Board Diversity, Firm Risk, and Corporate Policies

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Abstract

We examine the impact of director diversity on corporate policies and risk. Using a multi-dimensional diversity index, we find that board diversity leads to significantly lower realized return volatility. This is largely due to diverse boards adopting less risky financial policies. However, consistent with diversity fostering more efficient (real) risk-taking, firms with greater board diversity invest more in R&D and produce more and better innovation. Although diversity is associated with higher board frictions, performance tests indicate that the gains from diversity outweigh the costs. Instrumental variable tests that exploit exogenous variation in firm access to the supply of diverse nonlocal directors indicate that these relations are causal.

JEL classifications: G30, G32, G34

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Diversity on corporate boards has gained substantial political and media attention in recent years. Since 2008, six countries have adopted binding quotas to promote gender diversity on boards and several others have non-binding quotas or are considering legislation (Smith, 2014).[1] The economics and social psychology literatures have long recognized that diversity matters for team decision-making (Sah and Stiglitz, 1986, 1991; Moscovici and Zavalloni, 1969). In fact, there are numerous studies that examine the impact of gender diversity of boards, which is typically advocated on the grounds of attaining greater social equality or deepening the director talent pool.[2] However, it is not clear whether *gender* is the most important dimension of director diversity and there is far less research investigating other aspects of diversity.[3] Moreover, most studies investigate a narrow set of corporate outcomes, typically focusing on firm performance.[4]

The organizational behavior literature suggests that team diversity has many facets (Williams and O'Reilly, 1998). Therefore, we take a broader approach to analyzing the impact of director diversity. Namely, we construct an index based on *multiple* dimensions of diversity to test its impact on various corporate policies and outcomes related to firm risk.[5] We are agnostic about which aspects of diversity should matter for corporate outcomes and, admittedly, are partly driven by data availability in our choices. Our index reflects six distinct dimensions of diversity, including both demographic and cognitive measures that are observable and widely available. These include: gender, age, ethnicity, educational background, financial expertise, and board experience.

[1] The six countries include: Norway, Finland, Iceland, Belgium, the Netherlands, and Italy.
[2] Terjesen, Sealy, and Val Singh (2009) review over 400 studies on gender diversity incorporate boards.
[3] Carter, Simkins, and Simpson (2003) and Anand and Jog (2014) define diversity based on race and gender. Minton, Taillard, and Williamson (2014) investigate diversity in financial expertise of the board, while Anderson, Reeb, and Zhao (2011) create a measure of board heterogeneity based on several dimensions.
[4] See, for example, Carter, Simkins, and Simpson (2003), Adams and Ferreira (2009), Farrell and Hersch (2005), and Ahern and Dittmar (2012).
[5] While we favor the index-based approach due to potential ambiguities in the interpretation of principal components, as shown in the online appendix, we obtain consistent results when we rely on the principal component of our diversity factors. Indeed, these supplemental tests yield somewhat stronger results statistically.

Consistent with our empirical approach to measuring diversity, Baranchuk and Dybvig (2007) develop a model where board diversity encompasses multiple dimensions related to directors' preferences, incentives, and access to information. An important takeaway of this model is that the combined effect of different sources of diversity determines the attainment of the consensus necessary for the well-functioning of the board, more so than any individual dimension.

Our focus on corporate policies and outcomes related to firm risk stems from studies that suggest team diversity moderates group decisions (Sah and Stiglitz, 1986, 1991; Moscovici and Zavalloni, 1969). On the one hand, the evidence in social psychology studies supports this view (Kogan and Wallach, 1966), but no systematic evidence of these effects exists for the functioning of corporate boards. Our conjecture that diversity fosters moderation in board decisions is similar to the intuition of Adams, Almeida, and Ferreira (2005), who show that firm risk increases with CEO's power. Admas et al. argue this is because powerful CEOs have the ability to make unchecked decisions, which leads to more erratic choices that result in more extreme outcomes and ultimately greater risk. Similarly, we argue that homogeneity of preferences, incentives, and views among board members would also result in more idiosyncratic decisions, as they attract less scrutiny within the board. This lack of internal governance would ultimately manifest in the form of more volatile outcomes.

On the other hand, it is plausible that diversity would exacerbate conflicts among board members and disrupt the board's decision-making process. This would make the attainment of consensus harder and the resulting outcomes more erratic (Arrow, 1951). This view of the world suggests that board diversity would lead to higher rather than lower firm risk and outcome volatility. Ultimately, whether board diversity results in more or less volatile corporate outcomes is the empirical question at the heart of our analysis.

Using our multidimensional index, we show that greater board diversity is associated with lower realized firm risk. A one standard deviation increase in diversity is associated with a decrease in annualized return volatility of about 1%, which is nearly equal the magnitude associated with a similar increase in board size and one-third the magnitude of a similar increase in leverage. Breaking down the index by its components reveals that no single element of diversity drives the relation between the index and firm risk, consistent with the theory of Baranchuk and Dybvig (2007). Although each component of the diversity index is negatively related to firm risk, no individual effect is significant on its own. Moreover, the combined effect of the index components on firm risk remains negative and significant when we in turn exclude any individual component.

Establishing causality from our baseline findings is particularly challenging due to the endogenous nature of board composition (Hermalin and Weisbach, 1998; Adams, Hermalin, and Weisbach, 2010). To do so, we propose a novel instrumental variable approach that builds on the work of Giroud (2013) and may have wider applications in future studies of board composition. In particular, our instruments exploit the cross-sectional and time-series variations in the existence and intensity of one-stop flight connections between the locations of potential director home addresses and firm headquarters. Our main instrumental variable is the diversity (based on our index) in the pool of potential nonlocal directors that reside within a non-stop flight from the firm's headquarters. Overall, in line with our baseline results, the IV estimates provide strong and consistent support for the notion that greater board diversity *causes* lower firm risk.[6]

Notably, our main instrumental variable is not mechanically correlated with the *number* or *intensity* of non-stop flights to the headquarters from other cities in the U.S., which would require non-stop routes to hail predominantly from cities with more diverse director populations. Nor is it mechanically correlated with the size of the director population of the cities that are within a non-stop flight, since larger cities are not populated with more or less diverse potential directors according to our index. For the *exclusion restriction* to be violated in our context, any omitted variable that determines firm risk must also determine the existence of non-stop flights between firm headquarters and other cities in the U.S. as well as the diversity of the directors that reside at these locations. It seems unlikely that this may be the case and the exclusion restriction would be violated. Moreover, consistent with the *relevance condition* of our instrument, we show that actual board diversity is indeed significantly positively related to the diversity of potential nonlocal directors that reside one non-stop flight away from the firm headquarters. Importantly, supplemental evidence supports the conceptual underpinnings of our IV approach. Namely, we show that the geographical makeup of *actual* nonlocal board members of the firms in our sample reflects the degree of non-stop flight connectivity between the firm headquarters and the domicile of *potential* nonlocal directors.

In the subsequent analysis, we focus on corporate financial and investment policies to gain some insights on the link between board diversity and return volatility. To that end, we investigate how corporate financial and investment policies vary with board diversity. We find

[6] This finding is in contrast to that of Adams and Ragunathan (2015), who find that gender diversity is positively related to risk taking in the banking sector around the financial crisis, which they attribute to a selection effect. Moreover, it is worth noting that our sample excludes financial institutions, where the purported selection effect of Adams and Ragunathan may be prevalent due to the specific nature of the underlying business.

that firms with greater board diversity engage in less risky financial policies, consistent with the lower return volatility resulting from board diversity. In particular, firms with diverse board rely less on debt capital and maintain greater dividend payouts. However, these patterns in financial policies do not come at the expense of firm investment intensity. In fact, if anything, firms with more diverse boards tend to invest more aggressively in research and development (R&D).

The R&D results are particularly interesting because a greater focus on innovation activities is typically viewed as inherently risky and could in principle increase firm fundamental volatility. Nonetheless, psychology and organizational behavior studies also suggest that diversity enhances the breadth of perspectives and in turn problem-solving skills of groups (Hoffman and Maier, 1961). Empirical studies support this view, showing that diverse teams are better problem solvers (Hong and Page, 2004) and are also more innovative (Gao and Zhang, 2014). Therefore, we expand on these findings by investigating how board diversity affects innovation output and success. Supporting the view that diversity fosters more efficient investment in innovation activities, we find that firms with diverse boards produce more and better innovation, as measured by firms' patenting activity.

Next we examine the potential costs of board diversity. In particular, we evaluate the claim that diversity can lead to more conflicts and reduce workforce cohesion (Becker, 1957; Hambrick, Cho, and Chen, 1996; Li and Wu, 2014). We find some evidence in support of this view in the domain of corporate boards. Specifically, board attendance is lower and director turnover is higher among diverse boards.[7] These findings suggest the existence of a cost-benefit tradeoff at the heart of corporate board composition decisions and may help explain why not all firms have equally diverse boards. However, our instrumental variable estimates indicate that the

[7] This finding is in contrast to Adams and Ferreira (2009), who show that firms with female directors have better board meeting attendance and monitor CEOs more closely.

benefits of greater diversity, on average, outweigh the costs, as both firm operating performance and asset valuation multiples increase with board diversity.[8]

Our study makes several contributions to the literature on the impact of board diversity and the importance of board composition more generally. First, our findings add to existing studies on the impact of board diversity by expanding both its definition and the corporate outcomes examined. Consistent with the theory of Baranchuk and Dybvig (2007), we show that the multiple facets of board diversity *jointly* explain corporate policies and the resulting firm risk, more so than any single aspect of diversity. Moreover, while survey evidence indicates corporate officers tend to believe that board diversity is beneficial, they seldom are able to articulate why (Krawiec, Conley, and Broome, 2013). Our evidence supports management's beliefs and shows that board diversity reduces corporate risk, by limiting financial risk taking and increasing the efficiency of innovation activities, and ultimately leads to better performance.

Moreover, we contribute to the literature on boards more generally by proposing a new method to identify the causal effects of board composition. The difficulties with drawing causal inferences in this literature due to the endogenous nature of board composition have long been recognized (Hermalin and Weisbach, 1998). Hence, to gain insights about causality, researchers frequently rely on regulatory changes that affect board composition such as Sarbanes Oxley (Chhaochharia and Grinstein, 2009) or the implementation of gender quotas (Ahern and Ditmar, 2012). Semi-natural experiments that rely on regulatory changes, however, have recently come under more intense scrutiny by researchers who highlight the potential pitfalls of this

[8] This finding is consistent with Carter, Simkins, and Simpson (2003), who show a positive association between demographic diversity and firm value and contrasts with much of the finance literature on gender diversity, which finds either negative (Adams and Ferreira, 2009) or no impact (Farrell and Hersch, 2005) of female directors on firm performance and that implementing gender quotas is a value-destroying endeavor (Ahern and Dittmar, 2012).

experimental design (Hennessy and Strebulaev, 2015; Chelma and Hennessy, 2015). Our novel IV approach provides a framework for making causal inferences under more general circumstances, which can be used to complement and validate evidence from alternative approaches. Our method is similar in spirit to that of Knyazeva, Knyazeva, and Masulis (2013), who use the number of firms within a sixty mile radius of the firm headquarters as a proxy for the *local director* supply. An important difference, however, is that we exploit variation in the composition of the supply of *nonlocal directors* available to firms via non-stop flight routes. The main benefit of our instrument is that its variation stems from route decisions by airlines and dwelling decisions by directors, rather than firms' location choices. This is particularly important because it alleviates concerns that the firm's inherent risk profile or its drivers determine headquarters location choices and, thus, its desired access to the local director pool.

1 Data and sample construction

1.1 Sample construction

Our sample comprises non-financial and non-utility firms included in the intersection of the Execuomp and RiskMetrics databases for the years 1996 to 2010, in total 20,933 firm-year observations. Our main outcome and control variables are based on data available in the Compustat and CRSP databases. In addition, we utilize the NBER patent database and data on patenting activity from Kogan, Papanikolaou, Seru, and Stoffman (2014) in our tests pertaining firm innovation activities.

To construct the board diversity index, we use data on director characteristics. These are mostly from RiskMetrics, which includes information on director age, gender, race, financial expertise, and the number of directorships. For individuals with missing race data from

RiskMetrics, we use an online standardized algorithm to map names into ethnicities.[9] In addition, we collect information on directors' educational background (i.e., college degrees) from the BoardEx database. We are able to construct the board diversity index for about 70% of the original firm-year observations and, after dropping observations with missing values for the control variables, our final sample consists of 14,391 firm-year observations. The loss of observations is mainly due to the required data on director and CEO characteristics.[10] Table 1 reports sample summary statistics.

