Table 4. A one-standard-deviation increase in the MSA ethnic diversity increases board diversity over 8% of the standard deviation.

[8] Interestingly, in unreported estimates, also the second factor appears to be associated with higher firm performance volatility, while the third factor does not affect firm performance. Including the second and third factors in the regressions for firm performance volatility leaves the results we present hereafter unaffected.

In column 2, it also appears that firms with higher R&D to sales ratio have more diverse board members. This is consistent with the notion that diversity foster creativity and particularly benefits innovative firms, which have to perform complex tasks.

Our diversity proxy appears to be unrelated to other firm characteristics, such as growth opportunities, captured by the market-to-book ratio, or the firm's leverage, and varies little for a given firm over time, a feature that prevents us from using firm fixed effects in the rest of the analysis.

4. Board Diversity and Firm Performance Volatility

In this section, we explore that a diverse board may lead to unpredictable decisions and increase firm volatility. We start by relating alternative proxies for firm volatility to board diversity. In Subsection 5.1, we present ordinary least square estimates. However, we are aware that problems may arise because the composition of the board of directors is endogenously chosen (Adams, Hermalin, Weisbach, 2010). A major concern is that following an increase in volatility firms may choose to increase the diversity of their directors, leading to reverse causality. For this reason, in the following subsections, we introduce alternative identification strategies to deal with endogeneity problems.

4.1 Basic results

Table 4 shows that board diversity is associated with higher firm performance volatility. The parameter estimate in column 1 of Panel A of Table 5 suggests a small, but not economically irrelevant effect: A one-standard-deviation increase in the measure of diversity explains 3% for a firm with mean total return volatility.

Importantly, this effect is present not only when we consider the total return volatility, but also if we concentrate on fundamental volatility and we abstract from possible differences in exposure to systematic risk factors by considering a firm's idiosyncratic volatility.

4.2 Instrumental variable estimates

A concern with the above estimates is that firms with inherently higher volatility find optimal to have more diverse boards. Table 3 suggests a possible instrument for board diversity, which helps to address this reverse causality problem. Board diversity appears to reflect the ethnic diversity of the MSA in which a firm is headquartered. The Cragg-Donald Wald F statistics (which we present at the end of Table 5) confirms that our instrument is highly relevant for explaining board diversity.[9] Thus, we can explore whether board diversity continues to be associated to higher firm volatility once we use ethnic diversity in the MSA in which a firm is headquartered as instrument and abstract from factors that may lead firms to choose more or less diverse boards within an MSA.

Table 5 shows that not only the direction of our estimates is invariant when we rely on two-stage least squares, but the magnitude of the estimates increases significantly. A one-standard-deviation increase in board diversity explains almost 30% of the standard deviation of the total volatility of the average firm. The analogous effects for the firm's fundamental volatility and the firm's idiosyncratic volatility are 55% and 37%.

Such dramatic increase in the magnitude of the estimates may reflect the fact that the instrumental variable estimates allow us to concentrate on the supply of directors. In MSAs where firms choices are constrained by the supply of available directors, even the

[9] In unreported estimates, we also use the ethnic composition of the board of other listed companies headquartered in the MSA as instrument. The estimates are qualitatively and quantitatively similar to the ones we report.

firms for which the costs of having a diverse board are highest may end up having a diverse board. Furthermore, firms with headquarters in highly diverse geographical areas are subject to pressure to increase diversity in their board. They may thus increase board diversity even if this increases their performance volatility to a larger extent than for other firms.

4.3 Unobserved MSA heterogeneity

A remaining concern with the above estimates is that firms in more ethnically diverse MSAs are different from other firms. In this case, the effect of board diversity on firm volatility could be driven by an omitted firm factor. Put differently, our instrument may not satisfy the exclusion restriction.

As we show in Table 4, board diversity appears to be unrelated to firm characteristics other than board size and R&D expenses, features of the board we control for throughout the analysis. To further address this concern, we explore whether board diversity is still associated with firm volatility when we exploit a source of variation in the data that is orthogonal to the one we consider in the instrumental variable estimates. Specifically, we explore whether within a MSA firms with more diverse boards still experience higher volatility.

Table 6 shows that our results are robust to the inclusion of MSA fixed effects. The magnitude of the parameter estimates is unsurprisingly closer to the one we obtain in in Table 4, where we use ordinary least squares. Arguably, the smaller effect is due to the fact that firms choose to have diverse boards when diversity has smaller effects on their performance volatility. The estimates are both qualitatively and quantitatively similar in Table 7 when we control for firms lagged volatility (instead of MSA fixed effects).

5. Why Does Board Diversity Lead to Higher Volatility?

The previous evidence suggests that board diversity is associated with higher performance volatility. In the rest of the paper, we explore the mechanisms leading to this association.

5.1 Erratic Decision Making and Conflicts in the Boardroom

If indeed, as we argue, board diversity is associated with greater performance volatility because of difficulties in aggregating the diverse preferences of board members, we should observe less persistence in corporate strategies as different opinions prevail in different meetings. We should also observe that diverse boards meet more often.

Tables 8 and 9 show that this is indeed the case. In Table 8, we construct proxies for the persistence and conformity of corporate strategies. In column 1, we proxy the (lack of) persistence of a firm's strategy using the sum of the (standardized) variance between *t* and *t+4* of each of the following indicators of corporate policies: (1) advertising intensity (advertising/sales), (2) research and development intensity (R&D/sales), (3) plant and equipment newness (net P&E/gross P&E), (4) nonproduction overhead (Selling, general and administrative expenses/sales), (5) inventory levels (inventories/sales), and (6) financial leverage (debt/equity). We standardize the variance of each indicator by the industry's mean and standard deviation. In column 2, we consider a similar proxy excluding advertising intensity and R&D intensity which are imperfectly reported by many firms.

In columns 3 and 4, we consider how a firm's strategy conforms with the industry's strategy in year *t*. We first standardize each of the above indicators of

corporate policies subtracting the mean and dividing by the standard deviation, and then take the absolute difference between a firm's value and the average value for all firms in the same two-digit SIC industry. We multiply the absolute differences by minus one to have an indicator of conformity. As for the strategy persistency proxies, we consider the measures including R&D and advertising (column 3) and excluding them (column 4).

The estimates in Table 8 indicate that firms with diverse boards have less persistent strategies supporting the idea that these firms have more erratic decision making. The strategies of firms with diverse boards also conform to a less extent with those of other firms in the industries.

There is also evidence that the decision making process may be more difficult in firms with diverse boards.[10] In Table 9, a one-standard-deviation change in board diversity explains 10% of the standard deviation of board meetings.

Difficulties in reaching decisions and the fact that some members can more easily manipulate the outcomes of the decisions in diverse boards may increase disagreement between board members. This in turn may increase board turnover, as we find in Table 10. On average directors of diverse boards have shorter tenures. In column 1, a one-standard-deviation increase in board diversity decreases the average director tenure by 3.5% for the median firm.[11]

This average result masks larger differences in the tenure of the directors. In column 2 a one-standard-deviation increase in board diversity is associated with an

[10] In these tests, we do not control for leverage and R&D because these firm characteristics enter in the definition of the dependent variable.

[11] One may wonder whether the effect of our measure of diversity on volatility depends on the effect of diversity on the difference in tenure between directors. Although this would not completely change the interpretation of our results, in unreported results, we find that the estimates in Table 4 are invariant if we control for differences in tenure.

almost 2% increase in the coefficient of variation of directors' tenures (for the median firm). Arguably, some long-term directors may have learnt how to manipulate decisions, and others quit due to the inefficiency of the decision process.

Difficulties in decision making seem to lead also to higher executive turnover. In column 1 of Table 11, a one-standard-deviation increase in diversity appears to lead to higher probability of executive departure equivalent to 0.03 standard deviations. Importantly, this effect is unrelated to the firm's performance, as measured by the firm's profitability. Firms with diverse boards also have more new executives (columns 3 and 4) and overall higher turnover (columns 5 and 6).

In unreported results, we do not find analogous effects of board diversity on CEO turnover, suggesting that uncertainty about the CEO abilities is unlikely to drive our findings. The high executive turnover unrelated to performance may instead indicate frequent changes in board strategy requiring changes in the executive team and also leading to higher firm volatility.

