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Board diversity, firm risk, and corporate policies

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Abstract

We examine the effects of diversity in the board of directors on corporate policies and risk. Using a multi-dimensional measure, we find that greater board diversity leads to lower volatility and better performance. The lower risk levels are largely due to diverse boards adopting more persistent and less risky financial policies. However, consistent with diversity fostering more efficient (real) risk-taking, firms with greater board diversity also invest persistently more in R&D and have more efficient innovation processes. 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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1 Introduction

Corporate board diversity has gained substantial political and media attention in recent years. Since 2008, six countries have adopted binding quotas to promote gender diversity on boards while several others have non-binding quotas or are considering legislation (Smith, 2014).[1] Numerous studies examine the impact of gender diversity on 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 in fact the most important dimension of director diversity and there is far less research investigating other aspects.[3] Moreover, most studies on diversity investigate only a narrow set of corporate outcomes, typically focusing on firm performance.[4]

Using a multi-dimensional measure of diversity, we investigate the impact of board diversity on corporate outcomes primarily related to risk. Our focus on risk-related outcomes stems from economics and social psychology studies that suggest team diversity moderates group decisions (Sah and Stiglitz, 1986, 1991; Moscovici and Zavalloni, 1969). The direction of these effects, however, is largely an empirical question.

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[1] The six countries include: Norway, Finland, Iceland, Belgium, the Netherlands, and Italy.

[2] See Terjesen, Sealy, and Val Singh (2009), which reviews over 400 studies across disciplines on gender diversity on corporate boards.

[3] Both 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. Giannetti and Zhao (2016) focus mainly on ethnic diversity. The exception is Anderson, Reeb, and Zhao (2011) who measure board heterogeneity along several dimensions.

[4] In aiming to assess whether gender diversity is ultimately beneficial, most studies focus on firm performance or value (See Carter, Simkins, and Simpson (2003), Adams and Ferreira (2009), Farrell and Hersch (2005), and Ahern and Dittmar (2012), for examples). Exceptions include current work of Giannetti and Zhao (2016), who investigate the relation between board ethnic diversity and firm risk, and Carter, Franco, and Gine (2016), who show that greater gender diversity on boards reduces the pay gap between male and female executives.

On the one hand, the evidence in social psychology studies supports the view that diversity leads to moderated decisions (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 power. Adams et al. argue this is because powerful CEOs have the ability to make unchecked decisions, which leads to more idiosyncratic 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 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 firm outcomes. Thus, by this logic, we conjecture that greater board diversity should lead to less volatile outcomes.

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

We begin our analysis by constructing a diversity index. The organizational behavior literature suggests that team diversity has many facets (Williams and O'Reilly, 1998). Therefore, we take a general approach, including multiple dimensions of diversity. We are agnostic about which aspects of diversity should matter for corporate policies related to risk and, admittedly, are partly driven by data availability in our choices. Our index is based on six dimensions, including both demographic and cognitive factors that are observable and widely available. These include gender, age, ethnicity, educational background, financial expertise, and breadth of board experience.

Consistent with our 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 the model is that the combined effect of different sources of diversity affects the attainment of the consensus necessary for the well-functioning of a board, more so than any individual dimension.

Using our multidimensional index, we show that greater board diversity is associated with lower realized firm risk. This is consistent with the theory that diversity moderates decisions. However, establishing the causality of this result 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 Bernstein et al. (2016), which 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 nonlocal potential directors that reside within a non-stop flight from the firm headquarters.

Notably, our instrumental variable is not mechanically correlated with the 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.[5] Nor is it mechanically

[5] Note that the addition of a new direct flight to a firm's headquarters can either increase or decrease the diversity of the nonlocal director pool. If the new flight connects the headquarters location to an area composed of a

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, any omitted variable that determines firm risk must also be correlated with the existence of non-stop flights between firm headquarters and other U.S. cities *as well as* the diversity of the directors that reside in these locations.

Moreover, consistent with the *relevance condition* of our instrument, we show that actual board diversity is indeed positively related to the diversity of nonlocal potential directors residing a non-stop flight away from firm headquarters. Importantly, we conduct supplemental tests to assess the conceptual underpinnings of our IV approach. First, we show that the geographical makeup of *actual* nonlocal board members of our sample firms reflects the degree of non-stop flight connectivity between the firm headquarters and the domicile of nonlocal *potential* directors. Second, we confirm that changes in actual board diversity are related to changes in the diversity of nonlocal potential directors resulting from additions and deletions of flight routes connecting to firm headquarters. Lastly, we show that our IV estimates are driven by the diversity of directors employed outside the firm as opposed to internal executive directors who should be less affected by the diversity of the *nonlocal* supply of directors.[6]

Using the diversity of the nonlocal supply of directors as an instrument in two-stage least squares (2SLS) regressions, we find strong and consistent support for the notion that greater board diversity *causes* lower firm risk.[7] Moreover, the 2SLS estimates highlight the positive bias

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homogenous group of potential directors, then the diversity of the nonlocal pool of directors will likely decrease the diversity of the firm's nonlocal director pool.

[6] Henceforth, we use the label "executive directors" for inside directors who also serve as executives of the firm.

[7] 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.

embedded in OLS estimates. If director diversity makes corporate decisions less idiosyncratic, then firms operating in risky environments will find it optimal to select boards that are more diverse. Economically, the 2SLS estimates suggest that a one standard deviation increase in board diversity causes a 24-percentage point decrease in annual realized return volatility. This is about a one standard deviation decrease in volatility and holds using alternative measures of realized volatility and alternative index construction methodologies.

Breaking down the index by its individual components or by component type (cognitive or demographic) reveals that no single component of diversity alone drives the relation between the diversity index and firm risk. Moreover, the combined effect of the index components on firm risk remains negative and significant when we in turn exclude any individual component. This evidence supports the theory of Baranchuk and Dybvig (2007), which implies that the board's decision-making depends on the combined effect of different dimensions of board diversity.

Board diversity, however, is not equally effective in all circumstances. First, its moderating effect on firm risk increases with the firm's R&D intensity and growth opportunities, consistent with larger benefits from diversity when the firm profile is fundamentally riskier. Second, the moderating effect of board diversity on firm risk decreases in more volatile market conditions, when a nimbler decision process and swifter reactions may be more beneficial. Lastly, board diversity is less effective in moderating firm risk when a larger fraction of directors are co-opted or have longer tenure. This suggests that dynamics such as bondage to the CEO or emergence of "groupthink" that hamper the board's monitoring role (e.g., Coles et al. (2014, 2015)) also reduce the effectiveness of board diversity as a risk-moderating mechanism.

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.

In subsequent analysis, we focus on corporate financial and investment policies to gain further insights on the link between board diversity and realized volatility. To that end, we conduct two types of tests. We begin by examining whether board diversity affects the persistence of corporate policies. The rationale of these tests is that if diversity moderates board decisions, then corporate policies adopted by diverse boards should be more robust to changing conditions and, thus, be more persistent over time. Our evidence shows that indeed the persistence of corporate policies over one, two, or three-year windows increases with board diversity. These results support the idea that the lower ex post return volatility stemming from diverse boards is at least partly due to decisions that are ex ante less erratic.

Next, we investigate whether board diversity affects firm policy choices that determine corporate financial and real ex ante risk-taking. From these tests, we find that firms with greater board diversity adopt less risky financial policies, consistent with the lower return volatility resulting from board diversity. In particular, firms with diverse boards 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 regarded as inherently riskier 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; Cao et al., 2016). Expanding on these findings, we investigate how board diversity affects innovation output and success. Supporting the view that diversity fosters efficient innovation activities, we find that board diversity leads to greater innovation output (in absolute and per dollar invested) that is more impactful and original, as measured by firms' patenting activity.

Although board diversity reduces firm risk, it is not obvious that this is ultimately to the benefit of the firm shareholders. Indeed, diversity can generate more conflicts and reduce group cohesion (Becker, 1957; Hambrick, Cho, and Chen, 1996; Li and Wu, 2014). The decisions of diverse boards may then reflect inefficiently low risk-taking due to the inability to reach consensus on riskier policies, which leads to a "quite life" approach. Moreover, frictions inside the board may inefficiently lengthen the decision-making process (Hambrick et al., 1996). This would be especially problematic when firms need to react quickly, as suggested by the fact that the moderating effect of board diversity on risk is weaker when aggregate volatility is high.

In light of these considerations, we conclude our analysis by investigating the impact of board diversity on firm performance and value. Our results show that, on average, both operating performance and asset valuation multiples increase with board diversity. This evidence indicates that the benefits of diverse views among directors outweigh the costs, in our sample. In fact, our results imply that the typical board composition in our sample reflects a constrained maximization, whereby greater diversity would be desirable. Nonetheless, the positive effect of diversity on firm performance and value is weaker when aggregate volatility is high, in line with the notion that diversity is more costly when flexibility is more valuable.

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 corporate officer surveys often suggest that diversity is beneficial, respondents can seldom articulate why (Krawiec, Conley, and Broome, 2013). Our evidence supports management's beliefs and shows that board diversity lowers firm risk by producing more robust policy choices, reducing financial risk taking, and increasing the efficiency of innovation activities, and ultimately leads to better performance.[8]

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 of 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 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) (KKM, hereafter), who use the number of firms within sixty miles of the firm headquarters as a

[8] These results stand in sharp contrast to those of Giannetti and Zhao (2016), who report positive associations between board ethnic diversity and the volatility of firm performance. Our analysis of the reation between ethnic diversity and realized risk does not support these findings, as we find that no single element of diversity alone can explain firm risk. However, we recognize that there are some differences in the measurement of director ethnicity, choice of instrumental variables, and samples between the two studies.

proxy for the *local director* supply.[9] 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. This improves on the KKM measure in two important ways. First, our instrument's variation is generated by route decisions made by airlines and dwelling decisions made by directors, rather than firms' location choices. In our context, this is particularly important because it alleviates concerns that the firm's inherent risk profile or its drivers determine headquarters location choices and thus access to the local director pool. Second, our instrument better disentangles the effects of directors from managers since variation in our instrument depends on characteristics of the nonlocal director market, while managers naturally tend to reside in close proximity to the firm.

2 Data, Variables, and Sample

We begin this section by summarizing the construction of our sample and main variables. Then, in light of the fact that board diversity varies systematically with key firm and board characteristics, we discuss the conceptual underpinnings of our novel instrumental variable approach and the evidence that supports the relevance of our instrument for board diversity.

2.1 Sample Construction

Our sample comprises all non-financial, non-utility firms included in the intersection of the ExecuComp and RiskMetrics databases for the years from 1996 to 2014 for which there are available data to compute the diversity index. Our main outcome and control variables are based on data available in the Compustat and CRSP databases. In addition, we utilize the NBER patent

[9] Local labor supply-based measures have also been used to instrument for executive selection. For example, both Huang and Kisgen (2015) and Carter et. al. (2016) use the local proportion of women elected to political offices to instrument for the appointment of female executives.

database and data on patenting activity from Kogan, Papanikolaou, Seru, and Stoffman (2014) in our tests pertaining to firm innovation activities.