1.2 Diversity Index

Our index of board diversity is based on six factors. Our choice of factors is driven by the literature on diversity as well as data availability. Existing studies on diversity often make the distinction between demographic (i.e. observable) and cognitive (i.e. unobservable) characteristics (Maznevski, 1994; Milliken and Martins, 1996). We include three factors that capture potentially different aspects of each of these broad classes. However, we recognize these categories are not necessarily mutually exclusive, since demographic characteristics can be related to, for example, socioeconomic status. Factors included among demographic diversity are gender, age, and ethnicity, while institution of college education, financial expertise, and board experience are included as proxies for cognitive factors.

We construct the index as follows. For each board in each year, we calculate the percent of the board that is female (PCT_FEMALE), the mean number of other boards in the S&P1500 on which current members serve (NUM_BOARDS), the standard deviation of directors' age (STDEV_AGE), and Herfindahl concentration indexes for ethnicity (HHI_ETHNICITY),

[9] Our results are robust if we instead drop the corresponding observations with missing RiskMetrics data.
[10] In particular, requiring director data on Bachelor's degree institution reduces the sample size to 18,513 observations; for outside board seats to 16,296; for ethnicity (i.e., non-missing or non-"Other" in RiskMetrics) to 14,457. Not requiring these data filters increases the sample size to as much as 18,513 observations (about 90% of the original data) and does not alter the sign and significance of our baseline results.

institution where board members received their Bachelor's degree (HHI_BACHELOR), and financial expertise (HHI_FINEXPERT).[11] In particular, HHI_ETHNICITY is calculated using ethnic categories of the board member as provided by RiskMetrics. The categories of ethnicity are White/Caucasian, African-American, Hispanic, Asian, and Other. HHI_BACHELOR is calculated using the institution that granted the Bachelor's degrees to each board member, obtained from BoardEx. For example, if two board members received Bachelor's degrees from Harvard, one board member from Stanford, and three from Yale, then HHI_BACHELOR = $(2/6)^2 + (1/6)^2 + (3/6)^2 = 0.388$. Note that for HHI_BACHELOR, we do not take into account the year of graduation and rather focus on the institution where the board member received the degree. The intuition is that HHI_BACHELOR is intended to reflect similarities in pedigree or training which would stem from the culture of the institution granting the degree. Lastly, we calculate HHI_FINEXPERT using the binary variable for financial expertise as provided by RiskMetrics. Thus, if four out of ten board members are financial experts, then HHI_FINEXPERT = $(4/10)^2 + (6/10)^2 = 0.52$.

Next, we normalize each component by its mean and standard deviation, so that they are comparable, and then equally-weight each factor to construct the board diversity index:

$$\begin{aligned}\text{BOARD\_DIVERSITY} = {} & \text{PCT\_FEMALE} + \text{STDEV\_AGE} - \text{HHI\_ETHNICITY} \\ & - \text{HHI\_BACHELOR} - \text{HHI\_FINEXPERT} + \text{NUM\_BOARDS}\end{aligned} \tag{1}$$

We subtract the HHI-based measures because higher values indicate higher concentration of the corresponding factor among the board members and, therefore, lower diversity.[12] Upon

[11] We obtain almost identical results if instead of an STDEV_AGE, we calculate use the HHI of age by age groups, i.e., 20-29, 30-39, 40-49, etc. We favor using STDEV_AGE because it does not induce mechanical changes in age diversity due to directors transitioning from one age bucket to the next.

[12] Furthermore, we note that instead of calculating an HHI measure for gender, we instead calculate the percent of the board that is female due to the nature of the data. The average board is 11% female, the 95th percentile is 27% female, and 28% of boards are all-male. Thus the concentration measures would be heavily skewed and may not be

inspection of Table 1, we notice that the average board exhibits much more diversity in age and schooling, than along ethnicity or financial expertise. Figure 1 shows the average firm diversity index quintile by headquarter state. The figure indicates that firms located in states in the Midwest and Northeast have the greatest board diversity. In addition, boards of firms in Georgia and Washington tend to be diverse on average. Figure 2 displays the average board diversity by state for each of the index's underlying components.

Table 2 reports the correlations between each of the diversity index components and the index. In general the various components of board diversity tend to be positively correlated with one another. The exception is age diversity, which is negatively correlated with the other components of diversity. Thus, while all components are positively correlated with the index, mechanically, age diversity displays the lowest correlation.

1.3 Instrumental Variables

In our main analysis, we focus on supply-based instrumental variables to capture exogenous variation in board diversity. Subsequent robustness tests complement this analysis by using demand-driven instrumental variables instead. The following discussion describes how we construct our main IV and examines the conceptual underpinnings of its relevance.

1.3.1 Nonlocal director supply instruments

We construct two instruments that capture variation in the supply of *nonlocal* directors available to firms: the weighted supply and the weighted diversity of the supply of nonlocal directors that reside one non-stop flight away from the firm headquarters. Our main tests utilize the second of these two instruments.

as meaningful as using the percentage of female board members. However, we note that using the HHI of gender or using an indicator for whether or not the board contains a female member yields almost identical overall results.

Although the logic motivating our approach is similar to Knyazeva, Knyazeva, and Masulis (2013), we rely instead on the cross-sectional and time-series variations in the composition of the supply of nonlocal directors available to firms via non-stop flight routes. We purposefully exclude local directors because access to the local pool is more likely correlated with firm headquarters' location decisions, which may in turn depend on the firm's risk profile. In contrast, variation in firm access to the nonlocal director supply stems from decisions about airline routes and director dwellings, rather than firm headquarters location. As such, nonlocal director supply-based instruments seem more plausibly exogenous with respect to firm risk-taking than local supply-based measures.

To construct our measure, we begin by defining as nonlocal directors those who reside in counties at least 150 miles away from the firm headquarters county, but within 50 miles of airports connected via non-stop flights to airports within 50 miles of the firm headquarters county. Then, we collect data on the geographic distribution of potential director domiciles. Since the entire pool of *potential* directors is not observable, we use the population of individuals serving as *actual* directors and executives of all firms in our sample in a given year as a proxy for the pool of directors potentially available to each firm.

To collect potential director domicile information, we perform "people searches" using the LexisNexis public records database for the union of all individuals who are either directors included in the RiskMetrics database or executives included in the Execucomp database for non-financial, non-utility firms for the years 1996 to 2010. LexisNexis public records database gathers data from numerous sources including mortgage records, deed transfers, tax assessment records, driver's license records, voter registrations, and social security administration records to construct a profile for each individual. Included in each profile is a historical list of addresses with relevant dates for the individual. After removing addresses associated with post office boxes and places of work, we use the zip codes from these addresses along with the dates to construct a time series of zip code-level locations for each individual uniquely identified in the LexisNexis database. After creating these time series, we merge them back with the RiskMetrics and Execucomp datasets to be sure that we only include individuals' locations in our instrument construction while these individuals hold positions as executives or directors.

Our search and collection methods follow those outlined in Yonker (2016), and Pool, Stoffman, and Yonker (2015). Yonker (2016) collects social security registration information on executives, while Pool, et. al. (2015) collects address information for mutual fund managers. The probability of a unique match in LexisNexis increases with the amount of information that researchers have on individuals. Information, such as age, a unique first or last name, or middle initial all increase the likelihood of uniquely identifying executives/directors.

There are 40,081 unique individuals who are executives and/or directors included in these databases during our sample period. We identify zip codes of the individuals' home addresses for 383,895 director/executive-year observations, which is 82% of the full sample director/executive-year observations.

In addition to the geographic distribution of potential directors, our instruments rely on airline route data. Following Giroud (2013, 2015), we obtain airline routes data from the T-100 Domestic Segment Database for the period 1995 to 2010, which is compiled from Form 41 of the U.S. Department of Transportation (DOT) and includes all flights that have taken place between any two airports in the U.S.[13] The database contains monthly data for each airline and route

[13] All airlines operating flights in the U.S. are required by law to file Form 41 with the DOT and are subject to fines for misreporting.

(segment) including origin and destination airports, flight duration (ramp-to-ramp time), scheduled departures, performed departures, number of passengers, and aircraft type.

We use the T-100 data to count the number of non-stop flights connecting any two U.S. counties in each month between 1995 and 2010. In particular, we begin by identifying all airports within a 50-mile radius of each U.S. county population-weighed centroid. Then, for each pair of counties whose population-weighed centroids are at least 150 miles apart, we count the number of monthly direct flights connecting the airports pairs associated with each county pair. Lastly, to weight the supply of non-local directors available to the firm, we calculate the average number of monthly flights connecting each county pair in each calendar year.

To construct our instruments, we merge the county pair-level monthly measure of non-stop flight connections with the data on director residence described above as well as firm headquarters' counties based on zip codes from the CRSP-Compustat historical header file corrected for headquarters changes. Our main instrument is the weighted diversity (based on our index) of all potential directors in the U.S. that reside in a county with at least one daily non-stop flight between the director residence and the firm headquarters. In particular, we weight each potential director-firm-year observation by the average number of monthly non-stop flights between director and firm counties in a given year.

1.3.2 IV Validation Test: Non-stop flight connections and firm hiring of nonlocal directors

Our main tests utilize the diversity of the weighted supply of non-local directors within a direct flight of the firm headquarters. The conceptual premise of our IV specifications is that the existence of non-stop airline routes between director domiciles and firm headquarters would affect the geographic composition of the firm's board. Therefore, access to the supply nonlocal directors and its diversity would determine the diversity of the firm's actual board. In the spirit of

Knyazeva, Knyazeva, and Masulis (2013), this link rests on the assumption that directors are more likely to serve on boards of firms that entail lower travel costs and thus, if a non-stop flight exists between the firm headquarters and a potential director domicile, that individual is more likely to serve as a director on the firm board. Here, we explicitly test this hypothesized channel: are individuals more likely to serve as directors of a firm if non-stop flights connect their domicile and the firm headquarters locations?

To examine this question, we estimate the following model, using a county pair-year as the unit of observation:

$$Y_{ijt} = \beta_1 (N_{it}) + \beta_2 (N_{it} \times D_{ij}) + \beta_3 (N_{it} \times D_{ij} \times F_{ijt}) + \gamma \boldsymbol{X}_{it} + \lambda_{ij} + \lambda_t + \varepsilon, \tag{2}$$

where Y_{ijt} is equal to the log of one plus the number of individuals living in county i and serving as directors of firms headquartered in county j during year t, N_{it} is the log of one plus the number of individuals from county i serving as directors and/or executives to *any firm* during year t, D_{ij} is an indicator equal to one if the population-weighted centroid of county i is more than 150 miles away from that of county j, F_{ijt} is log of one plus the monthly average number of non-stop flights between counties i and j in year t, $\boldsymbol{X}_{it}$ is a vector of time-varying average characteristics of firms headquartered in county j during year t, λ_{ij} is a county-pair fixed effect, and λ_t is a year fixed effect.

Alternatively, with firm-county-year as unit of observation, we estimate the following model:

$$Y_{ijkt} = \beta_1 (N_{it}) + \beta_2 (N_{it} \times D_{ij}) + \beta_3 (N_{it} \times D_{ij} \times F_{ijt}) + \gamma \boldsymbol{X}_{kt} + \lambda_{ij} + \lambda_k + \lambda_t + \varepsilon, \tag{3}$$

where Y_{ijkt} is equal to the log of one plus the number of individuals living in county i and serving as directors of firm k headquartered in county j during year t, N_{it} is the log of one plus the number of individuals from county i serving as directors and/or executives of *any firm* during year t, D_{ij} is an indicator equal to one if the population-weighed centroid of county i is more than

150 miles away from that of county j, F_{ijt} is log of one plus the monthly average number of non-stop flights between counties i and j in year t, $\boldsymbol{X}_{kt}$ is a vector of time-varying firm characteristics during year t, λ_{ij} is a county-pair fixed effect, λ_k is a firm fixed effects, and λ_t year fixed effects.

Naturally, we expect $\beta_1 > 0$. Similar to Knyazeva, Knyazeva, and Masulis (2013), we also expect that individuals are less likely to serve as directors of firms headquartered farther than a reasonable driving distance (i.e., $\beta_2 < 0$). However, crucial for the premise of our IV approach, we posit that non-stop flight connectivity between firm and director locations should temper the effect of physical distance (i.e., $\beta_3 > 0$).

Table 3 presents the results of these tests. Columns 1 and 2 report OLS estimates of the county pairs-level model, i.e., equation (2) above, with standard errors clustered by county-pair. Columns 3 and 4 report estimates of the firm-level model, i.e., equation (3) above, with standard errors clustered by firm.