5.2 Analyst Forecast Errors

Our maintained hypothesis is that board diversity makes firms' decisions more unpredictable. This should imply that analysts find more difficult to forecast alternative measures of firm performance in firms with diverse boards. This is precisely what we find in Table 12. Mean (median) forecast errors for earnings, cash flows, earnings growth and sales growth are larger for firms with diverse boards.[12]

Importantly, analysts do not appear to disagree in their forecasts for firms with diverse boards. We find no evidence that the standard deviation of analyst forecast errors

[12] The number of observations varies across columns because the number of analyst forecasts varies for earnings, cash flows and sales. Also, to compute the standard deviation of analyst forecasts we need at least three observations.

is larger when board diversity increases. This indicates that our results on forecast errors are not driven by the fact that analysts disagrees on the prospects of firms with diverse boards because for instance these firms are more complex. It rather appears that these firms are on average more unpredictable.

5.3 Risk Taking

Firms with diverse boards could have more volatile performance because they take more risk. There is no evidence however that this is the case. Table 13 shows that firms with diverse boards do not invest more and do not make more acquisitions than other firms. They also have similar leverage.

6. Board Diversity and Firm Performance

Our results on volatility imply that we should expect firms with diverse boards to be both the best and the worst. In what follows, we show that this is indeed the case considering different aspects of firm performance.

In Table 14, diversity appears to affect the distribution of firm profits in a way that is consistent with our earlier results on volatility. In particular, it appears that the bottom decile and the median of the distribution of firm average profitability in the following three years is affected negatively by board diversity. We find no effect on the top decile of the distribution as well as on the average.

Thus, erratic decision-making appears to be associated with poor profitability for some firms, but not on average suggesting that there are circumstances under which diverse boards are beneficial notwithstanding erratic decision-making. Social psychology studies suggest that this is the case when diverse groups are expected to solve complex,

creative tasks. A possibility is that in companies with diverse boards more original innovation takes place. In Table 15, we measure the quantity and quality of innovation of a firm using the number of patents and the number of citations of the firm's patents, respectively. Firms with diverse boards do not have more patents. However, we find strong evidence that diverse boards are associated with more patent citations. Results are similar also in columns 6 and 7, where we control for International Patent Classification (IPC) categories to take into account that patents in different areas may receive systematically different numbers of citations.

This result is consistent with our earlier finding on firm performance volatility. Erratic decision-making decreases profitability for the worse performing firms with diverse boards. However, for innovative firms, it may also lead to more significant innovations, proxied by highly cited patents, and through this channel increases the firms' long-term performance.

7. Conclusions

We start from the premise based on evidence in social psychology that diverse individuals may have troubles in communicating and may disagree over corporate policies. We use corporate boards as a laboratory and test whether diversity may make decisions more erratic not only because it increases communication costs but also because diverse preferences cannot be univocally aggregated. We take firm performance volatility as an indicator of erratic decision-making and provide evidence that board diversity increases firm idiosyncratic and fundamental volatility even though there is no evidence that firms with diverse boards take on more risk.

While board diversity increases firm performance volatility, we also find that it may benefit innovative firms for which diverse boards are associated with more cited, and arguably more innovative, patents. Thus, our evidence suggests that diverse groups may have costs and benefits and that the development of decision rules aiming to make the decision process more efficient may improve the performance of diverse boards and diverse groups in general.

References

Adams, R. B, H. Almeida, and D. Ferreira, 2005, Powerful CEOs and Their Impact on Corporate Performance, *Review of Financial Studies* 18, 1403–32.

Adams, R. B. and D. Ferreira, 2009, Women in the boardroom and their impact on governance and performance, *Journal of Financial Economics* 94, 291–309.

Adams, R, and D Ferreira, 2010, Moderation in Groups: Evidence From Betting on Ice Break-Ups in Alaska, *Review of Economic Studies* 77, 882-913.

Adams, R. B., B. E. Hermalin, and M. S. Weisbach, 2010, The role of boards of directors in corporate governance: A conceptual framework and survey, *Journal of Economic Literature* 48, 58–107.

Ahern, K. R., D. Daminelli, and C. Fracassi, 2012, Lost in translation? The effect of cultural values on mergers around the world, *Journal of Financial Economics*, forthcoming.

Algan, Y. and P. Cahuc, 2010, Inherited Trust and Growth. *American Economic Review* 100, 2060–2092.

Anderson, R. C., D. Reeb, A. Upadhyay, and W. Zhao, 2011, The economics of director heterogeneity. *Financial Management* 40, 5–38.

Arrow, K., 1951, *Social Choice and Individual Values.* New York: John Wiley and Sons, Inc.

Ahern, K. R. and A. K. Dittmar, 2012, The changing of the boards: The impact on firm valuation of mandated female board representation. *Quarterly Journal of Economics* 127, 137–197.

Alesina, A., and E. La Ferrara, 2004, Ethnic Diversity and Economic Performance. *Journal of Economic Literature* 43:762–800.

Alesina, A., P. Giuliano, P., and N. Nunn, 2013, On the Origins of Gender Roles: Women and the Plough. *Quarterly Journal of Economics* 128, 469–530.

Barber, B. M., C. Heath, and T. Odean, 2003, Good Reasons Sell: Reason-Based Choice Among Group and Individual Investors in the Stock market", *Management Science,* 49, 1636–1652.

Beutel, A. M. and M.M. Marini, 1995, Gender and values, *American Sociological Review* 60, 436–448.

Chang, Y.-C., H. Hong, L. Tiedens, N. Na and B. Zhao, 2014, Does Diversity Lead to Diverse Opinions? Evidence from Languages and Stock Markets, Working Paper, Princeton University.

Cheng, S., 2008, Board Size and the Variability of Corporate Performance. *Journal of Financial Economics* 87: 157–76.

Cole, J. L., N. D. Daniel, and L. Naveen, 2015, Board Groupthink, Working Paper, University of Utah.

Dohmen, T., A. Falk, D. Huffman, and U. Sunde, 2012, The Intergenerational Transmission of Risk and Trust Attitudes. *Review of Economic Studies* 79, 645–677.

Fernandez, R., 2011, Does Culture Matter?,in, J. Benhabib, M. O. Jackson and A. Bisin, editors, *Handbook of Social Economics*, Vol. 1A, North-Holland.

Giannetti, M., Y. Yafeh, 2012, Do cultural differences between contracting parties matter? Evidence from syndicated bank loans. *Management Science* 58, 365–383.

Guiso, L., Sapienza, P., and L. Zingales, 2006, Does Culture Affect Economic Outcomes? *Journal of Economic Perspectives* 20, 23–48.

Irvine, P. J. and J. Pontiff, 2007, Idiosyncratic Return Volatility, Cash Flows, and Product Market Competition. *Review of Financial Studies* 22, 1149–1177.

Kerr, W. R., 2008, Ethnic scientific communities and international technology diffusion. *Review of Economics and Statistics* 90, 518–537.

Knyazeva, A., D. Knyazeva, and C. G. Raheja, 2009, Benefits of Focus vs. Heterogeneity: An Analysis of Corporate Boards, Working Paper.

Knyazeva, A., D. Knyazeva, and R. W. Masulis, 2013, The supply of corporate directors and board independence, *Review of Financial Studies* 26, 1561–1605.

Mateos, P., 2014, *Names, Ethnicity and Populations. Tracing Identity in Space*, Springer: Berlin, Germany.

Page, S. E., 2007, *The Difference: How the Power of Diversity Creates Better Groups,*

Firms, Schools, and Societies, Princeton University Press.

Pan, Y., Siegel, S., and T. Y. Wang, 2014, The Cultural Origin of Preferences: CEO Cultural Heritage and Corporate Investment, Working Paper, University of Minnesota.

Pan, Y, T Y Wang, and M S Weisbach, 2015, Learning About CEO Ability and Stock Return Volatility, *Review of Financial Studies* 28: 1623–66.

Sah, R. K. and Stiglitz, J., 1986, The Architecture of Economic Systems: Hierarchies and Polyarchies, *American Economic Review,* 76: 716–727.

Sah, R. K. and Stiglitz, J., 1991, The Quality of Managers in Centralized versus Decentralized Organizations, *Quarterly Journal of Economics,* 106: 289–295.