To construct the board diversity index, we use data that are mostly from RiskMetrics, which includes information on director age, gender, race, financial expertise, and the number of directorships. In addition, we use data on directors' educational background (i.e., college degrees) from the BoardEx database. We have complete data to construct the board diversity index for 70% of the original firm-year observations. After dropping observations with missing values for the control variables, our final sample consists of 21,572 firm-year observations. Panel A of Table 1 reports the sample summary statistics for the variables used in our empirical tests.

2.2 Diversity Index

The main variable of interest in our analysis is the diversity of directors sitting on the board. To measure diversity, we construct an index based on six distinct director characteristics. Our choice of characteristics is guided by the literature on diversity as well as data availability. Existing studies on diversity often distinguish between demographic (i.e. observable) and cognitive (i.e. unobservable) characteristics (e.g., Maznevski, 1994; Milliken and Martins, 1996). In line with this approach, we use three director characteristics for each of the two broad classes. However, we recognize that the classification may be ambiguous. For example, director demographics could plausibly affect cognitive characteristics to some extent. The director demographics that we use include gender, age, and ethnicity, whereas we use institution of college education, financial expertise, and other board experience to proxy for cognitive factors.

We combine the six director characteristics into a board diversity index as follows. For each board-year, we calculate the fraction of female directors (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 director ethnicity (HHI_ETHNICITY), institution where the directors received their Bachelor's degree (HHI_BACHELOR), and director financial expertise (HHI_FINEXPERT).[10] In particular, we calculate HHI_ETHNICITY using ethnic categories of the board members as provided by RiskMetrics: White/Caucasian, African-American, Hispanic, Asian, and Other.[11] We calculate HHI_BACHELOR using the institutions that granted the Bachelor's degrees to each board member. For example, if two directors received Bachelor's degrees from Harvard, one director from Stanford, and three from Yale, then HHI_BACHELOR is equal to 0.388 (i.e., $(2/6)^2 + (1/6)^2 + (3/6)^2$). It is worth noting that we do not take into account the year of graduation and rather focus on the institution where the director graduated. Thus, HHI_BACHELOR aims to capture similarities in pedigree or training that stem from the culture of the institution granting the degree. Lastly, we calculate HHI_FINEXPERT using the binary variable for financial expertise provided by RiskMetrics. Thus, if four out of ten board members are financial experts, then HHI_FINEXPERT = $(4/10)^2 + (6/10)^2 = 0.52$.

We normalize each diversity component by its mean and standard deviation, so that their scale is comparable, and then equally-weight each factor to construct the board diversity index:

BOARD_DIVERSITY= STDZ(PCT_FEMALE) + STDZ(STDEV_AGE)

[10] We obtain almost identical results if instead of STDEV_AGE, we calculate 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.

[11] If we cannot retrieve director ethnicity from RiskMetrics – approximately 40% of the original sample, we use the Onomap classification algorithm based on director first and last name to assign the director to an ethnic group.

$$+ \text{STDZ(NUM\_BOARDS)} - \text{STDZ(HHI\_ETHNICITY)} \quad (1)$$

$$- \text{STDZ(HHI\_BACHELOR)} - \text{STDZ(HHI\_FINEXPERT)}$$

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] The summary statistics in Panel A of Table 1 indicate that the average board exhibits more diversity in schooling than along ethnicity or financial expertise. Figure 1 provides a visual summary of the average board diversity index by firm headquarters state. The figure suggests that firms located in Midwest and East Coast states (except South Carolina) tend to have greater board diversity. Firms in Washington and Idaho also tend have diverse boards. Figure IA.1 in the Internet Appendix displays similar plots for the underlying components of the index.

Panel B of Table 1 reports the simple correlations between each of the diversity index components, as well as the components and the index. Consistent with each measure capturing a distinct dimension of diversity, the various components of the index tend to be only weakly positively correlated with one another. The notable exception is the age-based diversity component, which is negatively correlated with most of the other components.

2.3 Which Firms Have Diverse Boards?

If board diversity matters, we would expect it to vary systematically across firms. In Table 2, we analyze the association between board diversity and various firm characteristics to understand

[12]We calculate the percent of the board that is female instead of a HHI measure for gender 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 as meaningful. However, using the HHI of gender or an indicator for whether the board contains a female member yields almost identical overall results.

which firms tend to employ more diverse boards. The table reports the results of OLS regression models where the dependent variable is the diversity index. The independent variables consist of various time-varying firm characteristics (book assets, market-to-book ratio, leverage, etc.), CEO characteristics (tenure and position on the board), and firm location characteristics (based on headquarters county). In addition, we control for year, industry (Fama-French 49), and headquarters-county fixed effects, and report t-statistics adjusted for standard errors clustering at the firm level. The goal of this analysis is to assess whether board diversity varies systematically across firms, rather than to draw any causal inferences from the estimated relations.

The evidence in Table 2 indeed shows that board diversity is not randomly distributed along dimensions that can plausibly affect firm risk. Specifically, the results indicate that older, larger growth firms that invest more in R&D tend to have more diverse boards. In terms of board composition, firms with larger boards and younger directors have greater overall board diversity.[13] Additionally, we find that firms with more diverse boards tend to be located in wealthier areas and have CEOs with shorter tenure and in dual roles.

2.4 Instrumental Variable for Board Diversity

The results in Table 2 indicate that board diversity varies systematically along dimensions that likely affect the volatility of firm outcomes (i.e., firm risk). This evidence highlights the potential problems that afflict any analysis aiming to establish causal effects of the composition of the board due to its endogenous nature. Throughout our analysis, we use a novel director supply-based instrumental variable approach to tackle the challenge of capturing plausibly

[13] The age component of our diversity index is measured as the dispersion of director ages, so it is not immediately obvious whether the average age of the board members should be positively or negatively associated with diversity.

exogenous variation in board diversity.[14] In particular, we instrument the firm's board diversity by the diversity of the supply of *nonlocal potential* directors residing one non-stop flight away from the firm headquarters.

The logic of our approach rests on the idea that a director's travel costs determine the likelihood of a firm-director match, similar to the local director supply argument in KKM (2013). Different from KKM, however, our IV approach exploits the fact that the personal costs of performing a task at a distant location decrease with the availability of non-stop flights between the agent performing the task and its location, as in Giroud (2013) and Bernstein et al. (2016). Specifically, our instrumental variable is the average diversity of nonlocal potential directors weighted by the frequency of non-stop flights connecting director residence and firm headquarters locations.

The exogenous variation in our instrumental variable stems from cross-sectional and time-series variations in the diversity of the supply of nonlocal directors available to firms via non-stop flight routes – as opposed to the availability of local directors as in KKM. This is important in our context, given that firm access to local directors necessarily reflects the firm headquarters' location choice, which may in turn depend on or influence the firm's risk profile. This logical chain of relations implies that local supply-based instruments would likely violate the exclusion restriction in our context. Instead, the variation in our instrument reflects airlines' decisions about air routes as well as nonlocal directors' dwelling decisions, which alleviates concerns about violations of the exclusion restriction.

[14] For the sake of brevity, we limit our discussion here to the intuition behind our main IV, including its conceptual underpinnings and empirical relevance. Appendix A expands this discussion by providing greater details about the construction of the IV and the design of the tests that we conduct to validate empirically its conceptual underpinnings.

The conceptual premise for the relevance of our IV is that the existence of non-stop flights between director domiciles and firm headquarters determines the geographic composition of the board. The analysis in Table A.1 of Appendix A explicitly tests this conjecture. There we examine whether the likelihood that nonlocal potential directors serve on a board depends on the existence and frequency of non-stop flights connecting the director domicile and the firm headquarters locations, consistent with our hypothesized channel.

The supplemental evidence in Appendix A strongly supports our main conjecture. Indeed, consistent with KKM (2013), we find that physical distance between firms and potential directors greatly reduces the likelihood of a firm-director match. However, physical distance between firm headquarters and director domiciles becomes increasingly irrelevant as the frequency of non-stop flights between those locations increases. The magnitude of this effect is economically meaningful. For example, for distant counties where the population of potential directors is one standard deviation above the mean county, a one standard deviation increase in the availability of non-stop flights connecting to the firm headquarters increases the frequency of director-firm match by 25%.

Overall, the evidence in Appendix A validates the logical premise of our IV approach and alleviates concerns that first-stage IV estimation results in our subsequent tests may be spurious.

3 Board Diversity and Firm Risk

In this section, we discuss our baseline evidence about the effects of board diversity on firm risk as measured by the volatility of stock returns. We then discuss the results of tests that focus on the effects of different sources of diversity included in the aggregate index and on the conditional effects of diversity on firm risk.

3.1 Does Board Diversity Affect Stock Return Volatility?

Our main conjecture is that board diversity determines the degree to which idiosyncrasies in directors' preferences, incentives, and access to information affect the decision-making process of the board. As such, diversity among directors should have a first order impact on the risk associated with the outcome of board decisions.

Table 3 presents the results of our baseline tests. The dependent variable of interest in the estimated firm-year regression models is the annualized total volatility of daily stock returns.[15] All specifications include a host of controls for time-varying firm and CEO characteristics as well as characteristics of the firm headquarters-county. Columns 1 and 2 report OLS estimates, where Column 1 includes fixed effects for year, industry (i.e., Fama and French (1997) 49-industry), and headquarters-county, while Column 2 replaces industry and county with firm fixed effects. Columns 3 and 4 report the first and second stage results for our IV estimation. All of the t-statistics in the table are based on standard errors clustered at the firm level. Moreover, for ease of interpretation, all of the independent variables, including the Diversity Index, are normalized to have a mean of zero and standard deviation of one.

The evidence in Table 3 shows that higher board diversity is associated with lower realized stock return volatility, independent of the specification or estimation approach. This evidence supports the hypothesis that more diverse groups would make more moderated decisions, which are ultimately reflected in realized volatility. For example, the coefficient estimate on the Diversity Index in Column 1 implies that a one standard deviation increase in board diversity is

[15] In Table IA.1 of the Internet Appendix, we repeat our tests using instead the idiosyncratic volatility of daily returns, the total volatility of monthly returns, or the idiosyncratic volatility of monthly returns. We obtain consistent results across these alternative measures.

associated with a decrease in annualized volatility of 0.80 percentage points. However, the results in Column 1 may be biased due to omitted variables as well as the plausibly endogenous nature of board composition.

The OLS estimates in Column 2 show that the results in Column 1 cannot be explained by omitted time-invariant factors at the firm level, such as corporate culture for example. We continue to find that there is a negative and significant association between board diversity and stock return volatility after controlling for firm fixed effects. Therefore, the relation between volatility and board diversity does not appear to be due to a spurious correlation between time-invariant components of board diversity and corporate risk-taking style. These results, however, cannot rule out the possibility that omitted time-varying factors jointly determine firm risk and board composition, or that the firm time-varying risk profile drives board diversity.

In particular, one can plausibly envision the endogeneity bias going in either direction, depending on how board diversity affects the decision-making process. On the one hand, if diversity is anticipated to disrupt the deliberation process and make the resulting outcomes more erratic (Arrow, 1951), then firms that operate in more volatile environments may find it optimal to have *less* diversity in the board. This line of reasoning implies that OLS estimates are *negatively biased* and thus the bias may explain our baseline results. On the other hand, if directors' heterogeneity results in the synthesis of diverse views that make corporate decisions less idiosyncratic, then firms that operate in more volatile environments may find it optimal to have *more* diversity in the board. Contrary to the first view, this implies the OLS estimates are *positively biased* and underestimate the causal decrease in firm risk that stems from board diversity.