The evidence in the table provides strong support for our main conjectures. The coefficient on N_{it} is positive and significant. Hence, the number of directors who reside in county i and serve in county j (firm k) increases with the supply of potential directors residing in county i. However, physical distance between firm and potential director counties (D_{ij}) greatly reduces the strength of the aforementioned relation, as indicated by the negative coefficient on the interaction between D_{ij} and N_{it}. Thus, controlling for the county supply of potential directors, individuals are significantly less likely to serve as directors in counties (firms) that are beyond a reasonable driving distance (150 miles). In turn, crucially for the validity of our IV, the coefficient on the triple interaction between non-stop flight connectivity (F_{ijt}), D_{ij}, and N_{it} is positive. Therefore, physical distance between firm headquarters and director domiciles becomes increasingly less important as non-stop flight connectivity between locations increases. In other words, non-stop flight connectivity between director domiciles and firm headquarters increases the likelihood of a firm-director match.

The economic magnitude is also very large. For the average director-county and firm-county pair, a one standard deviation increase in the number of non-stop flights is associated with a *ten-fold* increase in the number of directors that serve on boards of firms headquartered in the given county. The economic magnitude is relatively large even for counties that are heavily populated with directors (i.e., at one standard deviation above the mean). For counties with high director population, a one standard deviation increase in the availability of non-stop flights to firms' headquarters increase the number of director-firm matches by 25%.

Overall, the evidence in Table 3 strongly supports the conjecture that the geographic origin of the firm's nonlocal directors depends directly on the non-stop flight connectivity between the firm headquarters and the director domicile. Thus, consistent with our hypothesized channel and IV approach, non-stop flight access to the diversity of nonlocal directors would affect the diversity of the firm's actual board. This validates the premise of our IV and alleviates concerns that our subsequent results from the first-stage IV estimation are spurious or due to other omitted variables.

2 Empirical Evidence

2.1 Who is Diverse?

We first analyze the correlation between the diversity index and various firm characteristics to understand which firms employ more diverse sets of directors. Table 4 reports the results of an OLS regression where the dependent variable is the diversity index. The independent variables consist of various firm-year specific characteristics (book assets, market-to-book ratio, leverage, etc.), CEO characteristics (tenure, position on the board, and the General Ability Index of

Custodio, Ferreirra, and Matos (2013)), firm location and life-cycle characteristics (headquarter state and year of IPO). In addition, we also control for year and industry (Fama-French 49) fixed effects and cluster the standard errors at the firm level. The goal of this specific exercise is not to prove a causal relation between the variables, but rather to gain a better understanding of the types of firms that tend to have a diverse board of directors.

The results indicate that larger and older firms that have more growth opportunities are associated with greater board of director diversity. In addition, larger boards and those with younger members tend to be associated with a higher diversity index.[14] In addition, CEOs with longer tenures tend to be associated with less diverse boards, while those CEOs who are also the Chair or President of the Board tend to be associated with more diverse boards. Furthermore, CEOs with more general skills (higher value of the General Ability Index) are associated with more diverse boards.

2.2 Diversity and Firm Volatility

Panel A of Table 5 reports the results of OLS regressions estimated at the firm-year level where the dependent variable is the annualized stock return volatility. We measure return volatility using both raw and idiosyncratic returns at both the daily and monthly levels of observation. Idiosyncratic returns are estimated using the market model. All models include a host of firm and CEO-level controls as well as year and industry (Fama-French 49) fixed effects. In addition, since we will later construct instruments for diversity that are partially based on conditions at the headquarter location, we include six control variables to capture characteristics and economic growth in the area of the headquarters: county per capita income growth, county

[14] Note that while age is a component of our diversity index, it is measured as the spread in the ages of the members, so it is not obvious whether the average age of the board members should be positively or negatively associated with diversity.

population growth, log of county per capita income, log of county population, percent clear weather days, and the *Diversity Index* of the directors located within 150 miles of the headquarter county. Standard errors are clustered at the firm level. In addition, for ease of interpreting economic magnitudes, all of the independent variables in the regression, including the Diversity Index, are normalized to have a mean of zero and standard deviation of one.

In Panel A, across all measures, higher board diversity is associated with lower realized stock return volatility. This is supports the hypothesis in the literature on team diversity and risk taking that predicts more diverse groups would make more moderate decisions, which are ultimately reflected in realized volatility. The coefficient estimate on the Diversity Index indicates that a one standard deviation increase in the index is associated with a decrease in volatility of 0.65 to 0.98 percentage points. The economic magnitude of the effect of diversity in column 1 is similar to the magnitude of an equivalent increase in board size. Market leverage, not surprisingly, has one of the largest economic effects on return volatility. The analysis in the remaining columns shows that these results are consistent across different measures of realized firm volatility.

It is possible that the negative association between diversity and firm volatility in Panel A may be explained by omitted variables that are fixed at the firm-level, such as a firm culture for example. We therefore repeat the above exercise using firm fixed effects in Panel B to purge the effect of any time-invariant firm-level omitted variables. We continue to find that there is a negative association between the board diversity index and all four measures of firm stock return volatility. This evidence suggests that the relation between firm volatility and board diversity is not due to a spurious correlation between potential time-invariant components of board diversity and corporate risk-taking style.

While the results in Table 5 show a negative correlation between the diversity index and firm stock return volatility, it is not clear whether a single component of the index is responsible for the overall effect or it is the joint effect of different types of diversity that matters. We explore this question in more detail in Table 6, which reports the results of OLS regressions where the dependent variable is the total daily stock return volatility for a firm in a given year.[15]

The main independent variable in Panel A columns 1 through 6 is each of the six components of the index individually. While all six components have a negative correlation with return volatility each one is statistically insignificant on its own. Similarly, when all components are included in the same model, in column 7, each has a negative coefficient but none is statistically significant. The results are consistent with the hypothesis that each component captures a different dimension through which diversity affects the stock return volatility of the firm. However, each component on its own does not have a statistically significant effect on volatility.

To further corroborate this hypothesis and to ensure that the main result is not merely due to any one component, we construct the *Diversity Index* while omitting in turn one of the individual components. We analyze how this modified index and the omitted component are associated with firm risk in Table 6 Panel B. We find that the diversity index omitting any one of the components retains not only its statistical significance, but also its economic magnitude. Furthermore, the omitted factor coefficient on its own is not statistically significant in explaining firm volatility. This suggests that it is the aggregated effect of the different sources of diversity to be important for board decision-making.[16] So, while some boards may be homogenous with respect to one factor, the general lifetime experience of the directors could be quite different, as

[15] Similar to Table 4, the results are robust to defining return volatility using either monthly returns or idiosyncratic returns. All models include year and firm fixed effects and standard errors are clustered at the firm level.
[16] We obtain similar results when we instead rely on principal component analysis to extract the common component in the variations of the various dimensions of diversity, as shown in Tables A.9 and A.10 of the internet appendix.

measured by other aspects, and this would have a large impact on firm risk taking propensity. Other boards may be quite different with respect to the training of their directors, for example drawing members from schools with very different cultures (e.g., Harvard vs. MIT), but could lack diversity along all other dimensions. The finding that the index retains its relation with risk when we exclude each of its components suggests that the totality of differences in backgrounds, experiences, and preferences matters for board decisions, as opposed to one particular aspect.

2.3 Instrumental Variables

Thus far, we have not claimed any causal relation between board diversity and firm stock return volatility. Naturally, there is likely an endogenous relation between the board diversity and firm risk-taking that simple OLS estimation cannot accommodate. As explained in Section 1.3, we rely on an instrumental variable approach to account for the endogenous nature of the relation between board diversity and firm risk taking.

Table 7 reports the results of a two-stage least squares instrumental variables regression where the dependent variable in the first stage is the firm's *Diversity Index* in a given year and the dependent variable in the second stage is the firm's total daily stock return volatility. As before, the results are robust to defining return volatility using either monthly returns or idiosyncratic volatility. In all models, we include firm headquarter county, industry (Fama-French 49), year fixed effects, and cluster the standard errors at the firm level.

As previously discussed, our main instrument is the diversity of the supply of potential nonlocal directors available to the firm via a nonstop flight. Thus, our identification relies on variation in direct airline routes and geographical distribution of potential director demographics. These two sources of variation depend to some degree on the socioeconomic conditions around firms' headquarters. For this reason, like in prior models, we continue to include six control variables that capture time-varying characteristics and economic growth in the county of the firm headquarters: county per capita income growth, county population growth, log of county per capita income, log of county population, percent clear weather days, and the *Diversity Index* of the directors located within 150 miles of the headquarter county.

The first stage estimation results show that the instrument has a positive and statistically significant (at the 1% level) effect on the board *Diversity Index*. The *t*-statistic on the first stage instrument is 2.88 and the F-statistic is greater than 10, which passes the "weak instrument test" of Stock and Yogo (2005). In line with the premise of our empirical strategy and earlier validation tests, this suggests that the diversity among actual board members of a firm strongly depends on the diversity of the supply of potential *nonlocal* directors to which the firm has access via nonstop flights.

The second stage estimates in Table 7 are in line with our baseline results. In particular, the evidence shows that the board diversity index instrumented with the diversity of the nonlocal director supply available to the firm has a negative and statistically significant relation with stock return volatility. This suggests that at least in part our baseline results are due to a *causal* inverse relation, whereby greater diversity in the background of directors on the firm board leads to less volatile outcomes, as measured by realized stock return volatility.

2.4 Diversity and Firm Policies

Having shown that board diversity leads to lower firm risk, we now ask how diverse boards reduce firm risk. We do so by investigating the impact of board diversity on firm financing and investment policies. Table 8 reports the results of the second stage of a 2SLS instrumental variables regression where the second stage dependent variables are various firm policies: net book leverage, net market leverage, dividend-to-asset ratio, CAPEX-to-asset ratio, and R&D-to-

asset ratio. The first stage for all models consists of the *Diversity Index* regressed on our main instrument as well as all other controls (not shown for brevity). All models in Table 8 follow the specifications of those in Table 7.

After instrumenting for the *Diversity Index*, our second-stage estimates indicate that board diversity leads to policies typically associated with lower financial risk, consistent with our earlier results on stock return volatility.[17] Namely, an increase in board diversity results in a statistically significant reduction in financial leverage and increase in dividend payout adopted by the firm. On average, a one standard deviation increase in the board (instrumented) diversity is associated with a 1.8 – 3.5% less net debt financing and a more than a 1% increase in dividend payouts by the firm.

Interestingly, despite lower reliance on debt financing and greater dividend payouts, we also find that greater board diversity results in more aggressive investment policies. In particular, on average, firms with more diverse boards have higher R&D investment intensity. The R&D results are especially intriguing, because investment in R&D is typically thought of as fundamentally riskier. However, researchers have also suggested that diverse backgrounds among group members can lead to more efficient risk-taking by fostering original and innovative ideas (Hoffman and Maier, 1961). In the next section, we investigate this issue further.

2.5 Diversity and Innovation

To test whether board diversity leads to more innovative outcomes, we follow the same approach as in the previous section, by instrumenting for board diversity. However, we use as outcome variables measures of both quantity and quality of firm innovation output. Specifically, we use the log number of patents to measure the quantity of innovation, the ratio of patents to

[17] Like in Table 7, the first stage results (not shown for brevity) show that the instrument has a positive and statistically significant association with the Diversity Index, with a t-statistic for the instrument greater than 3.

R&D to measure the effectiveness of R&D expenditure, the log number of patent citations to measure the quality of the innovation, and the log number of citations per patent as an alternative measure of patent quality.

After instrumenting for the *Diversity Index*, we find that board diversity has a positive and statistically significant effect on firm innovation quantity and quality. Not only is board diversity associated with a higher quantity of innovation, as measured by total number of patents, but also with a higher quality of innovation, as measured by the patent citations. Moreover, firms appear to be more efficient in generating innovation when their boards are more diverse, as evidenced by the positive relation of the *Diversity Index* with patents per dollar of R&D (column 3).[18]

The estimates imply that the economic magnitude of the effect of diversity on innovation output is large. A one standard deviation increase in board diversity is associated with nearly a doubling of the log-number of patents, which corresponds to a 60 percent change relative to the sample standard deviation of the log-number of patents. A one standard deviation increase in board diversity is associated with a 0.12 increase in the number of patents per million of dollar spent on R&D, corresponding to a one standard deviation change of the number of patents per R&D spending in our sample. The economic magnitudes of the effects of board diversity on innovation quality as measured by patent citations are equally large, on average.

2.6 Diversity and Board Frictions

Although director diversity results in greater innovation and lower firm risk, heterogeneity in the board may in fact be a double edged sword. There is ample evidence suggesting that diversity can lead to increased conflicts within groups (O'Reilly, Snyder, and Boothe, 1993; Smith, Smith, Olian, Sims, O'Bannon, and Scully, 1994), increased turnover in management teams, and slower

[18] We note, however that in column 3, the number of observations is almost half of our standard sample due to the fact that observations where R&D is missing must be dropped in this model.

reaction times to competitive forces (Hambrick et. al., 1996). Here, we test whether board diversity is in fact associated with such potential costs.