Sapienza, P., L. Zingales, D. Maestripieri, 2009, Gender differences in financial risk aversion and career choices are affected by testosterone, *Proceedings National Academy of Science* 106, 15268–15273.

Schwartz-Ziv, M. and M. S. Weisbach, 2013, What Do Boards Really Do? Evidence From Minutes of Board Meetings, *Journal of Financial Economics* 108, 349–66.

Siegel, J. I., A. Licht, S. H. Schwartz, 2011, Egalitarianism and international investment. *Journal of Financial Economics* 102, 621–642.

Appendix

Variable	Definition and Data Source
Board Diversity	
Geographical Area	A Herfindhal-based index capturing the dispersion of a firm's directors across different geographical areas of origin; the areas of origin include Africa, Americas, British Isles, Central Asia, Central Europe, Diasporic, East Asia, Eastern Europe, Middle East, Northern Europe, South Asia, and Southern Europe. The index varies between 1 and 0. A value of the index closer to 1 indicates that directors are concentrated in fewer areas of origin. Source: Onomap and Board Analyst.
Ethnic Group	A Herfindhal-based index capturing the dispersion of a firm's directors across different ethnic groups; The ethnic groups include White-British, White-Irish, White-Any Other White Background, Asian or Asian British-Indian, Asian or Asian British-Pakistani, Asian or Asian British-Bangladeshi, Asian or Asian British-Any other, Black or Black British-Caribbean, Black or Black British-African, Other Ethnic Group-Chinese, Other Ethnic Group-Any Other Ethnic Group. The index varies between 1 and 0. A value of the index closer to 1 indicates that directors are concentrated in fewer areas of origin. Source: Onomap and Board Analyst.
Religion	A Herfindhal-based index capturing the dispersion of a firm's directors across different religious origins; The religious origins include Bhuddist, Christian, Hindu, Jewish, Muslim, Sikh. The index varies between 1 and 0. A value of the index closer to 1 indicates that directors are concentrated in fewer areas of origin. Source: Onomap and Board Analyst.
Age_dissimilarity	The average distance of the age of each director in a firm from the mean age of the firm's directors, scaled by the mean age of the firm's directors. Source: Corporate Library's Board Analyst.
Dirship_dissimilarity	The average distance of the number of outside directorships of each director in a firm from the mean number of outside directorships of the firm's directors, scaled by the mean number of outside directorships of the firm's directors. Source: Corporate Library's Board Analyst.
Diverse_industry	This variable measures diversity in the industry experience of a firm's directors and is defined as 1-sum(*square of xk*), where *xk* is fraction of board seats that the firm's directors hold in firms in 2-digit SIC industry *k*, and *k* is different

	from the industry of the current firm. The variable is scaled by the total number of the board seats held by the firm's directors. Source: Corporate Library's Board Analyst.
% of Female Directors	The percentage of female directors on a firm's board. Source: Corporate Library's Board Analyst.
Firm Volatility	
TotRelVol (12 mon)	The standard deviation of a firm's monthly stock returns over 12 months. Source: CRSP.
TotRelVol (24 mon)	The standard deviation of a firm's monthly stock returns over 24 months. Source: CRSP.
Log(VolEPS)(24 mon)	The natural logarithm of the standard deviation of a firm's earnings per share shocks over 8 quarters. Earnings per share shocks are defined as in Irvine and Pontiff (2009). Source: CRSP and Compustat.
Idiovol	The standard deviation of the residuals obtained regressing a firm's monthly returns on the four Fama French factors (including the Cahart's momentum factor) over a 24 months interval. Source: CRSP.
Strategic Persistence/Conformity	
Strategic Persistence	Strategic persistence of a firm's strategy using the sum of the standardized variance between *t* and *t+4* of each of the following indicators of corporate policies: (1) advertising intensity (advertising/sales), (2) research and development intensity (R&D/sales), (3) plant and equipment newness (net P&E/gross P&E), (4) nonproduction overhead (Selling, general and administrative expenses/sales), (5) inventory levels (inventories/sales), and (6) financial leverage (debt/equity). Variance of each variable is standardized by the mean and standard deviation of the industry. We construct SP1 with all six variables and SP2 excluding advertising intensity and R&D intensity which are imperfectly reported by many firms. Source: Compustat.
Strategic Conformity	We standardize each of the indicators of corporate policies (as strategic persistence) by subtracting the mean and dividing by the standard deviation, and then take the absolute difference between a firm's value and the average value for all firms in the same two-digit SIC industry. We multiply the absolute differences by minus one to have an indicator of conformity. As for the strategy persistency proxies, we consider the measures including R&D and advertising (SC1) and excluding them (SC2).
Board Meetings and Director/Exec Turnovers	

Log number of meetings	The natural logarithm of the number of board meetings. Source: Corporate Library's Board Analyst.
Mean director tenure	Average director tenure. Source: Corporate Library's Board Analyst
Tenure_dissimilarity	The average distance of the tenure of each director in a firm from the mean tenure of the firm's directors, scaled by the mean tenure of the firm's directors. Source: Corporate Library's Board Analyst.
Executive Arrival	Number of new directors joining the board scaled by board size. Corporate Library's Board Analyst
Executive Departure	Number of new directors leaving the board scaled by board size. Corporate Library's Board Analyst
Total Executive Turnover	Sum of arriving directors and departing directors scaled by board size. Corporate Library's Board Analyst
Analyst Forecast Errors	
Mean EPS Forecast Error	Absolute value of difference between mean analyst earnings per share forecast and the actual earnings per share scaled by stock price. Source: IBES
Median EPS Forecast Error	Absolute value of difference between median analyst earnings per share forecast and the actual earnings per share scaled by stock price. Source: IBES
Stdev EPS Forecast Error	Standard deviation of the analyst earnings per share forecasts. Source. IBES
Mean CPS Forecast Error	Absolute value of difference between mean analyst cash flow per share forecast and the actual cash flow per share scaled by stock price. Source: IBES
Median CPS Forecast Error	Absolute value of difference between median analyst cash flow per share forecast and the actual cash flow per share scaled by stock price. Source: IBES
Stdev CPS Forecast Error	Standard deviation of analyst cash flow per share forecasts. Source. IBES
Mean Earnings Growth Forecast	Absolute value of difference between mean analyst earnings growth forecast and the actual earnings growth. Source: IBES
Median Earnings Growth Forecast	Absolute value of difference between median analyst earnings growth forecast and the actual earnings growth. Source: IBES
Stdev Earnings Growth Forecast	Standard deviation of analyst earning growth forecasts. Source. IBES
Mean Sales Growth Forecast	Absolute value of difference between mean analyst sales growth forecast and the actual earnings growth. Source: IBES
Median Sales Growth Forecast	Absolute value of difference between median analyst sales growth forecast and the actual earnings growth. Source: IBES
Stdev Sales Growth	Standard deviation of analyst sales growth forecasts.

Forecast	Source. IBES
Patents	
Log number of citations	The natural logarithm of 1 plus the number of citations of each patent granted to a firm during a year. Source: NBER patent database.
Instruments	
Eindex	Index of ethnic diversity in a MSA. The index is available from the Bureau of Census for 2000 and 2010. Since our sample period is 2001 to 2011, we use the 2000 Eindex for years up to 2007, and the 2010 Eindex for the following years including 2007. Results are similar if we just use the average of the two years Eindex or the most recent year. Source: Bureau of Census.
Mergers & Acquisitions	
M&A	Equal to one if the sample firm makes an acquisition during year *t* and zero otherwise. Source: SDC
Log(Total Number of M&As)	the log of total number of M&As a firm has made during the sample period. Source: SDC
Firm Level Controls	
% of outside directors	The percentage of outside directors in a firm in a given year. Source: Corporate Library's Board Analyst.
CEOFounder	A dummy variable that takes a value equal to one if the CEO is also a firm's founder. Source: Corporate Library's Board Analyst.
Log(BoardSize)	The natural logarithm of the number of board members. Source: Corporate Library's Board Analyst.
% of female directors	Percentage of female directors on board. Source: Corporate Library's Board Analyst.
Number of segments	It is the number of business segments each firm has based on 3-digit SIC code. Source: Compustat.
Log (Age)	The natural logarithm of a firm's age, defined as the number of years since incorporation. Source: Corporate Library's Board Analyst.
Log(Assets)	The natural logarithm of a firm's book value of assets. Source: Compustat.
Leverage	A firm's ratio of long-term debt to total assets. Source: Compustat.
Capex	A firm's ratio of capital expenditures to total assets. Source: Compustat.
Logq	The natural logarithm of a firm's market-to-book ratio, defined as (price*shares outstanding+book value of assets-book value of equity)/book value of assets. Source: Compustat.
ROA	A firm's income before extraordinary items, divided by

	the firm's total assets. Source: Compustat.
R&D	A firm's research and development expenditures divided by the firm's sales. Source: Compustat.