As previously explained, we propose a novel IV approach to tackle the challenges associated with omitted variable and endogeneity bias in the context of causal effects of board composition. Columns 3 and 4 in Table 3 report the resulting first and second stage IV estimates, respectively. The first stage estimates show that there is a significant (at the 1% level), positive relation between the diversity of directors on the board and the diversity of nonlocal potential directors available to the firm via nonstop flights. The *t*-statistic on the first stage instrument is 2.8 and the F-statistic is greater than 10, which passes the "weak instrument test" of Stock and Yogo (2005). This confirms that our instrument is (empirically) relevant, as suggested by the supplemental evidence in Appendix A discussed earlier. Interestingly, the economic effect of the diversity available in the supply of nonlocal directors is comparable to that of local directors – i.e., 0.05 vs. 0.06, respectively. Moreover, the estimated coefficients on the remaining first-stage control variables are broadly in line with those reported in Table 2.

The second stage IV estimates of the relation between board diversity and firm risk are qualitatively in line with the OLS results. That is, board diversity instrumented with the diversity of accessible nonlocal directors has a large negative and statistically significant effect on the firm stock return volatility. However, it is noteworthy that the negative impact of the instrumented board diversity is an order of magnitude larger than the OLS estimates, which suggests the latter are positively biased. In turn, this supports the argument that higher unconditional risk may lead firms to rely optimally on more diverse boards, if such heterogeneity helps to manage more efficiently and ultimately temper the firm's (unconditional) risk.

One concern with the IV tests in Table 3 may be that the diversity of potential non-local directors co-varies with the diversity of potential local directors and the instrumented board diversity reflects this underlying relation. This in turn would explain why local diversity does not matter in the second stage of the IV estimation. To address this concern we conduct two supplemental tests.[16] In the first test, we estimate our baseline model while excluding the diversity of potential local directors and find that our estimates of interest are nearly identical. In the second test, we estimate our model within subsets of firms with high and low diversity of potential local directors, and find that our results hold across the two subsamples. Overall, this evidence indicates that the relation between the diversity of potential local and nonlocal directors cannot alone explain our baseline results.

The model specifications in Table 3 include fixed effects for firm headquarters counties. This approach effectively controls for both the average diversity of potential directors residing in the firm headquarters county as well as the average diversity of nonlocal potential directors residing one non-stop flight away from the headquarters. An alternative approach to testing the causal impact of board diversity on volatility is to focus on the relation between changes in realized volatility and changes in board diversity that stem from variation in non-stop airline routes.

Table 4 reports the results of this alternative testing strategy. Here, we begin by examining whether changes in the actual board diversity depend on changes in the diversity of the pool of nonlocal potential directors due to additions or deletions of non-stop flight routes connecting to the headquarters. Specifically, we test whether changes in our IV stemming from changes in non-stop flight routes explain subsequent changes in board diversity. Since most director appointments are between three to five years, we use changes in board diversity three years ahead to allow the composition of the board to adjust to changes in flight routes. The evidence in Column 1 of Table 4 lines up with the estimates in Column 3 of Table 3 and supports the

[16] Tables IA.2 and IA.3 of the Internet Appendix report the results of these supplemental tests.

premise of our IV approach. Specifically, consistent with a causal impact, changes in the diversity of nonlocal potential directors resulting from additions or deletions of flight routes explain subsequent changes in the actual diversity of the typical board.

Next, we examine whether changes in board diversity instrumented with changes in the diversity of nonlocal potential directors due to flight route changes explain changes in volatility. This analysis is similar in spirit to our baseline tests, with the exception that we measure all of the variables of interest in changes over the relevant three-year window. The second stage IV estimates from this model, in Column 2 of Table 4, are in line with our baseline evidence and inferences. That is, the instrumented changes in board diversity are inversely related to changes in firm volatility measured over the same window. Therefore, increases (decreases) in board diversity resulting from increased (decreased) diversity in the pool of nonlocal potential directors due to flight route changes result in lower (higher) firm volatility. This evidence provides strong support for the idea that changes in board diversity stemming from flight route changes ultimately cause changes in firm volatility.

Overall, the results in Tables 3 and 4 demonstrate that there is a strong negative relation between board diversity and firm risk as measured by the volatility of stock returns. The evidence is consistent with the notion that board diversity has a causal impact on firm risk. Furthermore, our analysis underscores the importance of accounting for the potential endogeneity of board composition when evaluating the causal impact of board diversity.

3.2 Which Sources of Diversity Matter More for Firm Risk?

In the next set of tests, we examine whether the baseline results reported in Table 3 reflect dominant effects of some particular source of board diversity. We first examine whether the effects of aggregate diversity mask the impact of specific components of the index. We then repeat the baseline tests focusing on the diversity added to the board by directors who are not executives of the firm, which is particularly important in light of our IV estimation approach.

Table 5 reports the results of the analysis that we conduct to assess the impact of the various components of the board diversity index on our baseline results. Panel A reports the second stage IV estimates that we obtain when we repeat our analysis while focusing on the individual components of the index. Panel B reports the second stage IV estimates obtained when we in turn exclude each individual component from the index.[17]

The results in Panel A and B of Table 5 suggest that no single component of the diversity index drives our baseline inferences concerning the effect of aggregate board diversity. First, the estimates in Panel A indicate that each single instrumented component does not affect return volatility, except for a statistically marginal effect of gender diversity. Second, we find that our baseline results are robust when we omit any one of the individual components from the index. Overall, these results imply that the common variation in different aspects of board diversity affects the decision-making process and ultimately the volatility of firm outcomes. This is in line with the main implication of the Baranchuk and Dybvig (2007) model, whereby the combined effect of different sources of diversity affects the functioning of a board.

In Panel C of Table 5, we instead group the six components of board diversity into two separate indexes that reflect the broad nature of the different components. In particular, we construct an index for *demographic diversity*, based on age, gender, and ethnicity, and one for

[17] We obtain qualitatively similar results when we estimate the models by OLS, as shown in Panels A and B of Table IA.2 of the Internet Appendix.

cognitive diversity, based on educational background, financial expertise, and outside board experience. We then repeat the tests reported in Table 3 for each separate index.

The OLS estimates in Panel C suggest that firm risk covaries negatively with board diversity along both the demographic and cognitive dimensions – see Columns 1 and 2. However, while the first stage IV estimates indicate that the accessible diversity of nonlocal potential directors matters along both dimensions – i.e., Columns 3 and 5, only the instrumented cognitive diversity index retains a statistically significant impact on firm risk. Nonetheless, it is noteworthy that the economic magnitude of the effects of either type of diversity on risk is roughly four to seven times smaller than the baseline estimate in Table 3 for the aggregate index. Therefore, in line with the takeaway from Panels A and B, the results in Panel C further support the notion that no single category alone fully captures the effects of diversity on firm risk.

In Table 6, we repeat our tests while separating the effect of diversity added to the board by executive versus non-executive directors.[18] The motivation for this analysis is two-fold. First, it is not obvious that diversity added by executive directors should be meaningful, given that they interact daily and thus could tend to develop more homogenous views about decisions that affect firm risk. Second, the logic of our IV estimation approach does not strictly apply to executive directors, as they will naturally tend to reside in relative proximity of the firm headquarters.

Consistent with our priors, both the OLS and IV estimates in Table 6 indicate that the negative relation between firm risk and board diversity is predominantly due to the incremental diversity brought to the board by non-executive directors. Indeed, the magnitude of the OLS estimate for the effect of diversity added by non-executive directors in Column 1 is over three

[18] As explained in footnote 6, "executive directors" refers to directors who also serve as executives of the same firm.

times larger than that for executives in Column 4. Similarly, the corresponding IV estimate for non–executives in Column 3 is roughly 25% larger than the baseline IV estimate for the effect of aggregate board diversity in Table 3. Moreover, in line with the logic of our IV estimation, the first stage results in Columns 2 and 5 show that the relation between our instrument (i.e., diversity of accessible nonlocal potential directors) and the aggregate diversity of the board is due to the diversity added by non-executive directors.[19]

3.3 When Does Diversity Matter More for Firm Risk?

The evidence so far consistently shows that board diversity leads to lower risk for shareholders. It is plausible, however, that the effects of board diversity on risk would vary along dimensions that determine the optimal composition and role of the board. We examine here whether the effect of diversity on risk depends on firm, board, and market-wide characteristics that should affect the tradeoffs underlying the board composition and its role.

For example, if the benefits of diversity increase with the fundamental risk of the firm as previously discussed and the discrepancy between OLS and IV estimates confirms, we would expect the moderating effect of diversity to be larger in such circumstances. Conversely, we expect the moderating effect of diversity to be smaller when the environment in which the firm operates becomes (ex post) more volatile and changing circumstances require quicker reaction times and resolute decision-making (Hambrick, Cho, and Chen, 1996). Furthermore, to the extent that the effect of board diversity partly stems from its monitoring functions, we expect diversity to become less effective when other dynamics of the board hamper those functions.

[19] Indeed, for four of the six components of the diversity index, the evidence in Table IA.5 of the Internet Appendix shows that the diversity added by non-executive directors strongly depends on the diversity of nonlocal potential directors residing a nonstop flight away from the firm headquarters.

We examine the implications of these lines of reasoning in Table 7, which reports the second stage IV estimates of the effect of board diversity on firm risk conditional on various firm, board, and market-wide factors. Specifically, we use indicators for firms with above median asset market-to-book ratios and R&D investment intensity to proxy for firms with high fundamental risk, and an indicator for high level of market-wide volatility (i.e., VIX index) to proxy for times of broader changes in the environment. Based on the evidence in Coles et al. (2014, 2015), we use indicators for firms with an above median proportion of coopted or long-tenured directors to proxy for board dynamics that are likely to hamper its monitoring function.

The results in Table 7 are broadly consistent with the conjecture that board diversity is not equally effective under all circumstances. First, the evidence in Columns 1 and 2 shows that board diversity has a larger moderating effect on stock volatility when firm fundamental risk is higher, i.e., higher R&D investment intensity or asset market-to-book ratios. This is consistent with the earlier suggestion that these types of firms benefit most from a more diverse composition of the board. Conversely, the estimates in Column 3 indicate that board diversity exacerbates the effects of market-wide volatility on firm risk. Thus, board diversity is less effective when uncertainty in the broader environment increases and a nimbler decision process may be needed. Lastly, in Columns 4 and 5, we find that board diversity is less effective in moderating firm risk when a larger fraction of directors are co-opted or have longer tenure on the board, respectively. This evidence suggests that other dynamics of the board decision-making process play a key role with respect to the effectiveness of diversity as a risk-moderating factor.

Overall, the evidence discussed in this section reinforces the notion that the joint effect of different aspects of board diversity is what matters for firm risk, as opposed to any single aspect. Furthermore, the results indicate that the heterogeneity added to the board by outside directors is of first order importance for the risk associated with corporate decisions. Finally, we find that the strength of the link between board diversity and firm risk depends on the circumstances that should affect the optimal composition of the board and the effectiveness of its monitoring role.