We examine in particular the relation between director diversity and some observable measures of frictions within the board. We use two measures to capture variation in board frictions: board turnover and board meeting attendance. We define a 1-year and 3-year turnover rate as the percent of current board of directors for the firm that were *not* serving as directors for the firm one and three years prior, respectively. We measure low board attendance as the percentage of board members that attend less than 75% of the board meetings.

The OLS estimates reported in Table 10 indicate that board diversity is indeed associated with higher board turnover rates over both the 1-year and 3-year horizons. In addition, a one standard deviation increase in board diversity is associated with a 2.6% higher probability that a board member attends less than 75% of the meetings in a given year. However, while the signs of the IV estimates are consistent with those of OLS estimation, none are statistically different from zero. Thus, it is difficult to conclude that the relation between diversity and these frictions is causal.

2.7 Diversity and Firm Performance

The evidence thus far indicates that board diversity can have positive effects on firms, but is also associated with greater board frictions. Next we examine whether, on balance, the benefits accrued from board diversity outweigh its costs. To this end, we examine the effect of board diversity on both firm operating performance and asset valuation multiples.

Table 10 reports the results of 2SLS instrumental variables regressions where the second stage dependent variables are measures of profitability (ratio of EBITDA to assets) and firm value (log of asset market-to book value). Like in our earlier tests, for each model, the first stage consists of the *Diversity Index* regressed on our board diversity supply instrument and all other controls.

Our IV estimates provide consistent evidence that greater board diversity generates positive net benefits, on average, leading to greater profitability and firm value. The coefficient estimates on the instrumented *Diversity Index* are positive and significant at the 1% significance level for both the profitability and firm value models. The economic magnitude of these effects is also large. An increase in board diversity of one standard deviation increases EBITDA/Assets by 1.5 percentage points, or roughly one-third of the sample standard deviation. Increases in board diversity result in similarly large increases of market-to-book asset valuation multiples.

Overall, although directors' diversity may be disruptive for the well-functioning continuity of the board and thus may not be advisable to pursue across all firms, our evidence shows that the benefits of board diversity systematically outweigh its costs, on average resulting in superior firm performance.

3 Alternative Explanations and Robustness

3.1 Instrumented Modified Diversity Index

In Table 6, we explored the components of the *Diversity Index* and found that the only individual component that has a statistically significant association with stock return volatility is the heterogeneity of board age. However, using a modified index that excludes any one of the components, including age, does not alter our main inferences.

For completeness, we repeat a similar exercise in the context of our IV specification. In particular, we instrument the modified *Diversity Index* where each of its components is in turn excluded, similar to the approach followed in Table 6. Table A.1 of the online appendix presents the results of these additional robustness tests. Like in our baseline analysis, we find the results do not vary with the exclusion of any one component from the index. Across the board, we continue to find that there is a strong negative relation between the instrumented modified board diversity index and the firm stock return volatility.

3.2 Effect of Firm and Board Size

Although we control for firm and board size in our models, one may still worry that our results are due to omitted non-linear factors related to firm or board size, since larger firms and larger boards tend to have both more diverse board members and lower return volatility. We expand our baseline models in several ways to address this concern.

First, we include indicators for each decile of firm and board size to account for potential non-linear relations between size and return volatility. Second, we include indicators for firm and board size decile-*by*-year combinations to account for the dynamic nature of firm and board size and any non-linear relation they may have with return volatility. Third, we include higher order polynomials (to the third degree) for firm and board size as independent variables. Fourth, we repeat our baseline tests separately for small and large firms/boards (based on median size). Lastly, we examine the interactive effect of board diversity and firm/board size.

Tables A.2 through A.4 of the online appendix report the results of the supplemental tests that examine in greater depth the effects of firm or board size on our baseline evidence. Across all the alternative specifications in those tables, we find that our main result is very robust. In particular, board diversity is strongly and negatively associated with stock return volatility independent of how we control for firm or board size.

Therefore, while firm and board size are indeed directly correlated with board diversity, our robustness tests provide confidence that our main evidence does not result spuriously from un-modeled non-linear relations between firm/board sizes, board diversity, and return volatility.

3.3 Alternative Instruments: Access to Total Director Supply and Diversity of Peer Firms

To complement our main IV results, we conduct a series of tests that rely on alternative demand- and supply-based measures of board diversity. First, rather than using the weighted diversity of nonlocal directors residing within a nonstop flight of the firm headquarters, we use the weighted supply of nonlocal directors. The intuition underlying this IV approach is similar to our main instrument: that is, the greater is the fraction of potential nonlocal directors that the firm can attract as a result of convenient travel arrangements, the more likely it would be that the firm is able to draw from a diverse pool. Second, we use the average director diversity across firms in the same size quintile and industry (i.e., Fama-French 49) – excluding each firm actual board, as a proxy for the firm's demand of diverse directors. The intuition here is that peer-effects may lead firms to adopt similar board hiring practices.

There are valid conceptual reasons to believe (and the empirical evidence confirms) that both alternative instruments satisfy the *relevance* condition. It is, however, worth noting that we believe our main IV to be more likely to satisfy the *exclusion* restriction than each of the two alternative instruments. Therefore, we use the alternative IVs in supplemental tests only to validate the results based on our main instrument.

In Tables A.5 through A.8 of the online appendix, we replicate all of our tests based on the IV approach using the alternative instruments. In particular, we revisit the relation of the instrumented board diversity with firm stock return volatility in Table A.5, corporate financial and investment policies in Table A.6, innovation output and quality in Table A.7, and firm operating performance and valuation in Table A.8.

Across the board, the supplemental evidence from these tests is in line with our earlier inferences. Board diversity results in lower stock return volatility, which appears to be due to less financial risk taking. Concurrently, firms with diverse boards also invest more aggressively especially in R&D, which results in more and higher quality innovation output. On balance, notwithstanding the potential costs associated with heterogeneity of views, preferences, and incentives in the board, directors' diversity is associated with significantly better operating performance and asset valuation.

4 Conclusion

Today, diversity is promoted by almost every organization in the U.S. Firms, governments, and educational institutions all strive to achieve diversity in their workforces, management teams, representatives, educators, and student bodies. However, there is ample research that diversity has both costs and benefits. We investigate the implications of diversity in the context of corporate boards: an area in which many countries have recently mandated forms of diversity. We ask, what are the implications of director diversity for the risk-taking of firms that these boards monitor and advise?

We find that diversity in the board of directors' backgrounds reduces stock market volatility, which is consistent with diverse backgrounds working as a governance mechanism, moderating decisions and avoiding problems associated with "groupthink." When investigating how this is accomplished, we find that firms advised by diverse boards take on less financial risk in the form of lower financial leverage and increased payout to shareholders. This behavior, however, does not carry over onto real risk-taking activities. Indeed, consistent with the idea that diverse backgrounds lead to creative solutions, we find that not only do firms with diverse boards invest more in research and development, but these investments are in fact more productive – leading to greater quantity and quality of firm innovation output.

Diverse boards do come with a cost, however. In particular, we find some evidence that diversity is associated with increased board frictions. Board turnover is higher among diverse boards and board attendance is lower. These findings are consistent with people of different backgrounds having difficulty working together frequently or for long periods.

When assessing whether the benefits of board diversity outweigh the costs, we find that, on average, diversity in the board of directors leads to both higher profitability and firm value. This suggests that, in general, today's view that diversity should be promoted has some merits, not only from a social perspective, but also from an economic perspective – at least in the context of corporate boards. It should be recognized, however, that our estimates reflect the average effects of board diversity and, thus, it is likely that in some contexts the costs of diversity outweigh its benefits. This may be true, for example, in highly specialized firms or when trying to solve highly technical problems.

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Data Appendix

Variable Name	Definition
Daily Total Volatility (%)	Square root of 252 multiplied by the standard deviation of daily stock returns.
Daily Idiosyncratic Volatility (%)	Square root of 252 multiplied by the standard deviation of daily excess stock returns. Excess return is defined using a CAPM market model estimated over the prior year.
Monthly Total Volatility (%)	Square root of 12 multiplied by the standard deviation of monthly stock returns.
Monthly Idiosyncratic Volatility (%)	Square root of 12 multiplied by the standard deviation of monthly excess stock returns. Excess return is defined using a CAPM market model estimated over the prior year.
Female Board Member Ratio	Number of female directors divided by board size.
Standard Deviation Age	Standard deviation of the ages of the board members.
HHI Bachelors	Herfindahl index of the number of directors in each firm-year that are classified in categories by their Bachelor's granting institution. For example, 3 directors that are Harvard alums and 4 directors that are Yale alums would be defined as $(3/7)^2 + (4/7)^2$
HHI Ethnicity	Herfindahl index of the number of directors in each firm-year that are classified in categories by ethnicity, as defined in Risk Metrics. Risk Metrics' ethnic categories are Asian, African-American, Caucasian, Hispanic, and Native American.
HHI Financial Expert	Herfindahl index of the number of directors in each firm-year that are classified as having financial expertise or not having financial expertise.
Mean No. of Other Boards	For each firm-year, the mean number of other boards on which current directors serve.
Board Diversity Index	(Female Board Member Ratio) + (1 – HHI Age) + (1-HHI Bachelors) + (1 – HHI Ethnicity) + (1 – HHI Financial Expert) + Mean No. of Other Boards
Book Assets ($M)	Book assets as reported in Compustat.
Ln(Assets)	Natural log of book assets.
M/B	Market equity divided by book equity
Mkt. Leverage	Sum of long-term debt and current liabilities divided by the sum of market equity and book debt.
Asset Tangibility	Sum of investments and net PP&E divided by book assets.
Cash/Assets	Cash and short-term equivalents divided by book assets.
Firm Pays Dividends	Indicator equal to 1 if the firm pays dividends in the current year, and 0 otherwise.
ROA	Net income divided by book equity
R&D/Assets	R&D expense (set to 0 if missing) divided by book

	assets.
Board Size	Number of board of directors for the firm in the current year.
Avg. Board Age	Average age of the board of directors for the firm in the current year.
Firm Age	Number of years since the firm's IPO.
CEO Tenure	Number of years since the current CEO's starting date.
CEO is Chair and President	Indicator equal to 1 if the CEO is also the Chair and President of the board of directors.
CEO General Ability Index	The general ability index of the CEO is from Custodio et. al. (2013).
County Population	Population of the firm's headquarter county in the current year.
%Δ County Population	Percent change in the population of the firm's headquarter county from the prior to the current year.
County Per Capita Income	Per capita income of the firm's headquarter county in the current year.
%Δ County Per Capita Income	Percent change in the per capita income of the firm's headquarter county from the prior to the current year.
% Clear Days	Percent of annual days that are not cloudy, as defined in Yonker (2016).
Diversity of Local Directors	Board Diversity Index of all the individuals that serve as directors at any firm in the current year and reside within 150 miles of the firm's headquarter.
Number of Patents	Number of patents granted to the firm that were applied for in the current year.
Patents/R&D	Number of Patents divided by R&D expense
Total Citations	Total number of citations until 2013 for all patents granted to the firm that were applied for in the current year.
Citations/Patent	Total Citations divided by Number of Patents
EBITDA/Assets	
Q	Market value of assets divided by book value of assets.

Figure 1

The figure plots the average firm-year quintile of diversity of firms headquartered in each state using the diversity index. Construction of the index is detailed in the data section of the text.