Table 1: The Ethnic Origins of Directors

This table reports descriptive statistics of director ethnic diversity. The unit of observation is director firm year. We report the number of directors and the percentage of directors in the sample with ancestors from a given geographical area, belonging to a given ethnic group and with ancestors with a given religion. We also report the percentage of U.S. population with ancestors from a given geographical area, belonging to a given ethnic group and with ancestors with a given religion. Information on the percentage of U.S. population with ancestors from a given geographical area is obtained from http://www.infoplease.com/ipa/A0762137.html; information on the ethnic group of the U.S. population is from Encyclopedia Brit; and the information on the religion of the ancestors of the U.S. population is from the U.S. Bureau of Census.

	Sample		U.S. Population
Panel A: Geographical Area	N	%	%
AFRICA	428	0.19	13.32
AMERICAS	184	0.08	16.43
BRITISH ISLES	184,128	80.25	24.24
CENTRAL ASIA	95	0.04	0.99
CENTRAL EUROPE	12,988	5.66	21.37
DIASPORIC	5,407	2.36	
EAST ASIA	3,217	1.4	1.51
EASTERN EUROPE	1,788	0.78	3.14
MIDDLE EAST	938	0.41	0.52
NORTHERN EUROPE	2,206	0.96	3.29
SOUTH ASIA	2,320	1.01	2.23
SOUTHERN EUROPE	8,369	3.65	6.55
UNCLASSIFIED	7,372	3	6.42
Total	229,440	100	100
	Sample		U.S. Population
Panel B: Ethnic Group	N	%	%/
WHITE – BRITISH	166,520	72.58	
WHITE – IRISH	17,608	7.67	
WHITE - ANY OTHER WHITE BACKGROUND	30,926	13.48	
Total white (excluding Hispanic)			69.13
Total white		93.73	81.68
ASIAN OR ASIAN BRITISH - INDIAN	1,543	0.67	
ASIAN OR ASIAN BRITISH - PAKISTANI	399	0.17	
ASIAN OR ASIAN BRITISH - BANGLADESHI	17	0.01	
ASIAN OR ASIAN BRITISH - ANY OTHER	45	0.02	
OTHER ETHNIC GROUPS - CHINESE	1,865	0.81	
Total Asian		1.68	4.73
BLACK OR BLACK BRITISH - CARIBBEAN	124	0.05	
BLACK OR BLACK BRITISH - AFRICAN	353	0.15	
Total black		0.20	12.06
UNCLASSIFIED	10,040	4	2.66
Total	229,440	100	100
	Sample		U.S. Population
Panel C: Religion	N	%	%
BHUDDIST	3,522	1.54	0.80
CHRISTIAN	210,099	91.57	60.39
HINDU	1,187	0.52	0.34
JEWISH	4,343	1.89	1.84
MUSLIM	1,568	0.68	1.35
SIKH	285	0.12	0.08
NOT APPLICABLE	8,436	3.68	35.21
Total	229,440	100	100

Table 2: Firm Level Summary Statistics

This table reports summary statistics for the sample firms. The unit of observation is the firm year. Panel A reports summary statistics for our board diversity measures. Panel B reports summary statistics for the performance volatility proxies. Panel C provides summary statistics for the analyst forecast variables. Panel D provides summary statistics for the number of board meetings and managerial turnover. Panel E provides summary statistics of board characteristics. Panel F summarizes firm characteristics. Variable definitions are provided in the appendix.

Panel A: Board Diversity	Mean	Median	SD	P25	P75	N
Geographical Area	0.309	0.306	0.197	0.165	0.454	13,104
Census Ethnic Group	0.398	0.418	0.178	0.278	0.531	13,104
Census Religion	0.144	0.117	0.159	0.000	0.245	13,104
% Female Directors	0.088	0.083	0.085	0.000	0.136	13,104
Age Dissimilarity	0.148	0.145	0.042	0.119	0.174	13,104
Directorships Dissimilarity	0.745	0.732	0.254	0.575	0.894	13,104
Industry Experience Diversity	0.441	0.469	0.243	0.255	0.639	13,104
Degree Dissimilarity	0.750	0.776	0.140	0.672	0.852	13,104
School Rank Dissimilarity	0.439	0.480	0.194	0.320	0.594	13,104
Diversity (PC)	-0.000	-0.023	1.544	-1.170	1.107	13,104
Eindex	63.10	64.98	15.92	51.76	77.53	13,287

Panel B: Performance Volatility	Mean	Median	SD	P25	P75	N
Total Stock Vol (24 mons)	0.124	0.107	0.081	0.076	0.149	11,827
Total Stock Vol (12 mons)	0.122	0.103	0.086	0.073	0.148	12,205
Log (EPS Vol) (24 mons)	-8.548	-8.989	2.990	-10.718	-6.673	12,375
Idiosyncratic Stock Vol (24 mons)	0.093	0.079	0.066	0.056	0.112	12,208

Panel C: Board Meetings and Managerial Turnover	Mean	Median	SD	P25	P75	N
Board Meetings	7.930	7.000	3.769	5.000	9.000	11,435
Director tenure/Mean director tenure	0.724	0.715	0.237	0.572	0.866	13,091
Mean director tenure	8.436	7.900	3.890	5.667	10.538	13,097
Executive Arrival	0.132	0.143	0.152	0	0.200	12,228
Executive Departure	0.171	0.125	0.248	0	0.250	12,228
Total Executive Turnover	0.303	0.200	0.326	0	0.429	12,228

Panel D: Analyst Forecast Errors						
Mean EPS Forecast Error	0.012	0.003	0.031	0.001	0.010	42,434
Median EPS Forecast Error	0.012	0.003	0.031	0.001	0.010	42,434
Stdev EPS Forecast Error	0.054	0.030	0.075	0.020	0.060	33,738
Mean CPS Forecast Error	0.024	0.010	0.041	0.004	0.025	13,925
Median CPS Forecast Error	0.024	0.010	0.041	0.004	0.025	13,925
Stdev CPS Forecast Error	0.172	0.100	0.216	0.040	0.220	3,795
Mean Earnings Growth Forecast	19.10	12.57	20.02	5.21	26.08	9,466
Median Earnings Growth Forecast	19.06	12.58	20.00	5.15	26.00	9,466
Stdev Earnings Growth Forecast	4.24	3.15	4.17	1.79	5.15	7,206
Mean Sales Growth Forecast	17.64	11.34	19.61	5.03	22.85	4,269
Median Sales Growth Forecast	17.64	11.35	19.61	5.04	22.94	4,269
Stdev Sales Growth Forecast	2.45	1.56	2.86	0.71	3.25	887

Panel E: Board Characteristics	Mean	Median	SD	P25	P75	N

Board Size	13.467	12.000	5.562	9.000	17.000	12,608
CEO Founder	0.100	0.000	0.300	0.000	0.000	12,563
% of Outside Directors	0.618	0.625	0.152	0.500	0.727	13,104

Panel F: Other Firm Variables	Mean	Median	SD	P25	P75	N
Assets	5982.65	1138.43	25557.67	393.39	3665.64	13,104
Log(q)	0.543	0.447	0.496	0.185	0.823	13,103
Number of Segments	1.703	1.000	1.102	1.000	2.000	11,877
Company Age	39.734	26.000	37.152	13.000	57.000	10,356
R&D/Sales	0.179	0.002	1.100	0.000	0.065	12,816
Capex/Assets	0.059	0.037	0.075	0.019	0.069	13,078
Leverage (t)	0.191	0.159	0.198	0.004	0.296	13,047
ROA(t+1)	0.014	0.045	0.198	0.008	0.084	12,856
AvgROA(3yrs)	0.020	0.043	0.142	0.007	0.080	12,087

Table 3: Board Diversity

Panel A. Factor Analysis

We perform factor analysis on the proxies for diversity listed in this table. A total of three eigenvalues are larger than one, with values 2.38, 1.59, and 1.22, respectively. We list below the eigenvectors associated with this eigenvalues, which represent the weight of different proxies for diversity.