4 Board Diversity and Corporate Policies

Our evidence to this point shows that diversity in the board of directors has a large moderating impact on *ex post* volatility of stock returns, consistent with lower risk. In this section, we shift our focus on corporate policies to gain insights on the channels through which board diversity affects the firm *ex ante* risk profile.

We begin by examining whether the persistence of corporate policies depends on board diversity. If board diversity affects volatility due to a moderating effect, then the policies adopted by diverse boards should be more stable and persistent. Next, we investigate whether board diversity explains the patterns in financial and investment policies that theory suggests should determine firm risk. Lastly, we focus on a fundamental output of the firm investment strategy whose efficiency can have a large impact on firm risk. Namely, we examine whether board diversity affects the efficiency of corporate innovation in ways that are consistent with its effects on firm risk.

4.1 Board Diversity and Policy Persistence

In our baseline tests, we rely on realized stock volatility as a simple summary measure that should reflect idiosyncrasies in the board's decision-making process. We interpret the negative relation between board diversity and realized volatility as consistent with the conjecture that diversity fosters moderation in board decisions. This approach, however, has some drawbacks. Although we control for obvious determinants of fundamental risk, realized stock volatility is by construction an ex post measure that depends on a host of other factors, in addition to moderation in the board decision-making process. For example, for a firm pursing a high growth strategy, higher volatility may be optimal rather than reflective of board decisions that are more erratic.

To address this concern and gain further insights on whether moderation resulting from board diversity affects firm risk, we examine the time-series properties of firm policies. In particular, if diversity reduces idiosyncrasies in board decisions, then firms with diverse boards should need to change course less often or abruptly. In other words, the policies adopted by diverse boards should be more stable and robust to changing conditions, which would increase the persistence of such policies over time.

In our tests, we focus on the firm's investment in physical assets (Capex/Assets), innovation (R&D/Assets), and brand building (Advertising/Sales), as well as its reliance on debt capital (Net Book Leverage) and propensity to pay dividends (Dividend/Equity). Since the importance of these policies differs across firms and industries, we also construct a summary policy index that aggregates the five separate (standardized) policy measures. For each of these variables, we measure the persistence of the corresponding policy from year to year by estimating the relation between the observed policy one year ahead and the current policy. To test whether the persistence of a policy depends on board diversity, we include the interaction between the current policy and the current instrumented diversity of the board – while controlling for the stand-alone effect of diversity.

Table 8 reports the evidence from these tests. The results in Columns 1-5 show that each of the policies we examine is highly persistent, with coefficient estimates ranging from 0.69 to 0.94 for the average board. Relevant for our purposes, we also find that the coefficient estimate on the interaction between each policy and the instrumented diversity is positive and statistically significant at least at the 10% probability level. This evidence is consistent with the notion that greater board diversity leads to moderated and thus more persistent policies.

When we focus on the aggregate policy index, we obtain similar results and the implied magnitude of the effect of diversity on policy persistence is large. Specifically, the estimates in Column 6 imply that the overall persistence of firm policies increases by approximately ten percent, on average, if the instrumented diversity increases by one standard deviation. Notably, the magnitude of the effect of diversity on policy persistence becomes larger when we extend the horizon of our tests to two and three years ahead in Columns 7 and 8. In particular, when we extend the horizon from one to three years, the policy persistence of an average firm declines by more than 13 percent, i.e., (0.84-0.73)/0.84, while the decline for a firm with instrumented board diversity one standard deviation above the mean is only six percent, i.e., (0.93-0.875)/0.93.

4.2 Effect of Board Diversity on Financial and Investment Policies

Next, we examine whether board diversity affects financial and investment policies that directors can influence in their advisory and monitoring roles. Table 9 reports second stage IV estimates for various firm policy models: net book leverage, net market leverage, dividend-to-equity ratio, CAPEX-to-asset ratio, and R&D-to-asset ratio.[20] For each model, the first stage (not shown for brevity) consists of the board diversity index regressed on our main instrument as well as all other controls. The specification of the models in Table 9 mirrors that of the 2SLS models reported in Columns 3 and 4 of Table 3.

Consistent with diverse boards adopting policies that reduce the risk borne by shareholders, the second stage estimates in Columns 1-3 of Table 9 show that greater board diversity leads to

[20] We do not include the ratio of Advertising-to-Sales in these tests because it is not obvious conceptually what effect advertising intensity may have on firm fundamental risk.

policies associated with lower financial risk. In particular, all else equal, firms with more diverse boards rely relatively less on debt capital and sustain higher dividend yields for shareholders. On average, a one standard deviation increase in the instrumented board diversity is associated with a reduction in net market and book financial leverage of 0.57 and 1.22 standard deviations, respectively, and an increase in dividend returns to shareholders of 1.1 standard deviations.

Although diverse boards rely relatively less on debt capital and support greater returns to shareholders in the form of dividends, we find no evidence that this comes at the expenses of the firm’s organic growth. Indeed, the evidence in Column 4 indicates that the instrumented board diversity has no statistically significant impact on the level of firm investment in physical assets. In fact, the second stage IV estimate in Column 5 implies that, on average, more diversity in the board systematically leads to higher R&D spending. Thus, if anything, boards that are more diverse promote larger investments in innovation activities that can foster firm growth.

The effect of board diversity on R&D investment is economically large. A one standard deviation increase in instrumented board diversity is associated with an increase in R&D investment intensity of 0.92 standard deviations. This result is intriguing given that R&D investments are typically regarded as riskier, which may seem at odds with our baseline results. However, existing research also suggests that diversity can lead to more efficient risk-taking by fostering original and innovative ideas (Hoffman and Maier, 1961). In line with this latter view, the results in Table 7 indicate that the reduction in firm risk due to greater board diversity is indeed larger for firms that have more growth opportunities and invest more in R&D. In the next section, we delve further into this issue by directly examining the effect of board diversity on the efficiency of firm innovation activities.

4.3 Effect of Board Diversity on Innovation Efficiency

To test whether board diversity explains the output and quality of firm innovation activities, we continue to instrument for board diversity using the diversity of nonlocal directors available to the firm via nonstop flight routes. The outcome variables of interest are various measures of both the quantity and quality of the firm innovation output. We use the log number of patents to measure the firm absolute innovation output, the ratio of patents to R&D expenses to measure the relative innovation output per (million) dollar invested, the log number of patent citations to measure the aggregate quality of the innovation output, the log number of citations per patent as a measure of average patent quality, and patent originality as an alternative measure of patent quality.

Table 10 reports the results of this analysis. The evidence implies that the higher R&D investments made by firms with greater board diversity is at least partly justified by a greater efficiency of their innovation process. Across the board, the results in Table 10 indicate that the instrumented board diversity has a positive and statistically significant effect on the quantity and quality of the firm innovation. Greater diversity among directors is associated with larger innovation output, both in absolute terms as well as per dollar of R&D investment. Moreover, the quality of the firm innovation output as measured by total number of patent citations, number of citations per patent, and patent originality increases with board diversity.[21]

The economic magnitude of the estimated effects of board diversity on innovation output is large. For example, a one standard deviation increase in board diversity is associated with an increase of 2.7 standard deviations in the number of patents and 1.7 standard deviations in the

[21] The sample size drops in columns (2) and (5) due to missing/zero R&D data and missing patent originality data after 2006, respectively.

number of patents per million dollars of R&D expenses. The economic magnitude of the relation between board diversity and the various measures of patent quality is equally large.

One question raised by the results in Table 10 concerns the channel through which board diversity may affect the actual output of the firm innovation activities. On the one hand, it is conceivable that more diverse directors could lead to a more efficient allocation of the firm R&D resources *ex ante*, to the extent that the board plays an important advisory role in that respect. On the other hand, diversity in the board could facilitate more efficient monitoring of the firm capital budget and facilitate the *ex post* diversion of resources from failing to more promising areas of innovation. Both of these arguments suggest the existence of a direct channel through which board diversity influences the output of the firm innovation process.

Another possibility is that board diversity helps foster an environment where firm-wide diversity is sought and cultivated. Board diversity would thus allow the development of a more diverse workforce, which previous research shows to be a key driver of the efficiency of the firm innovation processes (e.g., Gao and Zhang, 2014; Cao et al., 2016). This argument suggests an indirect channel whereby diversity among board members indirectly improves the efficiency of the firm innovation process due to spillover effects on firm-wide diversity. Although beyond the scope of our main analysis, we examine the basic implication of this argument in Table IA.6 of the Internet Appendix. Consistent with the intuition of this argument, we find that there is a strong positive (negative) association between diversity in the board and KLD's assessment of the firm strengths (weaknesses) related to the diversity of the firm's workforce.

Overall, the evidence in this section shows that the persistence of corporate policies increases with the diversity of the firm's directors and this effect is larger over longer horizons. Thus, consistent with moderated decision-making, board diversity leads to policies that are more robust, which may at least partly explain its negative effect on stock volatility. Further tests point to additional channels through which policies adopted by diverse boards can affect volatility.[22] First, diverse boards adopt more conservative financial policies, which should reduce the risk borne by investors. Second, while diverse boards invest more in potentially riskier R&D, this behavior is justified by a higher efficiency (and thus lower risk) of the innovation activities associated with greater board diversity.

5 Board Diversity and Performance

While our results indicate that board diversity leads to lower firm risk because of less erratic corporate policies, lower financial risk-taking, and more efficient investments in innovation, heterogeneity in the board can be a double-edged sword. Indeed, 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 reaction times to changing conditions (Hambrick et. al., 1996).[23] Thus, it is not obvious what may be the net impact of board diversity on firm performance.

Lower risk is not in and of itself desirable, if it comes at the expense of shareholder value. Although the evidence on the efficiency of firm innovation activities suggests otherwise, it is possible that diverse boards persistently adopt sub-optimal low risk policies that do not maximize firm value. Therefore, in this section, we directly examine whether the benefits

[22] As shown in Table IA.7 and IA.8 of the Internet Appendix, we obtain similar results when we restrict our attention to the incremental diversity added to the board by non-executive directors.

[23] Table IA.9 of the Internet Appendix reports some evidence of these costs. Since conflicts inside the board are not observable, we use two coarse proxies to test whether board frictions increase with board diversity: board turnover rates and board meeting attendance propensity. While they provide no causal evidence, the OLS estimates in Table IA.9 show that there is a positive association between these proxies of board conflicts and board diversity.

accrued from board diversity outweigh its costs, on balance. To this end, we examine the effect of board diversity on both firm operating performance and asset valuation multiples.

Table 11 reports the second stage IV estimates of models where the dependent variables are firm profitability (ratio of EBITDA to assets) and asset valuation multiples (log of asset market-to book value).[24] Similar to earlier tests, in the first stage, we instrument board diversity with the diversity of nonlocal potential directors residing a nonstop flight away from firm headquarters.

The IV estimates in Columns 1 and 2 of Table 11 indicate that greater board diversity generates positive incremental net benefits that lead to greater profitability and higher valuations, respectively.[25] The coefficient estimates on the instrumented board diversity are positive and significant at the 1% significance level, and the economic magnitude of the effects is large. A one standard deviation increase in instrumented board diversity is associated with an average increase in EBITDA-to-assets of two standard deviations, all else equal. The economic magnitude of the positive effect on market-to-book asset valuation multiples is similarly large.