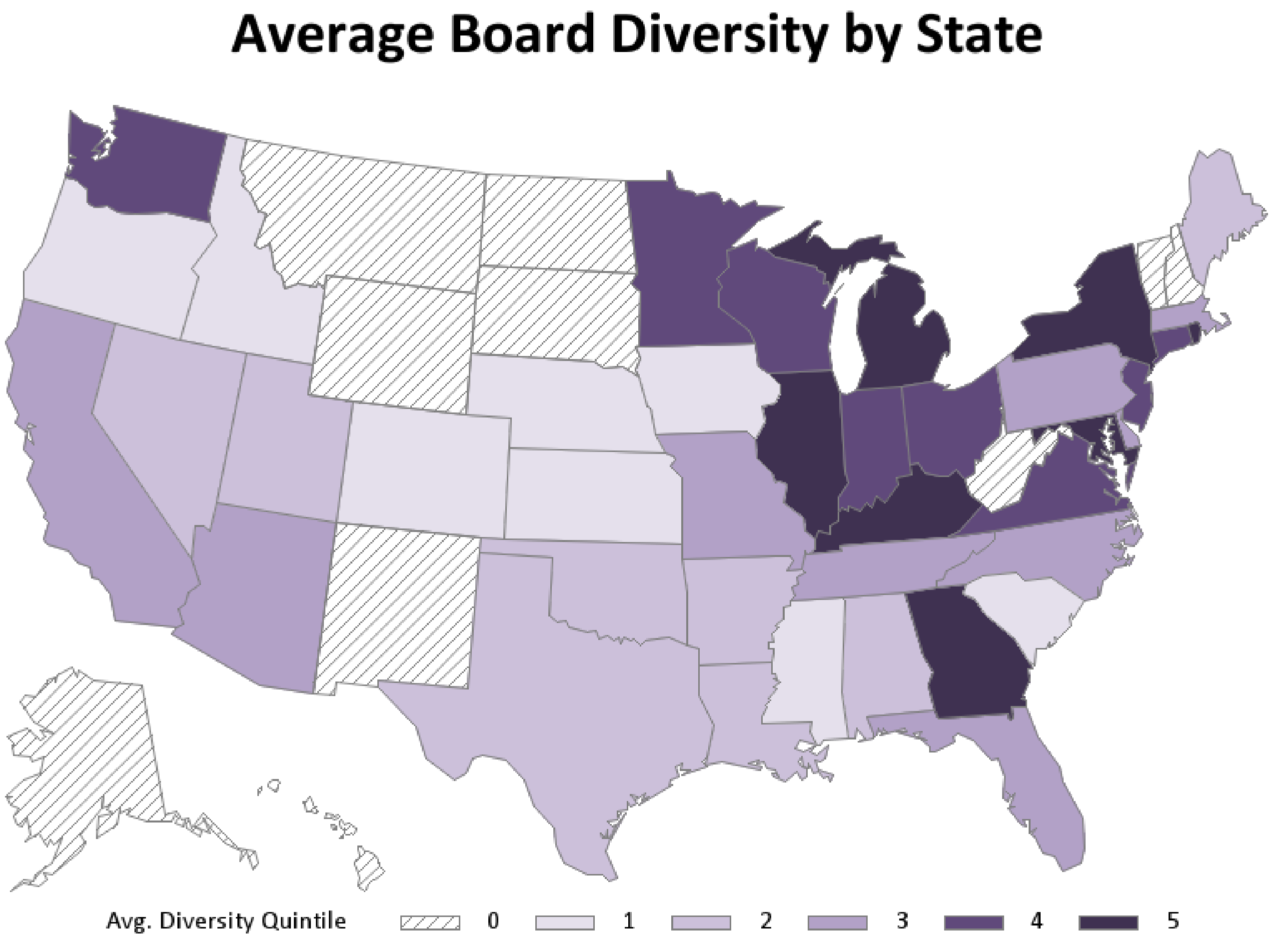


Figure 2

The figure plot the average firm-year quintile of diversity of firms headquartered in each state using each of the six components of diversity in the diversity index. These measures are detailed in the appendix.

Figure 2.A

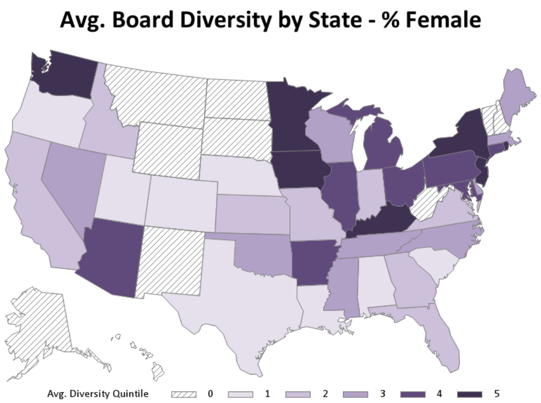
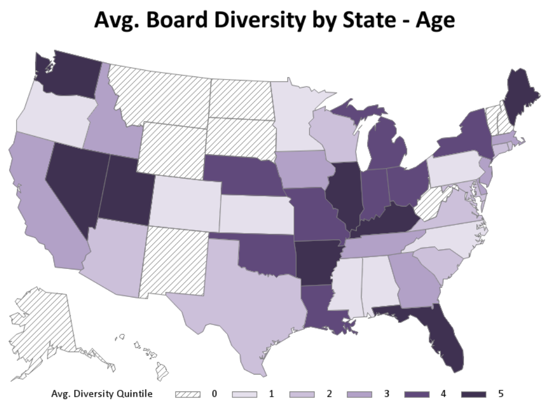


Figure 2.B



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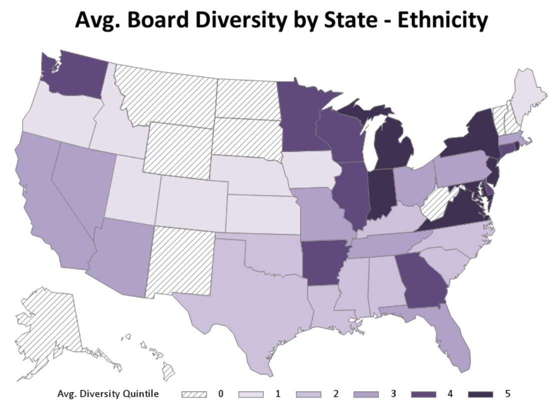

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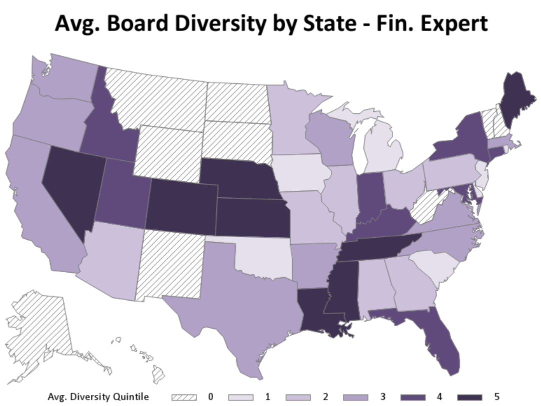

Figure 2.E

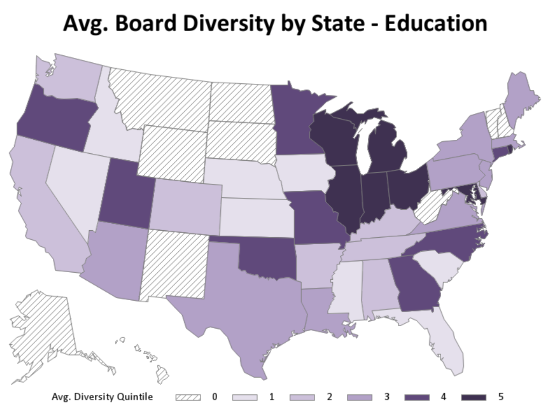

Figure 2.F

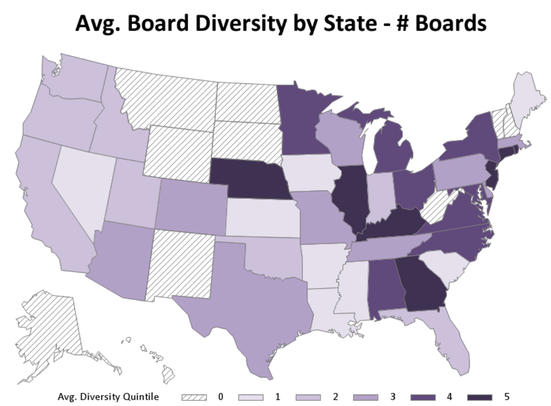

Table 1 – Descriptive Statistics

This table reports summary statistics for various firm-level time-varying characteristics. All variable definitions and descriptions are reported in the Appendix.

	(1) Mean	(2) Std. Dev.	(3) Median	(4) 25^{th} Pct.	(5) 75^{th} Pct.
Daily Total Volatility (%)	43.155	22.432	37.391	27.809	52.253
Daily Idiosyncratic Volatility (%)	37.701	20.124	32.948	23.867	46.035
Monthly Total Volatility (%)	39.065	23.302	33.268	23.537	47.717
Monthly Idiosyncratic Volatility (%)	36.274	21.734	30.904	21.737	44.906
Female Board Member Ratio	0.104	0.098	0.1	0	0.167
STDEV Age	7.774	2.462	7.436	6.009	9.223
HHI Bachelors	0.372	0.287	0.25	0.167	0.5
HHI Ethnicity	0.483	0.132	0.46	0.389	0.551
HHI Financial Expert	0.587	0.107	0.556	0.51	0.625
Mean No. of Other Boards	0.771	0.622	0.7	0.273	1.143
Board Diversity Index	0	1	0.113	-0.622	0.71
Book Assets ($M)	15,195.83	80,247.26	2,053.98	744.708	7,001.395
Ln(Assets)	7.816	1.653	7.628	6.613	8.854
M/B	1.886	1.613	1.43	1.109	2.093
Mkt. Leverage	0.171	0.157	0.136	0.042	0.262
Asset Tangibility	0.378	0.253	0.364	0.161	0.57
Cash/Assets	0.13	0.16	0.063	0.021	0.18
Firm Pays Dividends	0.636	0.481	1	0	1
ROA	0.046	0.17	0.048	0.014	0.093
R&D/Assets	0.026	0.051	0	0	0.028
Board Size	9.658	2.817	9	8	11
Avg. Board Age	59.697	4.023	59.909	57.375	62.2
Firm Age	24.949	19.312	20	10	34
CEO Tenure	7.12	7.244	5	2	10
CEO is Chair and President	0.252	0.434	0	0	1
CEO General Ability Index	0.059	0.99	-0.098	-0.706	0.622
County Population	1,431,492	1,816,724	891,764	494,748	1,562,154
%Δ County Population	0.008	0.015	0.006	0.001	0.013
County Per Capital Income	44,216.02	15,502.17	40,485	34,043	49,936
%Δ County Per Capital Income	0.041	0.047	0.042	0.018	0.068
% Clear Days	0.293	0.083	0.271	0.247	0.315
Diversity of Local Directors	0	0.859	0	-0.079	0.501
Number of Patents	21.558	140.97	0	0	2
Patents/R&D	0.009	0.116	0.002	0	0.009
Total Citations	168.434	1617.391	0	0	3
Citations/Patent	1.984	6.89	0	0	0.6
EBITDA/Assets	0.13	0.102	0.126	0.078	0.182
Q	1.91	1.608	1.459	1.139	2.114

Table 2 – Correlation between components of board diversity

This table reports the sample correlations between each component of the diversity index and the total diversity index.

		N(% Female)	(1)	(2)	(3)	(4)	(5)
(1)	N(STDEV Age)	-0.119					
(2)	- N(HHI Ethnicity)	-0.009	0.013				
(3)	- N(HHI Bachelors)	0.164	-0.157	0.056			
(4)	- N(HHI Financial Expert)	0.025	-0.057	0.008	0.051		
(5)	N(Mean # of Other Boards)	0.124	-0.187	-0.033	0.269	-0.003	
	Diversity Index	0.433	0.187	0.399	0.634	0.542	0.538

Table 3 – Non Local Supply IV Relevance: Does access to distant director supply explain the actual geographical composition of the board?

This table reports the OLS panel regression estimates of models where the dependent variable is indicated in the column title. In columns 1 and 2, each observation is a (firm HQ county *i*, director county *j*, year *t*) combination while each observation is a (firm *k*, firm HQ county *i*, director county *j*, year *t*) observation in columns 3 and 4. Firm-level control variables, like Ln(Assets), are aggregated at the county HQ level in column 2. *# County Directors* (N_{jt}) measures the number of directors from county *j* that serve on any firm board in our sample in year *t*. *Distant County* (D) is an indicator equal to 1 if the director county is more than 150 miles away from the firm HQ county. *# of Flights$_{ijt}$* (F_{ijt}) is measured as the log of one plus the average number of monthly non-stop flights between the firm HQ county *i* and director county *j* in year *t*. All models include fixed effects for years as well as firm-county and director-county pairs. Models 3 and 4 also include firm fixed effects. In all models, standard errors are clustered by firm-county and director-county pair.

	HQ County-Director Residence County		Firm-Director Residence County	
	(1)	(2)	(3)	(4)
Dependent Variable:	*Ln(1+# of County j Directors Serving in County i in Year t)*		*Ln(1+# of County j Directors Serving in Firm k-County i in Year t)*	
# County Directors (N_{jt})	0.5607***	0.5605***	0.4289***	0.4299***
	(0.0135)	(0.0135)	(0.0096)	(0.0096)
N×Distant County (D)	-0.4115***	-0.4111***	-0.3642***	-0.3651***
	(0.0139)	(0.0139)	(0.0098)	(0.0098)
N×D×# Flights (F_{ijt})	0.0295***	0.0294***	0.0117***	0.0115***
	(0.0027)	(0.0027)	(0.0017)	(0.0017)
D×F_{ijt}	0.0069***	0.0067***	0.0044***	0.0041***
	(0.0020)	(0.0020)	(0.0013)	(0.0013)
F_{ijt}	0.1473***	0.1128***	0.0323***	0.0344***
	(0.0028)	(0.0040)	(0.0025)	(0.0025)
Size of Director Pool	0.0253***	0.0607***	0.0625***	0.0670***
	(0.0055)	(0.0063)	(0.0029)	(0.0029)
Ln(Assets)		0.0056**		0.0186***
		(0.0026)		(0.0005)
M/B		0.0008		-0.0008*
		(0.0010)		(0.0004)
Sales Growth		0.0016***		-0.0003
		(0.0006)		(0.0004)
Annual Stock Volatility		0.0002		-0.0011*
		(0.0013)		(0.0006)
R&D Dummy		0.0037**		0.0047***
		(0.0019)		(0.0005)
Ln(1+Firm Age)		0.0156***		0.0005
		(0.0019)		(0.0005)
Ln(No. of Firms)		0.0525***		
		(0.0054)		

Firm FE	No	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm-county *x* director-county FE	Yes	Yes	Yes	Yes
Observations	838,928	838,662	4,663,744	4,654,695
R-squared	0.6855	0.6856	0.2183	0.2189
Predicted Y-hat at means	0.000679	0.000783	-0.000296	-0.000228
At ($F+\sigma_f$, N)	0.00758	0.00748	0.00406	0.00388
At (F, $N+ \sigma_n$)	0.150	0.150	0.0644	0.0646
At ($F+ \sigma_f$, $N+ \sigma_n$)	0.186	0.186	0.0805	0.0802

Standard errors clustered at Firm-county, director-county level
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4 – Which boards are diverse?