	First Factor	Second Factor	Third Factor
Geographical Area	**0.5953**	-0.0228	-0.0923
Census Ethnic Group	**0.5789**	0.01	-0.0906
Census Religion	**0.531**	-0.034	-0.0782
Age Dissimilarity	-0.0911	0.2427	**0.6464**
Directorships Dissimilarity	0.115	0.1576	**0.5326**
Industry Experience Diversity	-0.0065	**0.6102**	-0.088
Degree Dissimilarity	-0.0078	-0.3489	-0.3537
School Rank Dissimilarity	0.081	0.4749	0.2565
% Female Directors	-0.0168	0.4414	-0.2774

Panel B. Determinants of Board Diversity

This table relates firm characteristics to board diversity. Variable definitions are provided in the Appendix. We include industry and year fixed effect in each regression. We present ordinary least squares parameter estimates. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	Board Diversity	Board Diversity
Eindex	0.008***	0.008***
	(3.47)	(3.33)
Log(Assets)	-0.066**	-0.055**
	(-2.53)	(-2.04)
Logq	-0.046	-0.031
	(-0.71)	(-0.48)
Debt/Assets	-0.114	-0.145
	(-0.74)	(-0.94)
Capex/Assets	-0.396	-0.335
	(-1.20)	(-1.01)
Log(FirmAge)	-0.052	-0.043
	(-1.43)	(-1.20)
Log(#ofSegments)	0.070	0.075
	(0.97)	(1.04)
Log(BoardSize)	0.749***	0.728***
	(5.55)	(5.40)
CEOFounder	0.073	0.070
	(0.66)	(0.63)
% of Outside Directors	-0.330	-0.334
	(-1.40)	(-1.42)
ROA		-0.250
		(-1.62)
R&D/Sales		0.063*
		(1.89)
Constant	-1.837**	-1.894**
	(-2.36)	(-2.43)
Observations	9,875	9,859
R-squared	0.10	0.10

Table 4: Firm Volatility and Board Diversity

This table relates several proxies for firm volatility to our proxy for board diversity. The dependent variables are respectively the one-year total stock return volatility, the two-year total stock return volatility, the fundamental volatility and the idiosyncratic return volatility. Variable definitions are provided in the appendix. All regressions include year and 2-digit SIC code industry fixed effects. We present ordinary least squares parameter estimates. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	TotRetVol (12 mon)	TotRetVol(24 mon)	Log(VolEPS)(24mon)	Idiovol(24 mon)
Diversity	0.002***	0.002***	0.077***	0.001***
	(2.89)	(3.19)	(2.75)	(2.92)
Log(Assets)	-0.013***	-0.013***	-0.408***	-0.013***
	(-17.54)	(-16.87)	(-11.19)	(-19.42)
Logq	-0.024***	-0.025***	-2.901***	-0.018***
	(-12.09)	(-11.99)	(-30.03)	(-10.98)
Debt/Assets	0.064***	0.063***	2.561***	0.048***
	(8.93)	(8.05)	(10.75)	(7.74)
Capex/Assets	0.031**	0.038***	-0.182	0.014
	(2.33)	(2.62)	(-0.29)	(1.28)
R&D/Sales	0.009***	0.011***	0.260***	0.008***
	(3.99)	(3.82)	(4.30)	(5.51)
Log(FirmAge)	-0.005***	-0.005***	-0.245***	-0.005***
	(-5.53)	(-5.22)	(-5.08)	(-5.86)
Log(#ofSegments)	-0.005**	-0.005***	-0.261***	-0.006***
	(-2.57)	(-2.61)	(-2.76)	(-3.93)
Log(BoardSize)	0.005	0.007	0.715***	0.004
	(1.27)	(1.41)	(4.07)	(1.06)
CEOFounder	0.007**	0.006**	0.202	0.006**
	(2.38)	(2.11)	(1.45)	(2.57)
% of Outside Directors	-0.007	-0.005	0.021	-0.006
	(-1.11)	(-0.70)	(0.07)	(-1.19)
Constant	0.236***	0.223***	-3.394***	0.198***
	(15.02)	(14.27)	(-3.90)	(14.81)
Observations	9,541	9,276	9,709	9,544
R-squared	0.37	0.42	0.40	0.38

Table 5: Firm Volatility and Board Diversity – Instrumental Variable Estimates

This table reports instrumental variables estimates for the effects of board diversity for corporate volatility. The instrument is Eindex, capturing ethnic diversity in the MSA where a firm is headquartered. The dependent variables are respectively the one-year total stock return volatility, the two-year total stock return volatility, the fundamental volatility and the idiosyncratic return volatility. Variable definitions are provided in the appendix. All regressions include year and 2-digit SIC code industry fixed effects. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively. We also report the Cragg-Donald Wald F statistics for the validity of the instrument.

	(1)	(2)	(3)	(4)
	TotRetVol (12 mon)	TotRetVol(24 mon)	Log(VolEPS)(24mon)	Idiovol(24 mon)
Diversity	0.016*	0.016*	1.067**	0.016**
	(1.93)	(1.81)	(2.19)	(2.10)
Log(Assets)	-0.013***	-0.013***	-0.362***	-0.012***
	(-13.63)	(-13.93)	(-7.35)	(-14.78)
Logq	-0.023***	-0.025***	-2.921***	-0.018***
	(-10.50)	(-10.69)	(-24.23)	(-9.15)
Debt/Assets	0.064***	0.063***	2.607***	0.048***
	(8.57)	(7.90)	(8.99)	(7.43)
Capex/Assets	0.038**	0.043***	0.090	0.021
	(2.53)	(2.68)	(0.12)	(1.63)
R&D/Sales	0.008***	0.009***	0.169**	0.007***
	(3.29)	(3.29)	(1.99)	(4.49)
Log(FirmAge)	-0.005***	-0.005***	-0.193***	-0.004***
	(-3.96)	(-3.79)	(-2.91)	(-3.77)
Log(#ofSegments)	-0.006***	-0.007***	-0.377***	-0.007***
	(-2.85)	(-2.86)	(-2.93)	(-3.74)
Log(BoardSize)	-0.004	-0.001	0.034	-0.005
	(-0.62)	(-0.18)	(0.09)	(-0.81)
CEOFounder	0.005	0.005	0.148	0.005
	(1.51)	(1.44)	(0.82)	(1.51)
% of Outside Directors	-0.003	-0.003	0.222	-0.003
	(-0.45)	(-0.35)	(0.55)	(-0.46)
Constant	0.264***	0.252***	-1.879*	0.229***
	(11.55)	(10.77)	(-1.95)	(11.45)
Cragg-Donald F-stat	54.11	52.74	57.98	54.57
Observations	9,216	8,959	9,386	9,219
R-squared	0.30	0.34	0.18	0.25

Table 6: Firm Volatility and Board Diversity – Controlling for unobserved MSA-heterogeneity