Given the net positive effects of diversity on firm performance, a natural question is why all firms would not adopt boards that are more diverse. One reason may be that some firms have limited access to a well-qualified pool of diverse directors. Our first stage IV estimates indeed suggest that board diversity depends on the diversity of the pool of directors available to the

[24] Our earlier evidence shows that greater board diversity leads to more and better innovation. Hence, a positive relation between board diversity and asset market-to book ratios could reflect the larger weight of the value of growth options. This concern, however, does not apply to tests based on operating profitability, since this measure captures the income generating capacity of current assets-in-place – as opposed to future growth opportunities.

[25] This is in line with the results in Carter, Simkins, and Simpson (2003), which show a positive association between local demographic diversity and firm value. However, it is at odds with much of the finance literature on gender diversity, which finds either negative (e.g., Adams and Ferreira, 2009; Ahern and Dittmar, 2012) or no impact (e.g., Farrell and Hersch, 2005) of female directors on firm performance.

firm, both locally and within convenient flying routes. Thus, the headquarters location seems to create real barriers that prevent some firms from attaining greater board diversity.

A second reason could be that diverse boards are less effective or even suboptimal in some circumstances. The evidence in Table 7 regarding the conditional effects of diversity on firm risk suggests this may be the case. Therefore, we conduct here a similar analysis with respect to the effects of board diversity on firm performance. Table 12 reports the second stage IV estimates of the relation between board diversity and performance conditional on the firm, board, and market-wide factors examined in Table 7. Panel A and B summarize the results that we obtain for the performance models based on EBITDA-to-asset and asset market-to-book ratios, respectively.

Although in Table 7 we find that the moderating effect of board diversity on firm risk varies with firm, board, and market-wide characteristics, the results in Table 11 imply that these incremental effects do not spill over onto the relation between diversity and firm performance, except in the case of market-wide volatility. Board diversity appears to have equally beneficial effects independent of the role of firm growth opportunities and board monitoring, in Columns 1-2 and 4-5. Conversely, the beneficial effect of board diversity on firm performance is 15 to 20 percent lower during periods of high market-wide volatility, in Column 3.

It is telling that the effect of diversity on performance depends on market-wide time-series variation but not on arguably more predictable cross-sectional variation. Specifically, this evidence supports the idea that firms optimize the board composition vis-à-vis foreseeable firm level circumstances, whereas less predictable market conditions in which diversity may impede swift decisions by the board reduce the value of diversity among directors.

Overall, the evidence shows that greater aggregate board diversity is unconditionally beneficial in terms of firm performance.[26] This is inconsistent with the notion that the reduction in firm risk associated with board diversity reflects suboptimal risk-taking. Nonetheless, we also find that the net benefits of diversity are significantly lower in more volatile market-wide conditions, when the board decision process may need to be more nimble and swift.

6 Robustness Tests

In this section, we discuss the results of a series of tests that we conduct to assess the robustness of our main results.

6.1 Effect of Firm and Board Size

The results in Table 2 show that firm and board sizes are the two strongest determinants of board diversity. Larger firms and larger boards tend to be also associated with lower return volatility. Although we control for both firm and board size in all specifications, one may still be concerned that our results are due to omitted non-linear effects of firm or board size on return volatility that may be correlated with board diversity. To address this concern, we expand our baseline models in several ways.

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

[26] As shown in Table IA.10 of the Internet Appendix, we obtain similar results when we restrict our attention to the incremental diversity added to the board by non-executive directors.

repeat our baseline tests while excluding in turn the smallest and largest firms/boards (i.e., extreme deciles). Fifth, since larger firms and bigger boards may be located in more-connected regions, we also repeat our analysis while excluding potential directors from the ten most-connected cities. Lastly, we examine the interactive effect of board diversity and firm/board size.

Tables IA.11 through IA.13 of the Internet Appendix report the results of these supplemental tests that control for nonlinear effects of firm and board size on our baseline results. Although the magnitude of the estimated effects of diversity on firm risk varies somewhat across the alternative specifications in those tables, our main inferences remain unaffected. Overall, we conclude that nonlinearities in the relation between firm or board size and return volatility cannot account for our baseline results for the effect of board diversity on firm risk.

6.2 Alternative Demand-based IV – Board Diversity of Peer Firms

To complement our main IV tests, we repeat our analysis using an alternative demand-based instrumental variable for board diversity. In particular, we use the average diversity of boards across firms that are in the same size quintile and industry (i.e., Fama-French 49) – excluding the firm in question. The economic intuition for this alternative IV is that peer-effects may lead firms to adopt similar board appointment practices. Carter et al. (2016) adopt a similar demand-based IV approach, using the industry average fraction of female directors to instrument for the fraction of female directors serving on a firm's board.

While it seems reasonable (and the empirical evidence confirms) that the alternative IV satisfies the *relevance* condition, it is less clear that it may be safe to assume it satisfies the required *exclusion* restriction. In particular, it is sensible that similarities in the risk profiles of similar firms lead them to choose similar optimal board compositions. If so, the resulting IV estimates would be biased in the same direction as the OLS estimates – albeit possibly less so. Therefore, we use this alternative IV estimation approach only to validate the broad inferences we draw from our baseline analysis.

Panels A-E of Table IA.14 in the Internet Appendix report the results of the tests based on the alternative demand-based IV for board diversity. In particular, we revisit the effect of the instrumented board diversity on stock return volatility in Panel A, corporate financial and investment policies in Panels B and C, innovation output and quality in Panel D, and firm operating performance and asset valuation multiples in Panel E.

The supplemental evidence from the demand-based IV estimation is largely in line with the results from our baseline approach. Yet, the magnitude of the effects of board diversity based on the alternative IV tend to be smaller than our baseline estimates, which may be due to violations of the exclusion restriction resulting in an endogeneity bias similar to the OLS estimates.

6.3 Alternative Diversity Index Construction - Principal Components Analysis

In our main analysis, we construct the diversity index using a simple and intuitive aggregation method. This parametric approach is transparent and easy to interpret. However, the weights of the index components are not designed to maximize the components' common variation captured by the index. Principal Components Analysis (PCA) is a viable alternative method to achieve that objective. This statistical procedure by design assigns weights to each dimension to maximize the common variation captured by the principal components. This benefit comes at the cost of transparency and objective interpretation of the identified common factors. Nonetheless, for robustness, we examine whether constructing a board diversity index based on PCA analysis affects our earlier inferences.

Table IA.15 in the Internet Appendix reports the results of the PCA analysis. The evidence in Panel A shows that five of our six diversity measures load on the first principal component in a way that suggests lower (greater) board diversity (homogeneity) for higher values of the component. While with the reverse sign and except for the inconsistent effect of director age, this is consistent with our aggregation in the construction of the board diversity index. The results in Panel B indicate that the first principal component captures a large portion of the common variation across the six diversity measures (i.e., almost 29%) and has an eigenvalue substantially higher than one. Thus, this component seems to provide a reasonable summary measure of the common variation in the different dimensions of board diversity that we use in our baseline index.

In Panels A-E of Table IA.16 in the Internet Appendix, we replicate our main tests while using the PCA first principal component multiplied by minus one. We adopt this transformation for ease of interpretation, so that the component can be reasonably interpreted as a measure of board diversity. Panel A reports the estimates for the stock volatility models, Panels B and C for the corporate policies models, Panel D for the innovation output models, and Panel E for the firm performance models.

Across the board, the PCA-based results in Table IA.16 confirm our index-based evidence. In all of the panels, both the signs as well as the economic magnitudes of the estimated effects of board diversity are in line with the baseline results discussed in previous sections. If anything, the statistical significance of the estimated effects increases uniformly when we impose no predetermined weighting scheme.

Overall, the evidence from the tests in this section demonstrates that our earlier inferences are robust to variations in model specifications, IV selection, and aggregation of the multiple dimensions of board diversity. In particular, our results are not due to spurious correlations of firm and board sizes with both board diversity and firm risk. Our inferences do not change when we adopt a demand-based IV approach to estimate the causal effect of board diversity on firm risk, as opposed to our preferred supply-based instrument. Lastly, we obtain similar results whether we aggregate the various dimensions of diversity into an index using predetermined weights or more sophisticated statistical techniques.

7 Conclusion

Today, almost every organization in the U.S promotes diversity. Private, government, and educational institutions all strive to achieve diversity in their workforces, management teams, representatives, educators, and student bodies. However, there is ample research suggesting that diversity has both costs and benefits. We investigate the role of diversity in corporate boards, an area in which many countries have recently introduced mandated minimum levels of diversity. In particular, we examine the effects that board diversity has on the risk, policies, and performance of firms that these boards monitor and advise.

We find that diversity in the board of directors reduces stock return volatility, which is consistent with diverse backgrounds working as a governance mechanism, moderating decisions, and alleviating problems associated with "groupthink." When we shift our focus on corporate policies, we find that firms with diverse boards tend to adopt policies that are more stable and persistent, consistent with the board decisions being less subject to idiosyncrasies. Moreover, while diverse boards are less prone to take on financial risk, this behavior does not carry over onto real risk-taking activities. Indeed, consistent with the idea that diverse backgrounds are optimal when creative solutions are needed, we find that firms with diverse boards invest more in

R&D and these investments are more productive, leading to greater and higher quality innovation output.

Diverse boards do come with some cost, however. In particular, the response times of diverse groups tends to be slower than more homogenous groups. This can be detrimental when firms must react quickly to new information. Consistent with this, we find that the benefits of board diversity are lower during times of high aggregate volatility.

When assessing the net benefits of board diversity, we find that greater heterogeneity among directors leads to both higher profitability and firm valuations, on average. This supports the view that diversity should be promoted – albeit perhaps not imposed, not only from a social perspective, but also from an economic perspective – at least in the context of corporate boards. We recognize, however, that our estimates reflect average effects of board diversity and thus in some contexts the costs of diversity likely outweigh its benefits. This may be true, for example, in highly specialized firms or highly volatile market conditions.

References

Adams, R., Almeida, H., Ferreira, D., 2005. Powerful CEOs and their impact on corporate performance. Review of Financial Studies 18, 1403-1432.

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

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

Adams, R., Ragunathan, V., 2015. Lehman sisters. Upublished working paper. University of South Wales.

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

Anand, A., Jog, V., 2014. Diversity on boards. Unpublished working paper. University of Toronto.

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

Arrow, K., 1951. Social choice and individual values. Wiley, New York.

Baranchuk, N., Dybvig, P., 2009. Consensus in diverse corporate boards. Review of Financial Studies, 22 (2), 715-747.

Bernstein, S., Giroud, X., Townsend, R., 2016. The impact of venture capital monitoring. Journal of Finance, forthcoming.

Becker, G., 1957. The Economics of Discrimination. University of Chicago Press Economics Books, Chicago.

Cao, C., Li, X., Zeng, C., 2016. Board diversity, inventor collaboration, and corporate innovation. Unpublished working paper. Manchester University.

Carter, D., Simkins, B., Simpson, W., 2003. Corporate governance, board diversity, and firm value. Financial Review 38, 33-53.

Carter, M., Franco, F., Gine, M., 2016. Executive gender pay gaps: The roles of female risk aversion and board representation. Unpublished working paper. Boston College.