This table reports the OLS panel regression estimates of models where the dependent variable is the Diversity Index of the firm's board of directors in the current year. All columns contain year and industry (FF49) fixed effects. Standard errors are clustered at the firm-level, and t-statistics from these clusters are displayed in parenthesis.

	(1)	(2)
Ln(Assets)	0.392***	0.359***
	(19.256)	(17.540)
M/B	0.031*	0.036**
	(1.929)	(2.254)
Mkt. Lev.	-0.006	-0.007
	(-0.385)	(-0.410)
Tangibility	-0.020	-0.016
	(-0.660)	(-0.545)
Cash/Asset	0.018	0.020
	(0.945)	(1.023)
I(Dividend Paying)	0.019	0.010
	(1.069)	(0.592)
ROA	0.019**	0.022***
	(2.214)	(2.618)
(R&D/Assets)	0.203***	0.199***
	(10.361)	(10.367)
Ln(1+Firm Age)	-0.097***	-0.091***
	(-5.703)	(-5.461)
Ln (Board Size)	0.040**	0.043**
	(2.042)	(2.222)
Ln(Average Board Age)	0.060***	0.055***
	(3.181)	(2.959)
Ln(1+CEO Tenure)		-0.067***
		(-5.085)
CEO is Chair and President		0.043***
		(3.326)
CEO General Ability Index		0.093***
		(5.884)
Industry (FF49) Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	14,391	14,391
R-squared	0.474	0.488

Table 5 – Board diversity and firm stock volatility

This table reports the OLS panel regression estimates of models where the dependent variable is the firm's standard deviation of stock returns for the current year. The dependent variable in column 1 is the standard deviation of daily returns, the standard deviation of daily idiosyncratic returns obtained from a CAPM market model in column 2. The dependent variables in columns 3 and 4 use similar methodologies as columns 1 and 2, respectively, but with 12 monthly returns for the year. The Board Diversity Index is normalized by its sample mean and standard deviation. Panel A displays results from models with industry (Fama-French 49), headquarter county, and year fixed effects, while Panel B displays results from models with firm and year fixed effects. The full set of controls from Panel A are also included in the models in Panel B, but are omitted in the table output for brevity. All models cluster standard errors at the firm-level.

Panel A: Industry (FF49) and Year Fixed Effects

Dependent Variable:	(1) *Total* *Daily Vol.*	(2) *Idiosyncratic* *Daily Vol.*	(3) *Total* *Monthly Vol.*	(4) *Idiosyncratic* *Monthly Vol.*
Board Diversity Index	-0.915***	-0.7998***	-0.901***	-0.802***
	(-3.949)	(-4.063)	(-3.416)	(-3.567)
Ln(Assets)	-2.686***	-3.668***	-2.658***	-3.438***
	(-8.230)	(-12.179)	(-7.891)	(-10.643)
M/B	0.904***	0.503**	0.581**	0.600**
	(3.732)	(2.079)	(2.118)	(1.983)
Mkt. Lev.	3.557***	3.567***	4.354***	3.980***
	(11.086)	(11.334)	(12.731)	(11.861)
Tangibility	0.844**	0.615*	0.985***	0.854**
	(2.453)	(1.919)	(2.624)	(2.395)
Cash/Asset	2.456***	2.076***	2.573***	2.238***
	(8.972)	(8.507)	(8.472)	(8.186)
I(Dividend Paying)	-2.566***	-2.506***	-2.533***	-2.561***
	(-10.449)	(-11.167)	(-9.536)	(-10.250)
ROA	-3.546***	-3.722***	-3.619***	-4.088***
	(-4.009)	(-3.698)	(-4.080)	(-4.913)
(R&D/Assets)	2.037***	1.802***	2.400***	1.569***
	(5.246)	(4.757)	(5.783)	(4.272)
Ln(1+Firm Age)	-1.487***	-1.533***	-1.293***	-1.397***
	(-6.407)	(-6.952)	(-5.154)	(-5.739)
Ln (Board Size)	-1.081***	-0.913***	-0.888***	-0.889***
	(-4.430)	(-4.105)	(-3.316)	(-3.523)
Ln(Average Board Age)	-1.424***	-1.174***	-1.456***	-1.040***
	(-6.476)	(-5.923)	(-5.874)	(-4.425)
Ln(1+CEO Tenure)	-0.251	-0.361**	-0.222	-0.279*
	(-1.530)	(-2.399)	(-1.231)	(-1.670)
CEO is Chair and President	-0.086	-0.079	-0.045	0.049
	(-0.504)	(-0.512)	(-0.249)	(0.273)
CEO General Ability Index	0.538***	0.638***	0.386*	0.484**
	(2.712)	(3.576)	(1.823)	(2.404)
County Per Capita Income Growth	-0.216	-0.031	-0.592**	0.260

	(-0.857)	(-0.130)	(-2.010)	(0.946)
County Population Growth	-0.091	-0.115	-0.287*	-0.182
	(-0.602)	(-0.862)	(-1.739)	(-1.301)
Ln(County Per Capita Income)	3.556***	2.869***	3.010***	1.820**
	(4.884)	(4.431)	(3.932)	(2.461)
Ln(County Population)	-3.554***	-3.362***	-4.380***	-3.768***
	(-3.606)	(-3.711)	(-3.744)	(-3.438)
% Clear Days	0.865*	0.692	0.892*	0.957*
	(1.701)	(1.408)	(1.674)	(1.790)
Diversity of Local Directors	-0.551**	-0.575***	-0.720***	-0.635***
	(-2.554)	(-2.837)	(-2.899)	(-2.732)
Industry (FF-49) FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Observations	14,391	14,391	14,391	14,391
R-squared	0.607	0.594	0.489	0.454

Panel B: Firm and Year Fixed Effects

	(1)	(2)	(3)	(4)
Dependent Variable:	*Total Daily Vol.*	*Idiosyncratic Daily Vol.*	*Total Monthly Vol.*	*Idiosyncratic Monthly Vol.*
Board Diversity Index	-1.691**	-0.980*	-0.773**	-0.674*
	(-2.174)	(-1.738)	(-2.030)	(-1.927)
All Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	14,391	14,391	14,391	14,391
R-squared	0.751	0.744	0.649	0.625

Table 6 – Board diversity index components and firm stock volatility

This table reports the OLS panel regression estimates of models where the dependent variable is the firm's standard deviation of daily returns for the current year in both panels. All diversity variables are normalized by their sample mean and standard deviation. STDEV AGE is the standard deviation of board members' age. HHI Ethnicity is the standard HHI index over the ethnic groups that board members belong to (as categorized by Risk Metrics). HHI Bachelors is the HHI over the different degree granting institutions where board members received the Bachelors degree. HHI Financial Expert is the concentration of board members that are financial experts as classified by RiskMetrics. Mean # of Other Boards is the average number of other boards that the firm's board members serve on for the previous year. N(X) below denotes the normalized version of X.

Panel A

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
N(% Board Female)	-0.229						-0.220
	(-0.736)						(-0.709)
N(STDEV Age)		-0.356					-0.392
		(-1.198)					(-1.320)
- N(HHI Ethnicity)			-0.587				-0.580
			(-1.596)				(-1.452)
- N(HHI Bachelors)				-0.196			-0.180
				(-0.692)			(-0.641)
- N(HHI Financial Expert)					-0.083		0.007
					(-0.319)		(0.027)
N(Mean # of Other Boards)						-0.365	-0.332
						(-1.330)	(-1.213)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CEO & Board Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,391	14,391	14,391	14,391	14,391	14,391	14,391
R-squared	0.751	0.751	0.751	0.751	0.751	0.751	0.751

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)
Diversity Index excl. Female	-0.633**					
	(-1.991)					
N(% Board Female)	-0.233					
	(-0.750)					
Diversity Index excl. Age		-0.635*				
		(-1.848)				
N(STDEV Age)		-0.368				
		(-1.239)				
Diversity Index excl. Ethnicity			-0.662**			
			(-2.112)			
-1 * N(HHI Ethnicity)			-0.200			
			(-0.709)			
Diversity Index excl. Education				-0.471*		
				(-1.651)		
-1 * N(HHI Bachelors)				-0.508		
				(-1.468)		
Diversity Index excl. Fin. Expert					-0.759**	
					(-2.392)	
-1* N(HHI Financial Expert)					-0.036	
					(-0.139)	
Diversity Index excl. Other Boards						-0.558*
						(-1.860)
N(Mean # of Other Boards)						-0.343
						(-1.254)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
CEO & Board Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,391	14,391	14,391	14,391	14,391	14,391
R-squared	0.751	0.751	0.751	0.751	0.751	0.751

Table 7 – Diversity of non-local director supply IV and firm stock volatility

This table reports 1st and 2nd stage IV regression estimates of models where the diversity index is instrumented by the diversity of the directors that reside more than 150 miles away but within a non-stop flight of the firm headquarters. Standard errors are clustered at the firm-level and account for the two-stage nature of the estimation. The corresponding *t*-statistics are reported in parenthesis. All models include industry (FF49), firm headquarters county, and year fixed effects.

	(1)	(2)
	First Stage	Second Stage
Instrumented Diversity Index		-19.607***
		(-3.366)
Diversity of Directors w/ Non-Stop Flight	0.063***	
	(3.694)	
Ln(Assets)	0.243***	2.216
	(21.401)	(1.390)
M/B	0.037***	1.677***
	(3.410)	(3.746)
Mkt. Lev.	-0.007	3.334***
	(-0.705)	(8.027)
Tangibility	0.007	0.965*
	(0.561)	(1.752)
Cash/Asset	0.006	2.577***
	(0.626)	(6.028)
I(Dividend Paying)	-0.007	-2.691***
	(-0.779)	(-6.745)
ROA	0.013**	-3.283***
	(2.320)	(-3.948)
(R&D/Assets)	0.037***	2.738***
	(3.705)	(5.053)
Ln(1+Firm Age)	0.021**	-1.087***
	(2.298)	(-2.694)
Ln (Board Size)	0.187***	2.414**
	(18.190)	(2.074)
Ln(Average Board Age)	-0.063***	-2.605***
	(-7.154)	(-5.107)
Ln(1+CEO Tenure)	-0.024***	-0.709**
	(-3.550)	(-2.368)
CEO is Chair and President	0.008	0.066
	(1.184)	(0.245)
CEO General Ability Index	0.041***	1.320***
	(5.298)	(3.248)
County Per Capita Income Growth	0.011	-0.041
	(1.022)	(-0.138)
County Population Growth	-0.008	-0.222
	(-1.098)	(-1.118)
Ln(County Per Capita Income)	-0.205***	0.076
	(-6.609)	(0.049)

Ln(County Population)	0.236***	0.948
	(5.350)	(0.438)
% Clear Days	-0.051***	-0.157
	(-2.805)	(-0.191)
Diversity of Local Directors	0.027***	0.070
	(3.020)	(0.206)
FF49 FE	Yes	Yes
County HQ FE	Yes	Yes
Year FE	Yes	Yes
Observations	14,391	14,391
R-squared	0.561	0.123
IV F-stat		15.62
Durbin p-val.		< 0.001

Table 8 – Diversity of non-local director supply IV and firm policies

This table shows the 2nd stage IV regression estimates of models where the dependent variable is indicated in the column title. The endogenous variable Diversity Index is instrumented by the diversity of the directors that reside more than 150 miles away but within a non-stop flight of the firm headquarters. All time-varying controls from previous tables are included in the model but not shown to conserve space. All models include industry (FF49), firm headquarters county, and year fixed effects. Standard errors are clustered at the firm-level and account for the two-stage nature of the estimation. The corresponding *t*-statistics are reported in parenthesis.