This table relates several proxies for firm volatility to our proxy for board diversity. The dependent variables are respectively the one-year total stock return volatility, the two-year total stock return volatility, the fundamental volatility and the idiosyncratic return volatility. Variable definitions are provided in the appendix. In all regressions, we include MSA fixed effects as well as year and 2-digit SIC code industry fixed effects. The MSA is the metropolitan statistical area where each sample firm is headquartered. We present ordinary least squares parameter estimates. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	TotRetVol (12 mon)	TotRetVol(24 mon)	Log(VolEPS)(24mon)	Idiovol(24 mon)
Diversity	0.001*	0.001**	0.054*	0.001*
	(1.82)	(2.29)	(1.84)	(1.74)
Log(Assets)	-0.014***	-0.014***	-0.437***	-0.013***
	(-17.41)	(-17.12)	(-11.68)	(-19.25)
Logq	-0.023***	-0.024***	-2.857***	-0.017***
	(-11.15)	(-10.93)	(-28.68)	(-9.88)
Debt/Assets	0.065***	0.062***	2.517***	0.047***
	(8.50)	(7.82)	(10.87)	(7.63)
Capex/Assets	0.039***	0.048***	0.428	0.020*
	(2.87)	(3.25)	(0.67)	(1.75)
R&D/Sales	0.009***	0.010***	0.249***	0.008***
	(3.61)	(3.47)	(4.39)	(4.99)
Log(FirmAge)	-0.004***	-0.005***	-0.210***	-0.004***
	(-4.38)	(-4.19)	(-4.03)	(-4.65)
Log(#ofSegments)	-0.003	-0.003*	-0.225**	-0.004**
	(-1.60)	(-1.71)	(-2.34)	(-2.40)
Log(BoardSize)	0.007	0.009**	0.775***	0.006
	(1.61)	(1.97)	(4.21)	(1.63)
CEOFounder	0.004	0.004	0.060	0.004
	(1.59)	(1.22)	(0.41)	(1.62)
% of Outside Directors	-0.012*	-0.010	-0.070	-0.009*
	(-1.82)	(-1.52)	(-0.25)	(-1.79)
Constant	0.248***	0.193***	-3.552***	0.194***
	(9.33)	(8.48)	(-7.43)	(9.50)
Observations	9,216	8,959	9,386	9,219
R-squared	0.43	0.49	0.47	0.45

Table 7: Firm Volatility and Board Diversity – Controlling for Lagged Volatility

This table relates several proxies for firm volatility to our proxy for board diversity. The dependent variables are respectively the one-year total stock return volatility, the two-year total stock return volatility, the fundamental volatility and the idiosyncratic return volatility. Variable definitions are provided in the appendix. In all regressions, we control for lagged volatility as well as for year. We present ordinary least squares parameter estimates. All regressions include year and 2-digit SIC code industry fixed effects. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	TotRetVol (12 mon)	TotRetVol(24 mon)	Log(VolEPS)(24mon)	Idiovol(24 mon)
Diversity	0.001***	0.001**	0.013	0.001**
	(2.65)	(2.31)	(1.11)	(2.29)
Log(Assets)	-0.009***	-0.004***	-0.103***	-0.004***
	(-13.17)	(-10.55)	(-6.68)	(-10.82)
Logq	-0.018***	-0.010***	-0.836***	-0.009***
	(-11.47)	(-8.77)	(-15.94)	(-9.29)
Debt/Assets	0.046***	0.017***	0.390***	0.013***
	(6.90)	(3.90)	(3.66)	(3.67)
Capex/Assets	0.022*	0.015	1.007***	0.003
	(1.93)	(1.43)	(3.04)	(0.53)
R&D/Sales	0.007***	0.004***	0.148***	0.004***
	(3.93)	(4.26)	(3.86)	(4.65)
Log(FirmAge)	-0.003***	-0.001***	-0.051***	-0.001***
	(-5.00)	(-3.18)	(-2.69)	(-3.62)
Log(#ofSegments)	-0.003**	-0.001	-0.064*	-0.002***
	(-2.29)	(-1.50)	(-1.73)	(-2.97)
Log(BoardSize)	0.003	0.002	0.124	0.001
	(0.91)	(0.83)	(1.52)	(0.32)
CEOFounder	0.004*	0.001	0.037	0.001
	(1.80)	(0.42)	(0.56)	(0.94)
% of Outside Directors	-0.004	0.000	0.020	0.000
	(-0.86)	(0.06)	(0.15)	(0.03)
Lagged(Voaltility)	0.294***	0.659***	0.854***	0.659***
	(12.33)	(50.09)	(92.25)	(39.36)
Constant	0.248***	0.193***	-3.552***	0.194***
	(9.33)	(8.48)	(-7.43)	(9.50)
Observations	9,216	8,959	9,386	9,219
R-squared	0.43	0.49	0.47	0.45

Table 8: Board Diversity and Firm Strategies

This table relates strategic persistence and conformity to our proxy for board diversity. All dependent variables and independent variables are defined in Appendix. We present ordinary least squares parameter estimates. All regressions include year and 2-digit SIC code industry fixed effects. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	SP1	SP2	SC1	SC2
Diversity	-0.088*	-0.057*	-0.057**	-0.042**
	(-1.89)	(-1.86)	(-2.07)	(-2.27)
Log(Assets)	0.385***	0.301***	0.138***	0.117***
	(6.28)	(7.41)	(3.19)	(4.14)
Logq	-0.141	0.246**	-0.181	0.036
	(-0.83)	(2.15)	(-1.48)	(0.46)
Capex/Assets	0.971	0.249	0.601	-0.138
	(0.73)	(0.31)	(0.60)	(-0.21)
Log(FirmAge)	0.298***	0.190***	0.234***	0.166***
	(4.31)	(3.77)	(4.34)	(4.52)
Log(#ofSegments)	0.100	0.068	0.126	0.048
	(0.73)	(0.69)	(1.30)	(0.71)
Log(BoardSize)	-0.318	-0.170	-0.204	-0.074
	(-1.24)	(-0.92)	(-1.10)	(-0.57)
CEOFounder	-0.420*	-0.205	-0.052	-0.093
	(-1.72)	(-1.34)	(-0.35)	(-1.03)
% of Outside Directors	-0.486	-0.434	0.027	0.104
	(-1.10)	(-1.39)	(0.09)	(0.52)
Constant	-4.218***	-2.898***	-7.377***	-5.331***
	(-5.59)	(-5.74)	(-12.33)	(-14.98)
Observations	6,844	7,958	7,778	9,066
R-squared	0.07	0.06	0.09	0.09

Table 9: Board Diversity and Number of Board Meetings

This table relates the natural logarithm of the number of board meetings of a firm during a year to our proxy for board diversity. We present ordinary least squares parameter estimates. All regressions include year and 2-digit SIC code industry fixed effects. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)
	Log(Number of Meetings)
Diversity	0.092**
	(2.29)
Log(Assets)	-0.037
	(-0.69)
Logq	-0.610***
	(-4.62)
Debt/Assets	1.217***
	(3.19)
Capex/Assets	-1.538*
	(-1.69)
R&D/Sales	-0.061
	(-1.09)
Log(FirmAge)	-0.333***
	(-4.90)
Log(#ofSegments)	-0.024
	(-0.19)
Log(BoardSize)	1.737***
	(6.53)
CEOFounder	-0.090
	(-0.43)
% of Outside Directors	-0.462
	(-1.08)
Constant	5.023***
	(4.01)
Observations	9,318
R-squared	0.09

Table 10: Board Diversity and Director Turnover

This table relates director turnover during a year to our proxy for board diversity. We present ordinary least squares parameter estimates. All regressions include year and 2-digit SIC code industry fixed effects. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	Average Director Tenure	Coefficient of Variation of Director Tenure
Diversity	-0.182***	0.008***
	(-3.31)	(2.95)
Log(Assets)	0.181***	-0.025***
	(2.90)	(-7.65)
Logq	0.058	-0.007
	(0.35)	(-0.80)
Debt/Assets	-2.418***	-0.063***
	(-5.57)	(-2.61)
Capex/Assets	-2.185**	0.014
	(-1.99)	(0.22)
R&D/Sales	-0.071	-0.003
	(-1.34)	(-1.05)
Log(FirmAge)	1.507***	0.058***
	(17.07)	(10.58)
Log(#ofSegments)	0.645***	0.022**
	(3.98)	(2.35)
Log(BoardSize)	-2.121***	0.280***
	(-6.05)	(16.00)
CEOFounder	1.413***	0.044***
	(6.02)	(3.04)
% of Outside Directors	-4.840***	-0.072**
	(-8.92)	(-2.29)
Constant	5.723***	0.042
	(4.32)	(0.66)
Observations	10,208	10,207
R-squared	0.26	0.20