Chemla, G., Hennessy, C., 2015. The paradox of policy-relevant natural experiments. Unpublished working paper. London Business School.

Chhaochharia, V., Grinstein, Y., 2009. CEO compensation and board structure. Journal of Finance, 64, 231-261.

Coles, J., Daniel, N., Naveen, L., 2014. Co-opted boards. Review of Financial Studies 27, 1751-1796.

Coles, J., Daniel, N., Naveen, L., 2015. Board groupthink. Unpublished working paper. Drexel University.

Custódio, C., Ferreira, M., Matos, P., 2013. Generalists versus specialists: Lifetime work experience and chief executive officer pay. Journal of Financial Economics 108, 471-492.

Farrell, K., Hersch, P., 2005. Additions to corporate boards: the effect of gender. Journal of Corporate finance 11, 85-106.

Gao, H., Zhang, W., 2014. Does workforce diversity pay? Evidence from corporate innovation. Unpublished working paper. Nanyang Technological University.

Giannetti, M., Zhao, M., 2016. Board diversity and firm performance volatility. Unpublished working paper. Stockholm School of Economics.

Giroud, X., 2013. Proximity and investment: evidence from plant-level data. The Quarterly Journal of Economics 128, 861-915.

Hambrick, D., Cho, T., Chen, M., 1996. The influence of top management team heterogeneity on firms' competitive moves. Administrative Science Quarterly 41, 659–684.

Hennessy, C., Strebulaev, I., 2015. Natural experiment policy evaluation: A critique. Unpublished working paper. National Bureau of Economic Research.

Hermalin, B., and Weisbach, M., 1998. Endogenously chosen boards of directors and their monitoring of the CEO. American Economic Review 88, 96-118.

Hoffman, L., Maier, N.R., 1961. Quality and acceptance of problem solutions by members of homogeneous and heterogeneous groups. The Journal of Abnormal and Social Psychology 62, 401.

Hong, L., Page, S., 2004. Groups of diverse problem solvers can outperform groups of high-ability problem solvers. Proceedings of the National Academy of Sciences of the United States of America 101, 16385-16389.

Huang, J., and Kisgen, D., 2013. Gender and corporate finance: Are male executives overconfident relative to female executives? Journal of Financial Economics 108, 822-839.

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

Kogan, L., Papanikolaou, D., Seru, A., Stoffman, N., 2014. Technological innovation, resource allocation, and growth. Unpublished working paper. National Bureau of Economic Research.

Kogan, N., Wallach N., 1966. Modification of a judgmental style through group interaction. Journal of Personality and Social Psychology 4, 165-174.

Li, Z., Wu, Z., 2014. Market Reputation and Information Sharing: A Theory of Boardroom Collusion. Working paper. Arizona State University.

Milliken, F., Martins, L., 1996. Searching for common threads: Understanding the multiple effects of diversity in organizational groups. Academy of Management Review 21, 402-433.

Maznevski, M., 1994. Understanding our differences: Performance in decision-making groups with diverse members. Human relations 47, 531-552.

Minton, B., Taillard, J., Williamson, R., 2014. Financial expertise of the board, risk taking, and performance: Evidence from bank holding companies. Journal of Financial and Quantitative Analysis 49, 351-380.

Moscovici, S., Zavalloni, M., 1969. The group as a polarizer of attitudes. Journal of Personality and Social Psychology 12, 125-135.

O'Reilly, C., Snyder, R., Boothe, J., 1993. Effects of executive team demography on organizational change. Organizational change and redesign, Oxford University Press, New York, pp.147-175.

Pool, V., Stoffman, N., Yonker, S., 2015. The people in your neighborhood: Social interactions and mutual fund portfolios. Journal of Finance 70, 2679–2732.

Sah, R., Stiglitz, J., 1986. The Architecture of economic systems: Hierarchies and polyarchies. American Economic Review 76, 716-727.

Sah, Raaj K., and Joseph E. Stiglitz, 1991. The quality of managers in centralized versus decentralized organizations. The Quarterly Journal of Economics, 106, 289-295.

Smith, N., 2014. Gender quotas on boards of directors. IZA World of Labor.

Smith, K.G., Smith, K.A., Olian, J., Sims Jr, H., O'Bannon, D.. Scully, J., 1994. Top management team demography and process: The role of social integration and communication. Administrative Science Quarterly 39, 412-438.

Stock, J.H., Yogo, M., 2005. Testing for weak instruments in linear IV regression. Identification and inference for econometric models. In: Essays in honor of Thomas Rothenberg, Chapter 6. Cambridge University Press, New York, pp. 80-108.

Terjesen, S., Sealy, R., Singh, V., 2009. Women directors on corporate boards: A review and research agenda. Corporate Governance: An International Review 17, 320-337.

Williams, K.Y., O'Reilly, C.A., 1998. Demography and diversity in organizations: A review of 40 years of research. Research in Organizational Behavior, 20, 77-140.

Yonker, S. E., 2016. Geography and the market for CEOs. Management Science, forthcoming.

Appendix A – Details about the Construction and Relevance of the Instrumental Variable: Diversity of Nonlocal Director Supply Accessible via Non-Stop Flights

To construct our main instrumental variable, we collect data on the geographic distribution of domiciles of potential directors. Since the entire pool of *potential* directors is not observable, we use the population of individuals serving or having served as *actual* directors or executives of all other S&P 1,500 firms in the same size quintile in a given year as a proxy for the pool of directors potentially available to a firm. The underlying assumption is that the geographic distribution of the characteristics of board members and executives we identify reflects that of the potential director pool.[27] Then, we define as *nonlocal* potential directors those who reside in counties that are at least 150 miles away from the firm headquarters county.

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 2014. 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

[27] Conceptually, the true set of potential directors that reside at a particular location at a given point in time should fall somewhere in the continuum between the superset of all individuals of working age residing at the location and the subset of all individuals residing at the location and currently serving as directors. The larger set overestimates the supply of potential directors available from the particular location because not all individuals in that location are viable directors. Conversely, the latter subset will underestimate the supply of potential directors available from the particular location because not all individuals who are potentially viable directors in fact serve (e.g., a university professor with relevant expertise). Our approach produces a set that is somewhere on that continuum. We believe this approach provides a reasonable approximation of the set of potential directors from a location.

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.

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. At least one residential address is identified for 82% of director/executive-year observations. In total, we identify residential zip codes for 383,895 director/executive-year observations.

In addition to the geographic distribution of potential directors, we require airline route data to construct our main instrumental variable. Following Giroud (2013, 2015), we obtain airline routes data from the T-100 Domestic Segment Database for the period 1995 to 2014, 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.[28] The database contains

[28] By law, all airlines operating flights in the U.S. are required to file Form 41 with the DOT and are subject to fines for misreporting.

monthly data for each airline and route (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 2014. In particular, we begin by identifying all airports within a 50-mile radius of each U.S. county population-weighted centroid. Then, for each pair of counties whose population-weighted centroids are at least 150 miles apart, we count the number of monthly direct flights connecting the airport 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.

Lastly, 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 instrument is ultimately defined as the weighted diversity (based on our index) of all nonlocal potential directors in the U.S. who reside in a county with at least one daily non-stop flight between the director residence and the firm headquarters. Specifically, we weight the potential director-firm-year observation by the average number of monthly non-stop flights between the director-firm county pairs in the given year.

A.2 Empirical Evidence: Non-Stop Flight Connections and Firm-Director Matching

The conceptual premise of our IV approach is that the existence and intensity of non-stop airline routes between director domiciles and firm headquarters directly affects the geographic composition of the firm's board. As a result, the firm's ease of access to the supply nonlocal directors and its diversity would determine the diversity of the firm's actual board. In the spirit of KKM this link rests on the assumption that directors are more likely to serve on boards of firms that entail lower personal travel costs and thus, if a non-stop flight exists between the firm headquarters and a potential director domicile, that individual should be more likely to serve as a director on the firm board. Here, we explicitly examine this hypothesized channel: are individuals in fact more likely to serve as directors of a firm if non-stop flights connect their domicile and the firm headquarters locations?

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

$$Y_{ijt} = \beta_1 (N_{it}) + \beta_2 (N_{it} \times D_{ij}) + \beta_3 (N_{it} \times D_{ij} \times F_{ijt}) + \beta_4 (D_{ij} \times F_{ijt}) + \beta_5 (F_{ijt}) + \gamma \boldsymbol{X}_{it} + \lambda_{ij} + \lambda_t + \varepsilon, \quad (2)$$

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 average number of non-stop flights during a month between counties i and j in year t, $\boldsymbol{X}_{it}$ is a vector of average of time-varying 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.

We also conduct a similar analysis while using the firm-county-year as the unit of observation to estimate the following model:

$$Y_{ijkt} = \beta_1(N_{it}) + \beta_2(N_{it} \times D_{ij}) + \beta_3(N_{it} \times D_{ij} \times F_{ijt}) + \beta_4 (D_{ij} \times F_{ijt}) + \beta_5(F_{ijt}) + \gamma \boldsymbol{X}_{kt} + \lambda_{ij} + \lambda_k + \lambda_t + \varepsilon, \quad (3)$$

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, $\boldsymbol{X}_{kt}$ is a vector of time-varying firm characteristics during year t, λ_k is a firm fixed effects, and all other variables are the same as defined in Equation (2).

Naturally, we expect $\beta_1 > 0$. Similar to KKM 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 A.1 presents the results of these tests. Columns 1 and 2 report OLS estimates of the county pair-level model, with standard errors clustered by county-pair. Columns 3 and 4 report estimates of the firm-level model, with standard errors clustered by firm.

The evidence in the table provides strong support for our main conjectures. The estimated 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 the firm headquarters county and the potential director domicile county (D_{ij}) greatly reduces the strength of this relation, as indicated by the negative coefficient on the interaction between D_{ij} and N_{ij}. In other words, controlling for the supply of potential directors hailing from a particular county, individuals are significantly less likely to serve as directors of firms whose headquarters are beyond a reasonable driving distance (150 miles) from the potential director domicile.

Crucial to the conceptual underpinning of our instrumental variable, we find that the coefficient on the triple interaction between non-stop flight connectivity (F_{ijt}), D_{ij} and N_{ij} is positive and statistically significant. Therefore, physical distance between firm headquarters and director domiciles becomes increasingly less important as non-stop flight connectivity between those 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 of this effect is also quite meaningful. 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. This large effect is partly due to the sparsity of director-populated counties. Yet, 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 these counties, a one standard deviation increase in the availability of non-stop flights connecting to the firm headquarters increase the number of director-firm matches by roughly 25 percent.

Overall, the evidence in Table A.1 provides strong support to the notion that personal travel costs of a potential director affect the likelihood that the individual will serve on a firm board. Importantly, the results are consistent with the conjecture that the availability of direct flight connections reduces such personal costs and ultimately affects the actual composition of the board. Therefore, consistent with the premise of our IV approach, it is reasonable that variation in the diversity of nonlocal potential directors accessible via non-stop flights would affect the actual diversity of the firm board of directors.