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	*Net Book Leverage*	*Net Market Leverage*	*Dividend/Asset*	*Capex/Asset*	*R&D/Asset*
Instrumented Diversity Index	-1.760***	-3.552***	1.258**	0.299	0.780**
	(-3.178)	(-3.466)	(2.262)	(0.820)	(2.049)
Firm Controls	Yes	Yes	Yes	Yes	Yes
CEO & Board Controls	Yes	Yes	Yes	Yes	Yes
HQ County Controls	Yes	Yes	Yes	Yes	Yes
FF49 FE	Yes	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	14,391	14,391	14,391	14,391	14,391
R-squared	0.221	0.288	0.242	0.247	0.262
IV F-stat	23.81	23.81	18.71	14.26	19.07
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001

Table 9 – Diversity of non-local director supply IV and firm innovation

This table shows the 2nd stage IV regression estimates of models where the dependent variable is indicated in the column title. The endogenous variable Diversity Index is instrumented by the diversity of the directors that reside more than 150 miles away but within a non-stop flight of the firm headquarters. All time-varying controls from previous tables are included in the model but not shown to conserve space. All models include industry (FF49), firm headquarters county, and year fixed effects. Standard errors are clustered at the firm-level and account for the two-stage nature of the estimation. The corresponding *t*-statistics are reported in parenthesis.

	(1)	(2)	(3)	(4)
Dependent Variable:	*Ln(1+Patents)*	*Patents/R&D*	*Ln(1+Citations)*	*Ln(1+Cit./Pat.)*
Instrumented Diversity Index	1.795***	0.120**	1.783***	1.436***
	(3.978)	(2.024)	(4.017)	(3.717)
Firm Controls	Yes	Yes	Yes	Yes
CEO & Board Controls	Yes	Yes	Yes	Yes
HQ County Controls	Yes	Yes	Yes	Yes
FF49 FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	10,622	5,759	10,622	10,622
R-squared	0.028	0.067	0.054	0.087
IV F-stat	42.73	17.53	42.73	42.73
Durbin pval	0.00	0.00	0.00	0.00

Table 10 – Diversity and board frictions

This table reports the estimates of models where the dependent variable is indicated in the column titles. The odd-numbered columns display the estimates of OLS panel regression models while the even-numbered columns display the 2nd stage IV estimates. The endogenous variable Diversity Index is instrumented by the diversity of the directors that reside more than 150 miles away but within a non-stop flight of the firm headquarters. All time-varying controls from previous tables are included in the model but not shown to conserve space. All models include industry (FF49), firm headquarters county, and year fixed effects. Standard errors are clustered at the firm-level and, in the 2SLS models, account for the two-stage nature of the estimation. The corresponding *t*-statistics are reported in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	*Board 1-Year Turnover Rate*		*Board 3-Year Turnover Rate*		*% Directors Attend <75% Meetings*	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Diversity Index	0.007**	4.928	0.011*	8.481	0.026*	1.274
	(2.322)	(1.066)	(1.861)	(0.990)	(1.910)	(0.892)
Ln(Assets)	-2.177***	-1.142	-2.536*	-1.457	-0.285	-0.348
	(-3.680)	(-1.121)	(-1.899)	(-0.774)	(-1.326)	(-1.135)
M/B	0.052	-0.474**	-0.098	-1.034**	-0.059	-0.089
	(0.318)	(-1.961)	(-0.309)	(-2.394)	(-0.811)	(-1.091)
Mkt. Lev.	2.730	1.856	5.415	4.957	0.410	0.265
	(1.237)	(1.296)	(1.097)	(1.418)	(0.504)	(0.526)
Tangibility	-2.474	0.847	-8.131	0.495	0.380	0.148
	(-0.938)	(0.778)	(-1.395)	(0.199)	(0.374)	(0.351)
Cash/Asset	0.370	3.087**	-2.284	2.668	0.044	0.634
	(0.176)	(1.986)	(-0.474)	(0.739)	(0.045)	(0.869)
I(Dividend Paying)	1.381*	-0.257	0.954	-0.520	-0.353	-0.185
	(1.811)	(-0.624)	(0.601)	(-0.496)	(-1.211)	(-1.246)
ROA	-3.149**	-8.580***	-4.989***	-10.521***	0.318	-0.165
	(-2.397)	(-4.053)	(-4.296)	(-2.951)	(1.155)	(-0.234)
(R&D/Assets)	-3.644	-9.937	11.655	-14.921	-4.022*	-1.795
	(-0.580)	(-1.464)	(0.985)	(-0.978)	(-1.912)	(-0.817)
Ln(1+Firm Age)	-3.498***	0.100	-6.905**	-0.265	-0.216	-0.214**
	(-2.695)	(0.336)	(-2.376)	(-0.408)	(-0.426)	(-2.055)
Ln (Board Size)	16.977***	1.290	30.684***	2.787	1.344***	0.558
	(12.674)	(0.343)	(12.616)	(0.377)	(2.770)	(0.482)
Ln(Average Board Age)	40.967***	10.975	112.369***	33.738**	3.400*	-0.090
	(8.924)	(1.413)	(10.597)	(2.284)	(1.668)	(-0.034)
Ln(1+CEO Tenure)	-0.546**	-0.869*	0.679*	-1.221	0.058	0.219
	(-2.440)	(-1.892)	(1.660)	(-1.421)	(0.670)	(1.535)
CEO is Chair and President	-0.174	-1.085	-0.996	-2.047	0.314**	-0.218
	(-0.406)	(-1.543)	(-1.171)	(-1.385)	(1.965)	(-1.057)
CEO General Ability Index	-2.177***	-0.116	-2.536*	-0.153	-0.285	-0.123
	(-3.680)	(-0.279)	(-1.899)	(-0.186)	(-1.326)	(-0.910)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,012	13,012	9,176	9,176	14,391	14,391
R-squared	0.255	0.241	0.512	0.522	0.322	0.333

Table 11 – Diversity of non-local director supply IV and firm performance

This table reports the 2nd stage IV regression estimates of models where the dependent variable is indicated in the column title. The endogenous variable Diversity Index is instrumented by the diversity of the directors that reside more than 150 miles away but within a non-stop flight of the firm headquarters. All time-varying controls from previous tables are included in the model but not shown to conserve space. All models include industry (FF49), firm headquarters county, and year fixed effects. Standard errors are clustered at the firm-level and account for the two-stage nature of the estimation. The corresponding *t*-statistics are reported in parenthesis.

	(1)	(2)
Dependent Variable:	*EBITDA/Assets*	*ln(Q)*
Instrumented Diversity Index	1.493***	3.011***
	(3.316)	(4.171)
Firm Controls	Yes	Yes
CEO & Board Controls	Yes	Yes
HQ County Controls	Yes	Yes
FF49 FE	Yes	Yes
HQ County FE	Yes	Yes
Year FE	Yes	Yes
Observations	14,391	14,391
R-squared	0.243	0.277
IV F-stat	27.57	36.49
Durbin pval	<0.001	<0.001

Online Appendix Tables

Table A.1 – Robustness: Instrumented modified diversity index and volatility

The dependent variable is the annualized stock return volatility of daily returns for each firm-year. All models include the standard set of firm, firm-year, and board-year controls from Table 7, along with industry (FF49), year, and headquarter county fixed effects. Each column displays the second stage results of a 2SLS instrumental variables regression where the diversity index excludes one of its components.

	(1)	(2)	(3)	(4)	(5)	(6)
Non-Local Supply Diversity IV excl. Female	-24.219***					
	(-2.593)					
Non-Local Supply Diversity IV excl. Age		-28.043**				
		(-2.439)				
Non-Local Supply Diversity IV excl. Ethnicity			-30.878**			
			(-2.273)			
Non-Local Supply Diversity IV excl. Bachelors				-27.81**		
				(-2.191)		
Non-Local Supply Diversity IV excl. Financial Expertise					-25.183**	
					(-2.432)	
Non-Local Supply Diversity IV excl. Number of Other Boards						-30.567**
						(-2.313)
HQ County FE	Yes	Yes	Yes	Yes	Yes	Yes
FF49 FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,391	14,391	14,391	14,391	14,391	14,391
R-squared	0.165	0.162	0.163	0.164	0.161	0.160
IV F-stat	15.58	14.02	10.25	13.035	12.66	10.22
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Table A.2 – Robustness: Instrumented board diversity and volatility, controlling for non-linear effects of firm and board sizes

The dependent variable is the annualized stock return volatility of daily returns for each firm-year. All models include the standard set of firm, firm-year, and board-year controls from Table 7, along with industry (FF49), year, and headquarter county fixed effects. The models differ in their respective methods for controlling for non-linear effects of firm and board sizes. Column 1 includes fixed effects for firm size deciles, column 2 includes fixed effects for (year X firm size decile), and column 3 includes a third order polynomial for firm size instead of a liner control. Columns 4-6 repeat the exercise for non-linear controls for board size and Columns 7-9 combine the methods of the first six columns for firm and board size together. T-statistics from standard errors clustered at the firm-level displayed in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Non-Local Supply Diversity IV	-19.295**	-16.962**	-12.983***	-29.325**	-29.908**	-30.945**	-18.652**	-16.739**	-13.301***
	(-2.206)	(-2.155)	(-6.225)	(-2.351)	(-2.203)	(-2.276)	(-2.105)	(-2.167)	(-6.130)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Board Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FF49 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	Yes	No	Yes	No	No	Yes
Firm Size Decile FE	Yes	No	No	No	No	No	Yes	No	No
Firm Size Decile ×Year FE	No	Yes	No	No	No	No	No	Yes	No
Firm Size 3rd Order Poly	No	No	Yes	No	No	No	No	No	Yes
Board Size Quintile FE	No	No	No	Yes	No	No	No	Yes	No
Board Size Quintile ×Year FE	No	No	No	No	Yes	No	Yes	No	No
Board Size 3rd Order Poly	No	No	No	No	No	Yes	No	No	Yes
Observations	14,391	14,391	14,391	14,391	14,391	14,391	14,391	14,391	14,391
R-squared	0.292	0.381	0.478	0.411	0.380	0.359	0.322	0.388	0.471
IV F-stat	13.79	15.84	21.7	11.18	9.676	10.08	12.97	16.22	22.8
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Table A.3 – Robustness: Instrumented board diversity and volatility, dropping extreme firm and board sizes

The dependent variable is the annualized stock return volatility of daily returns for each firm-year. All models include the standard set of firm, firm-year, and board-year controls from Table 7, along with industry (FF49), year, and headquarter county fixed effects. The sample restrictions for each model are indicated in the column titles.

	(1) No small firms	(2) No large firms	(3) No small boards	(4) No large boards
Non-Local Supply Diversity IV	-33.924**	-34.010*	-30.313**	-29.582**
	(-2.107)	(-1.748)	(-2.547)	(-2.344)
Firm Controls	Yes	Yes	Yes	Yes
Board Controls	Yes	Yes	Yes	Yes
FF49 FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	10,482	10,215	10,942	10,902
R-squared	0.312	0.290	0.308	0.335
IV F-stat	8.780	4.876	12.63	10.74
Durbin pval	0.0000	0.0001	0.0000	0.0000

Table A.4 – Robustness: Instrumented board diversity and volatility, by firm size

Non-Local Supply Diversity IV	-10.952**
	(-2.400)
IV * Size Tercile 2	4.696
	(0.970)
IV * Size Tercile 3	-5.040
	(-1.109)
Size Tercile 2	-2.044
	(-1.345)
Size Tercile 3	3.759
	(1.361)
Firm Controls	Yes
Board Controls	Yes
FF49 FE	Yes
HQ County FE	Yes
Year FE	Yes
Observations	14,391
R-squared	0.487
IV F-stat	15.78
Durbin pval	0.0000

Table A.5 – Alternative instrumental variables: Board diversity and volatility

Odd columns are first stage regressions where LHS is Diversity Index and RHS is the instruments + all controls. Even columns are the second stage where LHS is Volatility and RHS is instrumented diversity + all controls. (standard errors are adjusted to account for the two-stage regression). Standard errors are clustered at the firm-level, and t-statistics are reported in parenthesis. All models include industry (FF49) and year fixed effects. All controls are included but not shown.