Table 11: Board Diversity and Executive Turnover

This table relates executive turnover during a year to our proxy for board diversity. We present ordinary least squares parameter estimates. We measure executive turnover as the number of departing executives, the number of arriving executives, and the total of departing and arriving executives, scaled by the number of executives. All regressions include year and 2-digit SIC code industry fixed effects. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Exe-Depart	Exe-Depart	Exe-Arrival	Exe-Arrival	Depart+Arrival	Depart+Arrival
Diversity	0.005***	0.006***	0.005***	0.005***	0.010***	0.010***
	(4.44)	(4.55)	(2.78)	(2.86)	(3.90)	(4.01)
ROA	-0.089***	-0.086***	-0.093***	-0.089***	-0.182***	-0.175***
	(-6.73)	(-6.32)	(-3.97)	(-3.90)	(-6.02)	(-5.75)
ROA*Diversity		-0.011		-0.011		-0.022
		(-1.48)		(-0.99)		(-1.40)
Log(Assets)	-0.001	-0.001	-0.005**	-0.005**	-0.006*	-0.006*
	(-0.88)	(-0.84)	(-2.43)	(-2.40)	(-1.94)	(-1.90)
Logq	-0.009**	-0.009**	-0.012*	-0.012*	-0.021**	-0.021**
	(-2.10)	(-2.13)	(-1.69)	(-1.71)	(-2.13)	(-2.16)
Debt/Assets	0.005	0.006	0.018	0.018	0.023	0.024
	(0.42)	(0.46)	(0.93)	(0.95)	(0.82)	(0.86)
Capex/Assets	-0.077***	-0.078***	0.012	0.011	-0.065	-0.068
	(-3.00)	(-3.05)	(0.29)	(0.26)	(-1.09)	(-1.14)
R&D/Sales	-0.003*	-0.003*	-0.003	-0.003	-0.006	-0.006
	(-1.72)	(-1.84)	(-0.94)	(-1.00)	(-1.40)	(-1.49)
Log(FirmAge)	-0.004*	-0.004*	-0.006**	-0.006**	-0.010**	-0.010**
	(-1.87)	(-1.90)	(-1.96)	(-1.98)	(-2.12)	(-2.15)
Log(#ofSegments)	-0.007*	-0.006*	-0.007	-0.007	-0.014*	-0.014*
	(-1.82)	(-1.79)	(-1.36)	(-1.34)	(-1.72)	(-1.69)
Log(BoardSize)	0.079***	0.078***	0.072***	0.072***	0.151***	0.150***
	(10.36)	(10.28)	(6.47)	(6.41)	(9.12)	(9.06)
CEOFounder	-0.012**	-0.012**	-0.027***	-0.027***	-0.040***	-0.039***
	(-2.32)	(-2.32)	(-3.80)	(-3.79)	(-3.69)	(-3.68)
% of Outside Directors	-0.005	-0.005	-0.035*	-0.035*	-0.039	-0.040
	(-0.35)	(-0.36)	(-1.80)	(-1.81)	(-1.38)	(-1.39)
Constant	-0.059	-0.058	0.022	0.023	-0.037	-0.035
	(-1.41)	(-1.39)	(0.42)	(0.44)	(-0.43)	(-0.40)
Observations	9,907	9,907	9,907	9,907	9,907	9,907
R-squared	0.06	0.06	0.06	0.06	0.08	0.08

Table 12: Analyst Forecast Errors and Board Diversity

This table relates analyst forecasts to our proxy for board diversity. The dependent variables in Panel A are respectively mean, median and standard deviation of analysts' earnings and cash flow forecast errors. The dependent variables in Panel B are the mean, median and standard deviation of analysts' earning growth and sales growth forecasts. Variable definitions are provided in the appendix. In all regressions, we include MSA fixed effects as well as year and 2-digit SIC code industry fixed effects. The MSA is the metropolitan statistical area where each sample firm is headquartered. We present ordinary least squares parameter estimates. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

Panel A

	(1)	(2)	(3)	(4)	(5)	(6)
	Mean AFE	Med AFE	Std AFE	Mean CPS	Med CPS	Std CPS
Diversity	0.001**	0.001**	0.000	0.001*	0.001*	-0.002
	(2.29)	(2.31)	(0.07)	(1.85)	(1.86)	(-0.40)
Log(Assets)	-0.002***	-0.002***	0.004***	-0.004***	-0.004***	0.020***
	(-7.86)	(-7.86)	(3.68)	(-5.88)	(-5.87)	(3.00)
Logq	-0.011***	-0.011***	-0.015***	-0.021***	-0.021***	-0.061***
	(-12.83)	(-12.80)	(-5.59)	(-11.92)	(-11.92)	(-2.71)
Debt/Assets	0.011***	0.011***	0.006	0.021***	0.021***	0.013
	(4.29)	(4.27)	(0.79)	(4.03)	(4.05)	(0.29)
Capex/Assets	0.002	0.002	0.064***	0.001	0.001	0.134**
	(0.33)	(0.31)	(2.97)	(0.07)	(0.06)	(2.41)
R&D/Sales	0.002***	0.002***	0.010***	0.005***	0.005***	-0.560**
	(4.44)	(4.44)	(3.64)	(3.28)	(3.28)	(-2.42)
Log(FirmAge)	-0.001***	-0.001***	-0.006***	-0.001	-0.001	-0.002
	(-3.47)	(-3.52)	(-3.20)	(-0.72)	(-0.71)	(-0.18)
Log(#ofSegments)	-0.002***	-0.002***	-0.002	-0.001	-0.001	-0.023
	(-2.61)	(-2.62)	(-0.61)	(-0.51)	(-0.49)	(-1.27)
Log(BoardSize)	0.001	0.001	0.003	0.006	0.006	0.043
	(0.57)	(0.59)	(0.65)	(1.41)	(1.42)	(1.38)
CEOFounder	0.001	0.001	0.002	0.001	0.001	0.016
	(1.04)	(1.01)	(0.57)	(0.61)	(0.59)	(0.72)
% of Outside Directors	-0.000	-0.001	0.026**	-0.002	-0.002	0.065
	(-0.18)	(-0.22)	(2.50)	(-0.47)	(-0.48)	(0.84)
Constant	0.036***	0.036***	0.017	0.100***	0.101***	-0.006
	(8.11)	(8.10)	(1.12)	(4.87)	(4.89)	(-0.06)
Observations	33,671	33,671	27,186	12,025	12,025	3,208
R-squared	0.14	0.14	0.27	0.17	0.17	0.19

Table 12: Analyst Forecast Error and Board Diversity (Continued)

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)
	Mean EPSgr	Med EPSgr	Std EPSgr	Mean Salgr	MedSalgr	Std Salgr
Diversity	0.878***	0.888***	0.012	0.811**	0.812**	0.003
	(3.33)	(3.37)	(0.26)	(2.38)	(2.38)	(0.02)
Log(Assets)	-2.622***	-2.609***	-0.213***	-2.049***	-2.052***	-0.187
	(-8.18)	(-8.14)	(-3.65)	(-4.36)	(-4.36)	(-0.81)
Logq	-5.489***	-5.456***	-0.153	-5.901***	-5.881***	0.119
	(-6.05)	(-6.01)	(-0.94)	(-4.28)	(-4.27)	(0.27)
Debt/Assets	2.598	2.549	0.390	7.022**	7.030**	0.157
	(1.19)	(1.17)	(0.87)	(2.09)	(2.10)	(0.13)
Capex/Assets	16.126**	16.580***	4.157**	26.221**	26.087**	-3.809
	(2.55)	(2.66)	(2.41)	(2.51)	(2.50)	(-1.00)
R&D/Sales	13.783**	13.736**	5.226***	38.526***	38.596***	5.440***
	(2.04)	(2.05)	(6.58)	(3.90)	(3.91)	(2.66)
Log(FirmAge)	-1.459***	-1.455***	-0.101	-1.475***	-1.478***	0.250
	(-4.00)	(-4.01)	(-1.27)	(-2.63)	(-2.64)	(1.39)
Log(#ofSegments)	0.233	0.232	0.179	-1.423	-1.403	0.415
	(0.34)	(0.34)	(1.18)	(-1.63)	(-1.61)	(1.44)
Log(BoardSize)	0.953	0.907	-0.279	0.603	0.619	-2.498***
	(0.60)	(0.57)	(-0.97)	(0.28)	(0.29)	(-2.92)
CEOFounder	1.893	1.929	0.571**	1.409	1.394	-0.501
	(1.41)	(1.44)	(2.44)	(0.72)	(0.72)	(-1.61)
% of Outside Directors	-0.611	-0.815	-0.123	-6.739*	-6.740*	-1.948
	(-0.23)	(-0.31)	(-0.25)	(-1.74)	(-1.74)	(-1.16)
Constant	49.870***	49.802***	7.241***	19.307***	19.271***	8.866***
	(3.82)	(3.81)	(8.61)	(3.83)	(3.83)	(3.78)
Observations	7,711	7,711	5,898	2,451	2,451	413
R-squared	0.14	0.14	0.13	0.22	0.22	0.40