Appendix Table A.1

This table reports OLS estimates of models where the dependent variable is in the column title. In columns (1) and (2), each observation is a (firm HQ county *i*, director county *j*, year *t*) combination. In columns (3) and (4), each observation is a (firm *k*, firm HQ county *i*, director county *j*, year *t*) combination. Firm-level control variables, e.g., Ln(Assets), are firm HQ county level means in column (2). *Number County Directors* (N_{jt}) is the number of directors from county *j* who 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. *Number Flights$_{ijt}$* (F_{ijt}) is the log of one plus the mean 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. The corresponding *t*-statistics are in parenthesis.

	(1)	(2)	(3)	(4)
	HQ County-Director Residence County		Firm-Director Residence County	
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)*	
Number 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 × Number 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×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 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

Appendix B – Variables Definitions

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	For each firm-year, this index is computed as (Female Board Member Ratio) + (1 – HHI Age) + (1-HHI Bachelors) + (1 – HHI Ethnicity) + (1 – HHI Financial Expert) + Mean No. of Other Boards
Non-Executive ΔDiversity Index	For each firm-year, this index is computed as the difference between the Board Diversity Index and the Board Executives Diversity Index
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 headquarters county in the current year.
%Δ County Population	Percent change in the population of the firm's headquarters county from the prior to the current year.
County Per Capita Income	Per capita income of the firm's headquarters county in the current year.
%Δ County Per Capita Income	Percent change in the per capita income of the firm's headquarters 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	EBITDA divided by book assets
Q	Market value of assets divided by book value of assets.

Figure 1

The figure displays the average value of the diversity index of firms headquartered in each state. Averages are based on firm year observations over the entire sample period. States with fewer than twenty firm year observations are set to missing (shown in black). Construction of the index is detailed in the data section of the text.

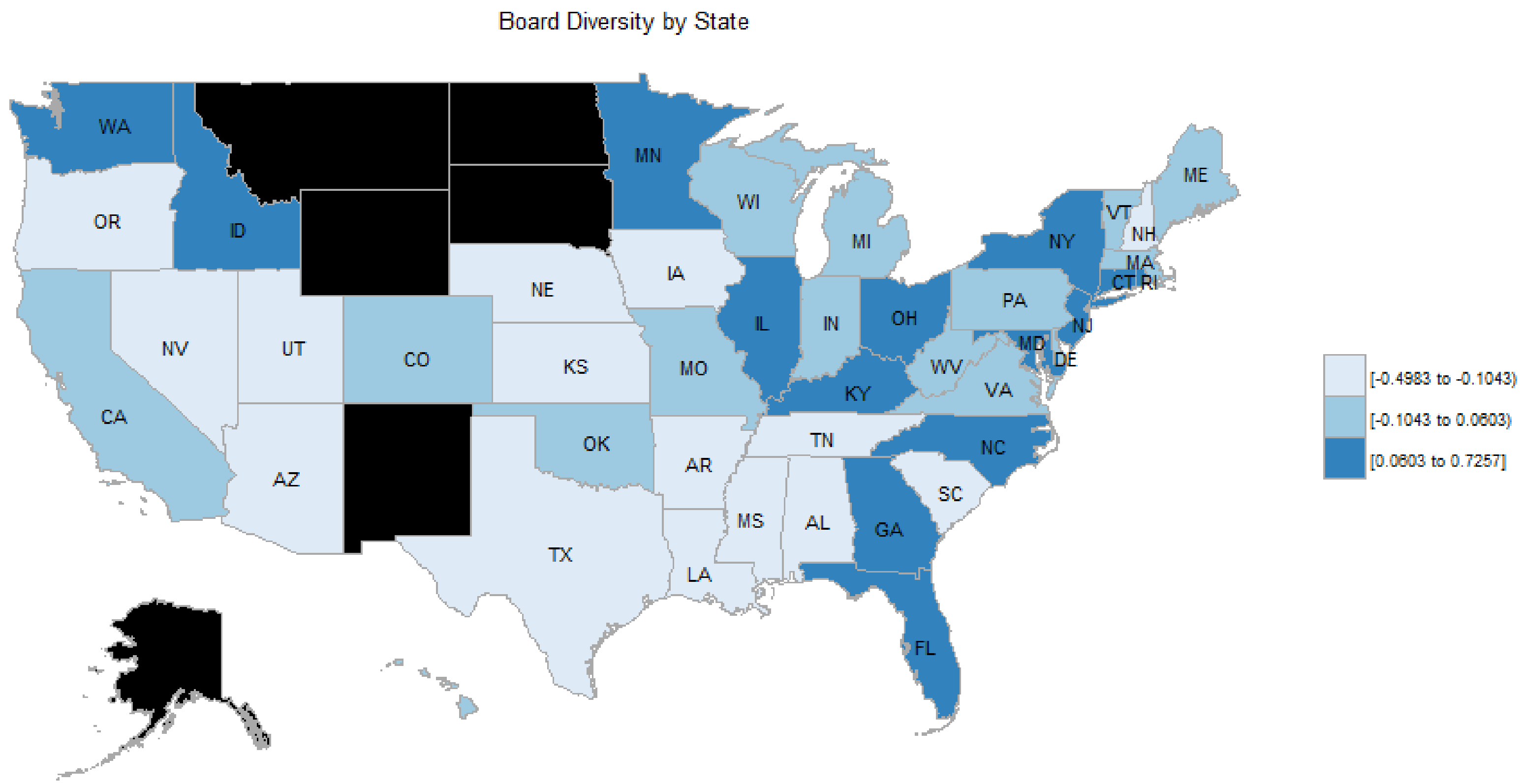

Table 1 – Descriptive Statistics

Panel A reports summary statistics for various firm-level time-varying characteristics. All variable definitions are in the Data Appendix. Panel B reports the simple correlations between the components of board diversity.

Panel A

	(1) Mean	(2) Std. Dev.	(3) Median	(4) 25th Pct.	(5) 75th 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
Net Mkt. Leverage	0.071	1.156	0.079	-0.036	0.219
Net Book Leverage	0.024	0.619	0.133	-0.082	0.303
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
Dividends/Equity	0.168	3.88	0.094	0	0.241
Capex/Assets	0.048	0.053	0.033	0.014	0.063
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
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
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
Patent Originality	0.369	0.181	0.375	0.268	0.480
EBITDA/Assets	0.13	0.102	0.126	0.078	0.182

Q	1.91	1.608	1.459	1.139	2.114
% Directors Attend <75% Meetings	1.41	4.41	0	0	4.15
Board 3-Year Turnover Rate (%)	52.77	38.34	66.66	0	85.71

Panel B

	Panel B	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 2 – Which boards are diverse?

This table reports OLS regression estimates of models where the dependent variable is the *Diversity Index* of the firm's board of directors in the current year. All models include industry (Fama-French 49), headquarters county, and year fixed effects. All standard errors are clustered at the firm-level. The corresponding t-statistics are reported in parenthesis.

	(1)	(2)
Ln(Assets)	0.292***	0.279***
	(15.869)	(14.877)
M/B	0.039***	0.039***
	(2.767)	(2.775)
Mkt. Lev.	-0.014	-0.014
	(-0.937)	(-0.884)
Tangibility	-0.034	-0.028
	(-1.456)	(-1.192)
Cash/Asset	-0.000	-0.007
	(-0.018)	(-0.397)
I(Dividend Paying)	0.012	0.015
	(0.742)	(0.948)
ROA	0.029**	0.030**
	(2.458)	(2.518)
(R&D/Assets)	0.075***	0.069***
	(3.938)	(3.615)
Ln(1+Firm Age)	0.042**	0.041**
	(2.450)	(2.419)
Ln (Board Size)	0.217***	0.220***
	(11.491)	(11.737)
Ln(Average Board Age)	-0.057***	-0.060***
	(-3.454)	(-3.620)
Ln(1+CEO Tenure)	-0.023*	-0.025*
	(-1.751)	(-1.836)
CEO is Chair and President	0.022*	0.023**
	(1.960)	(2.104)
County Per Capita Income Growth		-0.032***
		(-3.499)
County Population Growth		-0.015
		(-1.311)
Ln(County Per Capita Income)		0.057***
		(2.939)
Ln(County Population)		0.021
		(1.314)
Industry (FF49) Fixed Effects	Yes	Yes
HQ County Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	21,572	21,572
R-squared	0.319	0.322

Table 3 – Board diversity and stock return volatility

This table reports regression estimates of models where the dependent variable is the annualized standard deviation of the firm's daily stock returns. The *Board Diversity Index* is normalized by its sample mean and standard deviation. Column (1) reports ordinary least square (OLS) estimates for the model that includes industry (Fama-French 49), headquarters county, and year fixed effects, while column (2) reports OLS estimates for the model with firm and year fixed effects. Columns (3) and (4) report 1st and 2nd stage IV regression estimates obtained when the board diversity is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All standard errors are clustered at the firm level and account for the two-stage nature of the estimation in column (4). The corresponding t-statistics are reported in parenthesis.

	(1) OLS	(2) OLS	(3) IV 1st Stage	(4) IV 2nd Stage
Board Diversity Index	-0.799***	-0.630**		
	(-4.080)	(-2.317)		
Instrumented Diversity Index				-23.891**
				(-2.531)
Diversity of Nonlocal Directors w/in Non-Stop Flight			0.050***	
			(2.835)	
Diversity of Local Directors	-0.623***	-0.110	0.062***	0.916
	(-3.455)	(-0.559)	(4.999)	(1.319)
Ln(Assets)	-2.406***	-5.239***	0.239***	3.688
	(-7.945)	(-5.535)	(11.535)	(1.457)
M/B	1.092***	1.094***	0.022*	1.754***
	(3.901)	(3.316)	(1.833)	(3.581)
Mkt. Lev.	2.998***	3.833***	-0.010	2.623***
	(9.157)	(9.190)	(-0.658)	(5.578)
Tangibility	1.013***	1.554**	0.007	1.156*
	(3.205)	(2.193)	(0.286)	(1.826)
Cash/Asset	2.420***	1.213***	-0.007	2.266***
	(9.739)	(3.277)	(-0.399)	(4.880)
I(Dividend Paying)	-2.477***	-1.706***	0.005	-2.363***
	(-11.091)	(-5.030)	(0.285)	(-5.454)
ROA	-4.663***	-2.573***	0.023**	-4.098***
	(-4.297)	(-3.887)	(2.066)	(-3.989)
(R&D/Assets)	1.027***	-0.271	0.066***	2.578***
	(2.729)	(-0.512)	(3.636)	(2.983)
Ln(1+Firm Age)	-1.445***	-5.647***	0.036**	-0.610
	(-6.496)	(-6.292)	(2.078)	(-1.067)
Ln (Board Size)	-1.071***	-1.536***	0.211***	3.793*
	(-4.788)	(-4.862)	(11.235)	(1.863)
Ln(Average Board Age)	-1.388***	-1.447***	-0.052***	-2.591***
	(-6.914)	(-4.709)	(-3.102)	(-4.026)
Ln(1+CEO Tenure)	-0.414**	-0.117	-0.026**	-1.017**
	(-2.310)	(-0.601)	(-2.101)	(-2.419)
CEO is Chair and President	-0.080	0.224	0.018*	0.329
	(-0.525)	(1.356)	(1.714)	(1.006)

County Per Capita Income Growth	-0.052	-0.022	-0.023**	-0.592
	(-0.198)	(-0.095)	(-2.430)	(-1.493)
County Population Growth	-0.279	-0.203	0.002	-0.224
	(-1.625)	(-1.264)	(0.249)	(-0.833)
Ln(County Per Capita Income)	4.631***	5.205***	0.035	5.471**
	(3.727)	(3.665)	(0.422)	(2.402)
Ln(County Population)	-3.882	1.278	-0.178	-7.547
	(-1.171)	(0.310)	(-0.775)	(-1.159)
Year FE	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	No	Yes	Yes
HQ County FE	Yes	No	Yes	Yes
Firm FE	No	Yes	No	No
Observations	21,572	21,572	21,572	21,572
R-squared	0.600	0.745	0.391	0.468
IV F-stat				23.82
Durbin p-val.				< 0.001

Table 4 – Instrumented Change in Board Diversity and Changes in Firm Volatility

This table reports IV regression estimates of models where the dependent variable in the 1st stage is the change in board diversity over a 3-year window and the dependent variable in the 2nd stage is the change in firm stock volatility over the same 3-year window. The change in board diversity is instrumented with the change in diversity of potential directors who reside more than 150 miles away due to changes in non-stop flights from the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3. All 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) IV 1st Stage	(2) IV 2nd Stage
Instrumented Change in Board Diversity		-5.360** (-1.964)
Change in Nonlocal potential Director Diversity due to Changes in Non-Stop Flight Routes	0.082** (2.342)	
Firm, CEO, Board, and HQ County Controls	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes
Observations	14,786	14,786
R-squared	0.172	0.515
IV F-stat		17.23
Durbin p-val.		<0.001

Table 5 – Which diversity matters for return volatility?