	(1)	(2)	(3)	(4)
	First Stage	Second Stage	First Stage	Second Stage
Instrumented Diversity Index		-15.687**		-15.137***
		(-2.156)		(-2.784)
Directors Supply w/ Non-Stop Flight	0.179***			
	(4.612)			
FF5/Size Matched Diversity			0.064***	
			(6.627)	
Ln(Assets)	0.177***	1.575	0.159***	1.472
	(19.491)	(1.037)	(16.663)	(1.267)
M/B	0.025***	1.607***	0.023***	1.592***
	(3.157)	(4.220)	(2.978)	(4.723)
Mkt. Lev.	0.024	17.408***	-0.007	17.946***
	(0.340)	(5.647)	(-0.101)	(5.932)
Tangibility	0.111*	3.544	0.128**	4.342*
	(1.815)	(1.314)	(2.153)	(1.675)
Cash/Asset	0.140*	18.173***	0.154**	18.332***
	(1.857)	(5.677)	(2.088)	(5.882)
I(Dividend Paying)	-0.027	-5.126***	-0.025	-5.089***
	(-1.235)	(-5.861)	(-1.159)	(-6.071)
ROA	0.041	-39.388***	0.067	-39.830***
	(0.480)	(-10.122)	(0.841)	(-10.790)
Ln (Board Size)	0.748***	6.245	0.753***	5.852
	(16.879)	(1.100)	(17.336)	(1.329)
Ln(Average Board Age)	-1.668***	-43.959***	-1.645***	-41.461***
	(-10.316)	(-3.305)	(-10.552)	(-3.888)
Ln(1+Firm Age)	0.051***	-1.002	0.049***	-1.045
	(3.556)	(-1.439)	(3.454)	(-1.615)
Ln(1+CEO Tenure)	-0.069***	-1.448**	-0.070***	-1.453***
	(-7.181)	(-2.350)	(-7.408)	(-2.863)
CEO is Chair and President	0.116***	1.745	0.101***	1.435*
	(6.324)	(1.605)	(5.687)	(1.712)
CEO General Ability Index	0.090***	1.492**	0.089***	1.546***
	(10.172)	(2.012)	(10.308)	(2.601)
County Per Capita Income Growth	-0.188	-16.575**	-0.152	-13.512*
	(-0.655)	(-2.078)	(-0.549)	(-1.747)
County Population Growth	-0.298	3.448	-0.359	0.524
	(-0.612)	(0.281)	(-0.695)	(0.042)

Ln(County Per Capita Income)	-0.501**	26.444***	-0.510**	24.640***
	(-2.227)	(3.081)	(-2.331)	(2.964)
Ln(County Population)	-0.431**	-0.816	-0.323*	-2.334
	(-2.161)	(-0.099)	(-1.649)	(-0.284)
% Clear Days	0.460	17.870	0.481	19.968
	(1.139)	(0.938)	(1.289)	(1.169)
Diversity of Local Directors	-0.004	0.380*	-0.004	0.379*
	(-0.495)	(1.773)	(-0.535)	(1.832)
FF49 FE	Yes	Yes	Yes	Yes
County HQ FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	14,391	14,391	14,391	14,391
R-squared	0.555	0.393	0.561	0.417
IV F-stat		20.70		45.53
Durbin pval		0.000510		1.05e-06

Table A.6 – Robustness: Alternative board diversity IV and firm policies

Panel A – Access to distant director supply IV

	(1)	(2)	(3)	(4)
Dependent Variable:	*Net Book Leverage*	*Net Market Leverage*	*Dividend/Asset*	*R&D/Asset*
Instrumented Diversity Index	-1.005**	-1.463***	1.752***	0.716**
	(-2.509)	(-3.122)	(2.752)	(2.287)
Firm Controls	Yes	Yes	Yes	Yes
CEO & Board Controls	Yes	Yes	Yes	Yes
HQ County Controls	Yes	Yes	Yes	Yes
FF49 FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	14,391	14,391	14,391	14,391
R-squared	0.422	0.411	0.431	0.437
IV F-stat	21.70	21.70	20.36	20.88
Durbin pval	0.0000	0.0000	0.0000	0.0005

Panel B – Sector-size matched board diversity IV

	(1)	(2)	(3)	(4)
Dependent Variable:	*Net Book Leverage*	*Net Market Leverage*	*Dividend/Asset*	*R&D/Asset*
Instrumented Diversity Index	-0.566**	-0.579***	0.993***	0.647**
	(-2.126)	(-2.830)	(2.692)	(2.356)
Firm Controls	Yes	Yes	Yes	Yes
CEO & Board Controls	Yes	Yes	Yes	Yes
HQ County Controls	Yes	Yes	Yes	Yes
FF49 FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	14,391	14,391	14,391	14,391
R-squared	0.297	0.051	0.131	0.474
IV F-stat	41.41	41.41	38.88	39.31
Durbin pval	0.0000	0.0000	0.0000	0.0000

Table A.7 – Robustness: Alternative board diversity IV and firm innovation

Panel A – Access to distant director supply IV

	(1)	(2)	(3)	(4)
Dependent Variable:	*Ln(1+Patents)*	*Patents/R&D*	*Ln(1+Citations)*	*Ln(1+Cit./Pat.)*
Instrumented Diversity Index	1.733***	0.094*	1.745***	1.627***
	(3.449)	(1.784)	(3.531)	(3.333)
Firm Controls	Yes	Yes	Yes	Yes
CEO & Board Controls	Yes	Yes	Yes	Yes
HQ County Controls	Yes	Yes	Yes	Yes
FF49 FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	10,622	5,759	10,622	10,622
R-squared	0.056	0.229	0.156	0.205
IV F-stat	30.95	16.22	30.95	30.95
Durbin pval	0.0000	0.0022	0.0000	0.0000

Panel B – Sector-size matched board diversity IV

	(1)	(2)	(3)	(4)
Dependent Variable:	*Ln(1+Patents)*	*Patents/R&D*	*Ln(1+Citations)*	*Ln(1+Cit./Pat.)*
Instrumented Diversity Index	0.960***	0.083	0.769***	0.637**
	(2.843)	(1.470)	(2.634)	(2.148)
Firm Controls	Yes	Yes	Yes	Yes
CEO & Board Controls	Yes	Yes	Yes	Yes
HQ County Controls	Yes	Yes	Yes	Yes
FF49 FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	10,622	5,759	10,622	10,622
R-squared	0.352	0.249	0.396	0.294
IV F-stat	43.47	28.85	43.47	43.47
Durbin pval	0.0000	0.0031	0.0000	0.0001

Table A.8 – Robustness: Alternative board diversity IV and firm performance

Panel A – Access to distant director supply IV

	(1)	(2)
Dependent Variable:	*EBITDA/Assets*	*ln(Q)*
Instrumented Diversity Index	2.447***	4.263***
	(3.212)	(3.781)
Firm Controls	Yes	Yes
CEO & Board Controls	Yes	Yes
HQ County Controls	Yes	Yes
FF49 FE	Yes	Yes
HQ County FE	Yes	Yes
Year FE	Yes	Yes
Observations	14,391	14,391
R-squared	0.201	0.235
IV F-stat	18.15	26.07
Durbin pval	0.0000	0.0000

Panel B – Sector-size matched board diversity IV

	(1)	(2)
Dependent Variable:	*EBITDA/Assets*	*ln(Q)*
Instrumented Diversity Index	1.173***	2.444***
	(3.295)	(4.331)
Firm Controls	Yes	Yes
CEO & Board Controls	Yes	Yes
HQ County Controls	Yes	Yes
FF49 FE	Yes	Yes
HQ County FE	Yes	Yes
Year FE	Yes	Yes
Observations	14,391	14,391
R-squared	0.212	0.255
IV F-stat	38.62	49.19
Durbin pval	0.0000	0.0000

Table A.9 – Principal Component Analysis of Board Diversity

This table reports the results of principal component analysis on the six dimensions of diversity used to construct the board diversity index in the main tests. Panel A reports the resulting eigenvectors with the corresponding loadings of the six dimensions of diversity. Panel B reports the eigenvalues associated with each principal component and the fraction of common variation in the six dimensions of diversity explained by each component.

Panel A – Eigenvectors and factor loadings

	1st Comp.	*2nd Comp.*	*3rd Comp.*	*4th Comp.*	*5th Comp.*	*6th Comp.*
% Female	-0.2900	0.5476	-0.2224	0.7204	-0.1328	0.1733
Std. Dev. Age	0.3376	-0.499	0.1453	0.6484	0.4412	-0.0295
HHI Ethnicity	0.0554	0.4386	0.8805	0.0093	0.1439	-0.0917
HHI Bachelors	0.5865	0.197	-0.0552	-0.1149	0.0129	0.7751
HHI Fin. Expertise	0.4397	0.4677	-0.3816	-0.0971	0.4275	-0.5002
Mean Board Experience	-0.5115	0.0357	-0.074	-0.1946	0.7642	0.3312

Panel B – Eigenvalues and Common Variation

	Eigenvalue	*Difference*	*Proportion*	*Cumulative*
1st Comp.	1.7198	0.67949	0.2866	0.2866
2nd Comp.	1.04031	0.042315	0.1734	0.46
3rd Comp.	0.997995	0.10574	0.1663	0.6264
4th Comp.	0.892254	0.130373	0.1487	0.7751
5th Comp.	0.761881	0.17412	0.127	0.902
6th Comp.	0.587761	--	0.098	1

Table A.10 – Principal Component of Board diversity and firm stock volatility

This table reports the OLS panel regression estimates of models where the dependent variable is the firm's standard deviation of stock returns for the current year. The dependent variable in column 1 is the standard deviation of daily returns, the standard deviation of daily idiosyncratic returns obtained from a CAPM market model in column 2. The dependent variables in columns 3 and 4 use similar methodologies as columns 1 and 2, respectively, but with 12 monthly returns for the year. The first principal component of the Board Diversity Index is the main independent variable. Panel A displays results from models with industry (Fama-French 49), headquarter county, and year fixed effects, while Panel B displays results from models with firm and year fixed effects. The full set of controls from Panel A are also included in the models in Panel B, but are omitted in the table output for brevity. All models cluster standard errors at the firm-level.

Dependent Variable:	(1) *Total* *Daily Vol.*	(2) *Idiosyncratic* *Daily Vol.*	(3) *Total* *Monthly Vol.*	(4) *Idiosyncratic* *Monthly Vol.*
First Principal Component	0.817***	0.778***	0.713***	0.652***
	(3.390)	(3.525)	(2.733)	(2.587)
Ln(Assets)	-2.599***	-3.583***	-2.598***	-3.402***
	(-7.661)	(-11.506)	(-7.429)	(-10.144)
M/B	0.897***	0.498**	0.572**	0.590*
	(3.704)	(2.055)	(2.084)	(1.945)
Mkt. Lev.	3.511***	3.523***	4.314***	3.945***
	(10.901)	(11.164)	(12.584)	(11.723)
Tangibility	0.840**	0.610*	0.981***	0.850**
	(2.443)	(1.910)	(2.618)	(2.386)
Cash/Asset	2.437***	2.058***	2.556***	2.221***
	(8.885)	(8.407)	(8.402)	(8.097)
I(Dividend Paying)	-2.572***	-2.512***	-2.537***	-2.566***
	(-10.482)	(-11.206)	(-9.560)	(-10.269)
ROA	-3.538***	-3.717***	-3.613***	-4.085***
	(-3.995)	(-3.692)	(-4.069)	(-4.905)
(R&D/Assets)	2.052***	1.816***	2.412***	1.577***
	(5.273)	(4.780)	(5.795)	(4.280)
Ln(1+Firm Age)	-1.457***	-1.503***	-1.268***	-1.375***
	(-6.262)	(-6.790)	(-5.040)	(-5.612)
Ln (Board Size)	-1.126***	-0.953***	-0.938***	-0.947***
	(-4.656)	(-4.318)	(-3.527)	(-3.756)
Ln(Average Board Age)	-1.442***	-1.192***	-1.468***	-1.047***
	(-6.514)	(-5.980)	(-5.878)	(-4.428)
Ln(1+CEO Tenure)	-0.255	-0.365**	-0.224	-0.279*
	(-1.553)	(-2.423)	(-1.239)	(-1.665)
CEO is Chair and President	-0.046	-0.042	-0.012	0.078
	(-0.272)	(-0.274)	(-0.063)	(0.440)
CEO General Ability Index	0.590***	0.687***	0.428**	0.520**
	(2.950)	(3.819)	(2.013)	(2.562)
County Per Capita Income Growth	-0.218	-0.032	-0.594**	0.258
	(-0.865)	(-0.135)	(-2.016)	(0.940)
County Population Growth	-0.089	-0.113	-0.285*	-0.180
	(-0.585)	(-0.841)	(-1.721)	(-1.278)

Ln(County Per Capita Income)	3.608***	2.918***	3.067***	1.886**
	(4.946)	(4.503)	(4.001)	(2.547)
Ln(County Population)	-3.633***	-3.438***	-4.465***	-3.866***
	(-3.629)	(-3.735)	(-3.751)	(-3.468)
% Clear Days	0.860*	0.688	0.891*	0.962*
	(1.691)	(1.397)	(1.671)	(1.797)
Diversity of Local Directors	-0.548**	-0.570***	-0.719***	-0.636***
	(-2.543)	(-2.818)	(-2.892)	(-2.731)
Industry (FF-49) FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Observations	14,391	14,391	14,391	14,391
R-squared	0.584	0.572	0.473	0.449