Table 13: Board Diversity and Risk Taking

This table relates investment, leverage, as well as likelihood and M&A frequency to our proxy for board diversity. Investment is proxied by "Capex" (Column (1)), the total capital expenditures, scaled by book value of assets at the beginning of the year. Leverage (Column (2)) is measured as the total debt divided by book value of assets. Column (3) presents a logit model in which the dependent variable is equal to one if the sample firm makes an acquisition during year *t* and zero otherwise. Column (4) is the log of total number of M&As a firm has made during the sample period. Variable definitions are provided in the appendix. In all columns but column (3), we present ordinary least squares parameter estimates. All regressions include year and 2-digit SIC code industry fixed effects. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Capex (t+1)	Leverage (t+1)	Logit Model (M&A=1)	Log(total number of M&As)
Diversity	-0.000	0.001	0.010	-0.005
	(-1.30)	(1.37)	(0.43)	(-0.42)
Log(Assets)	-0.001**	0.004***	0.526***	0.225***
	(-2.15)	(5.14)	(15.90)	(14.98)
Logq	0.012***	-0.005**	0.449***	0.109**
	(9.30)	(-2.46)	(5.56)	(2.48)
Debt/Assets	-0.005	0.862***	-0.829***	-0.006
	(-1.57)	(91.88)	(-3.72)	(-0.06)
Capex/Assets	0.609***	0.066***	-0.576	-0.005
	(20.81)	(3.78)	(-0.81)	(-0.01)
Log(FirmAge)	0.000	-0.001	-0.007	-0.007
	(0.48)	(-1.05)	(-0.16)	(-0.33)
Log(#ofSegments)	0.001	-0.001	0.261***	0.063
	(1.59)	(-0.86)	(2.94)	(1.37)
Log(BoardSize)	-0.000	0.000	-0.475***	-0.065
	(-0.07)	(0.01)	(-2.99)	(-0.81)
CEOFounder	0.001	-0.009***	0.135	0.103
	(0.43)	(-2.92)	(1.14)	(1.62)
% of Outside Directors	-0.005	0.004	-0.029	0.184
	(-1.49)	(0.64)	(-0.11)	(1.24)
Constant	0.004	0.018	-4.188***	-1.071***
	(0.53)	(1.08)	(-4.74)	(-2.84)
Observations	10,051	10,033	12,308	1,989
R-squared	0.66	0.82	0.18	0.25

Table 14: Board Diversity and Firm Performance

This table relates firm performance to our proxy for board diversity. Firm performance is measured as average ROAs between year t+1 and t+3. In columns 2 to 4, we present quintile regressions. The relevant quintile is indicated on top of each column All regressions include year and 2-digit SIC code industry fixed effects. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
	Q=10th	Q=50th	Q=90th
Diversity	-0.004***	-0.001***	0.000
	(-2.61)	(-3.48)	(0.40)
Log(Assets)	0.018***	0.004***	-0.002***
	(10.25)	(8.60)	(-3.63)
Logq	0.099***	0.083***	0.099***
	(19.26)	(57.24)	(53.67)
Debt/Assets	-0.010	-0.020***	-0.014***
	(-0.77)	(-5.47)	(-3.06)
Capex/Assets	-0.008	-0.041***	-0.037***
	(-0.20)	(-3.72)	(-2.61)
R&D/Sales	-0.243***	-0.060***	-0.027***
	(-81.71)	(-72.04)	(-25.64)
Log(FirmAge)	0.012***	0.005***	0.002**
	(5.06)	(6.63)	(2.03)
Log(#ofSegments)	0.009**	0.002*	0.001
	(2.02)	(1.71)	(0.87)
Log(BoardSize)	-0.022**	-0.003	-0.003
	(-2.38)	(-1.28)	(-1.03)
CEOFounder	-0.021***	-0.010***	-0.006**
	(-2.81)	(-4.91)	(-2.25)
% of Outside	-0.012	-0.009*	-0.003
	(-0.69)	(-1.80)	(-0.57)
Constant	-0.236***	-0.058***	0.046**
	(-4.41)	(-3.87)	(2.39)
Observations	9,503	9,503	9,503
R-squared	0.339	0.234	0.320

Table 15: Board Diversity and Innovation

This table reports regressions in which the dependent variables are log of number of patent grants at firm year level (in Column (1)) and log of the number of patent citations for each patent applied in a given year (Columns (2)-(7)). Columns (2) and (3) include only the firm years with patent grants. Columns (4)-(7) include all firm years; if the firm did not apply for any patent during that year, then the number of citations is zero. Columns (3) and (5) includes the number of patents granted as control. Columns (6) and (7) also control for the patent's IPC classifications. Robust T-statistics are reported and standard errors are clustered at firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Diversity	0.014	0.020***	0.021***	0.016***	0.017***	0.016***	0.017***
	(0.70)	(3.28)	(3.40)	(3.91)	(4.13)	(3.78)	(3.91)
Log(Assets)	0.435***	0.016**	0.003	0.001	-0.014*	-0.002	-0.011
	(13.31)	(2.02)	(0.30)	(0.14)	(-1.82)	(-0.28)	(-1.31)
Logq	0.289***	0.013	0.016	-0.038**	-0.034**	-0.039**	-0.036**
	(3.93)	(0.64)	(0.81)	(-2.23)	(-2.11)	(-2.29)	(-2.21)
Debt/Assets	-0.442**	0.049	0.073	0.025	0.047	0.024	0.039
	(-2.49)	(0.61)	(0.88)	(0.40)	(0.73)	(0.36)	(0.58)
Capex/Assets	-0.489	0.715***	0.607**	0.077	-0.021	0.140	0.054
	(-0.86)	(2.60)	(2.20)	(0.38)	(-0.10)	(0.58)	(0.21)
R&D/Sales	0.200*	0.021	0.004	-0.009*	-0.012**	-0.011**	-0.012**
	(1.95)	(0.38)	(0.09)	(-1.90)	(-2.15)	(-2.10)	(-2.21)
Log(FirmAge)	0.070**	0.005	0.006	0.005	0.006	0.005	0.006
	(1.97)	(0.62)	(0.75)	(0.89)	(1.02)	(0.84)	(0.95)
Log(#ofSegments)	0.118	-0.029*	-0.029*	-0.024**	-0.024**	-0.023**	-0.024**
	(1.62)	(-1.87)	(-1.87)	(-2.32)	(-2.49)	(-2.22)	(-2.33)
Log(BoardSize)	-0.199	-0.140***	-0.130***	-0.066**	-0.053**	-0.064**	-0.056**
	(-1.47)	(-3.41)	(-3.13)	(-2.36)	(-2.06)	(-2.22)	(-2.06)
CEOFounder	0.143	-0.062*	-0.058	-0.071**	-0.066**	-0.073**	-0.070**
	(1.60)	(-1.69)	(-1.52)	(-2.28)	(-2.04)	(-2.24)	(-2.10)
% of Outside Directors	0.540***	-0.065	-0.076	0.017	0.007	0.012	0.006
	(3.08)	(-1.15)	(-1.37)	(0.32)	(0.13)	(0.21)	(0.11)
# of Patents			0.015		0.018***		0.012*
			(1.61)		(2.86)		(1.65)
Constant	-1.195	1.164***	1.165***	0.625***	0.616***	0.674***	0.665***
	(-0.94)	(12.64)	(12.73)	(8.78)	(9.41)	(8.86)	(9.30)
Observations	3,263	22,109	22,109	90,834	90,834	88,779	88,779
R-squared	0.53	0.05	0.05	0.11	0.11	0.10	0.10