This table reports regression estimates of models where the dependent variable is the annualized standard deviation of the firm's daily stock returns. Panel A reports 2nd stage IV estimates obtained when we instrument each normalized component of the diversity index with the corresponding diversity of the potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. Panel B reports 2nd stage IV estimates obtained by excluding each component of the diversity index in turn and instrumenting the restricted normalized diversity index with the corresponding diversity index of nonlocal potential directors residing within a non-stop flight of the firm headquarters. Panel C reports OLS (columns (1-2)) and IV (columns (3-6)) estimates obtained when grouping the six measures of diversity in two separate indexes. *Demographic Diversity* is calculated using demographic characteristics of the directors: percent female, standard deviation of age, and HHI ethnicity. *Cognitive Diversity* is calculated using cognitive characteristics of the directors: HHI bachelors, HHI financial expert, and other board experience. *Demographic Diversity* and *Cognitive Diversity* are normalized by their sample mean and standard deviation. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3. All standard errors are clustered at the firm level and account for the two-stage nature of the estimation where appropriate. The corresponding *t*-statistics are in parenthesis.

Panel A: 2nd Stage IV Estimates using Individual Components of the Diversity Index

	(1)	(2)	(3)	(4)	(5)	(6)
Instrumented (% Female)	-1.351*					
	(-1.955)					
Instrumented (STDEV Age)		-5.734				
		(-0.296)				
Instrumented - (HHI Ethnicity)			-2.092			
			(-0.596)			
Instrumented - (HHI Bachelors)				-1.631		
				(-0.352)		
Instrumented - (HHI Fin. Expertise)					0.210	
					(0.518)	
Instrumented (Num. Boards)						0.869
						(1.372)
Firm, CEO, Board, and HQ County Controls	Yes	Yes	Yes	Yes	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572	21,572
R-squared	0.598	0.612	0.592	0.600	0.599	0.598

Panel B: 2nd Stage IV Estimates using Restricted Diversity Index

	(1)	(2)	(3)	(4)	(5)	(6)
Instrumented Diversity Index excl. Female	-23.530***					
	(-2.790)					
Instrumented Diversity Index excl. Age		-22.899***				
		(-2.897)				
Instrumented Diversity Index excl. Ethnicity			-21.066***			
			(-3.030)			
Instrumented Diversity Index excl.Bachelors				-24.546*		
				(-1.852)		
Instrumented Diversity Index excl. Fin. Expertise					-24.526***	
					(-2.789)	
Instrumented Diversity Index excl Num. Boards						-26.159***
						(-2.581)
Firm, CEO, Board, and County Controls	Yes	Yes	Yes	Yes	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572	21,572
R-squared	0.165	0.162	0.163	0.164	0.161	0.160
IV F-stat	21.12	33.74	31.18	14.834	21.59	13.86
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Panel C: 2nd Stage IV Estimates using Cognitive and Demographic Diversity Indexes

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	IV 1st Stage	IV 2nd Stage	IV 1st Stage	IV 2nd Stage
Demographic Diversity (*DD*)	-0.211**					
	(-2.058)					
Cognitive Diversity (*CD*)		-0.350***				
		(-3.619)				
Nonlocal Directors *DD*			0.022***			
			(2.671)			
Instrumented *DD*				-6.713		
				(-1.221)		
Nonlocal Directors *CD*					0.095***	
					(5.219)	
Instrumented *CD*						-3.351**
						(-2.456)
Firm, CEO, Board, and HQ County Controls	Yes	Yes	Yes	Yes	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572	21,572
R-squared	0.600	0.600	0.217	0.397	0.451	0.550
IV F-stat				25.28		39.36
Durbin p-val.				<0.001		<0.001

Table 6 – Whose diversity matters? Diversity Added by Non-Executive versus Executive Directors

This table reports OLS and IV regression estimates of models where the dependent variable is the annualized standard deviation of the firm's daily stock returns and aggregate board diversity is broken into the diversity added to the board by non-executive (columns (1-3)) and executive (columns (4-6)) directors. Executive (non-executive) directors are the members of the board who are (not) also executives of the same firm. Each measure of board diversity is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3. All standard errors are clustered at the firm level and account for the two-stage nature of the estimation where appropriate. The corresponding *t*-statistics are in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)
	Non-Executive Directors			*Executive Directors*		
	OLS	IV 1st Stage	IV 2nd Stage	OLS	IV 1st Stage	IV 2nd Stage
Diversity Added by Non-Executive Directors	-0.726*** (-5.76)					
Diversity of Nonlocal Directors w/in Non-Stop Flight		0.039** (2.019)				
Instrumented Diversity Added by Non-Executives Directors			-30.515* (-1.851)			
Diversity Added by Executives Directors				-0.223** (-2.28)		
Diversity of Nonlocal Directors w/in Non-Stop Flight					0.027 (1.148)	
Instrumented Diversity Added by Executives Directors						-45.372 (-1.153)
Firm, CEO, Board, and HQ County Controls	Yes	Yes	Yes	Yes	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572	21,572
R-squared	0.603	0.186	0.322	0.592	0.105	0.331
IV F-stat			15.44			4.297
Durbin p-val.			< 0.001			0.125

Table 7 – When does diversity matter more? Conditional effects on return volatility

This table reports 2nd stage IV regression estimates of models where the dependent variable is the annualized standard deviation of the firm's daily stock returns *Diversity Index* and its interaction with the indicator variables are instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3. 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)
Instrumented Diversity Index	-22.460**	-13.137*	-30.662**	-25.322**	-24.76***
	(-2.520)	(-1.816)	(-2.369)	(-2.492)	(-2.717)
High R&D Firm	6.610***				
	(2.991)				
(IV Diversity)×(High R&D)	-5.381**				
	(-2.310)				
High M/B Firm		0.603*			
		(1.902)			
(IV Diversity)×(High M/B)		-3.331***			
		(-2.759)			
High VIX Period			43.450***		
			(4.498)		
(IV Diversity)×(High VIX)			5.868**		
			(2.106)		
GroupThink Board				-0.887	
				(-0.568)	
(IV Diversity)×(GroupThink)				8.450***	
				(3.513)	
Co-Opted Board					-3.135***
					(-3.270)
(IV Diversity)×(Co-Opted)					3.853**
					(2.184)
Firm, CEO, Board, and HQ County Controls	Yes	Yes	Yes	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572
R-squared	0.256	0.280	0.512	0.331	0.299
IV F-stat	18.12	18.12	18.12	18.12	18.12
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001

Table 8 – Board Diversity and Policy Persistence

This table reports 2[nd] stage IV regression estimates of models where the dependent variable is indicated in the column title. *Diversity Index* and its interaction with the relevant policy variable are instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. *Policy Index* is the sum of the normalized values of (PP&E/Assets), (Advertising/Sales), Net Book Leverage, (Dividends/Assets), and (R&D/Assets). All models include the instrumented *Diversity Index* (not reported for brevity), industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3. All 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.

Dependent Variable:	(1) Net Book Leverage$_{t+1}$	(2) (Dividends/ Equity)$_{t+1}$	(3) (Capex/ Assets)$_{t+1}$	(4) (Advertising / Sales)$_{t+1}$	(5) (R&D/ Assets)$_{t+1}$	(6) Policy Index$_{t+1}$	(7) Policy Index$_{t+2}$	(8) Policy Index$_{t+3}$
(Policy Variable)$_t$	0.873***	0.687***	0.938***	0.890***	0.860***	0.839***	0.772***	0.730***
	(2.505)	(3.200)	(3.419)	(3.190)	(3.418)	(3.098)	(3.409)	(3.891)
(Instr. Diversity)$_t$ ×	0.055***	0.241***	0.014**	0.082**	0.033*	0.091***	0.149***	0.145***
(Policy Variable)$_t$	(2.830)	(2.644)	(2.174)	(2.476)	(1.787)	(3.836)	(4.438)	(4.267)
Instrumented Board Diversity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm, CEO, Board, and HQ County Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HQ Country, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,073	19,073	19,073	19,073	19,073	19,073	16,812	14,768
R-squared	0.831	0.178	0.963	0.902	0.917	0.839	0.776	0.811
IV F-stat	11.36	18.647	10.18	19.226	19.807	11.125	16.113	9.395
Durbin p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Table 9 – Board diversity and firm policies

This table reports 2nd stage IV regression estimates of models where the dependent variable indicated in the column title is standardized to have zero mean and standard deviation equal to one. *Diversity Index* is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3. 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.

Dependent Variable:	(1) *Net Book Leverage*	(2) *Net Market Leverage*	(3) *Dividend/ Equity*	(4) *Capex/ Asset*	(5) *R&D/ Asset*
Instrumented Diversity Index	-1.228***	-0.573***	1.094**	0.011	0.917***
	(-2.730)	(-3.037)	(2.254)	(0.532)	(3.269)
Firm, CEO, Board, and HQ County Controls	Yes	Yes	Yes	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572
R-squared	0.222	0.289	0.240	0.247	0.261
IV F-stat	22.15	22.15	19.19	15.12	20.01
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001

Table 10 – Board diversity and firm innovation output

This table reports 2nd stage IV regression estimates of models where the dependent variable indicated in the column title is standardized to have zero mean and standard deviation equal to one. *Diversity Index* is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3. 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:	*Ln(1+Patents)*	*Patents/ R&D*	*Ln(1+Citations)*	*Ln(1+Cit./Pat.)*	*Patent Originality*
Instrumented Diversity Index	2.793***	1.732**	2.632***	1.687***	1.746**
	(4.064)	(2.017)	(4.025)	(3.750)	(2.450)
Firm, CEO, Board, and HQ County Controls	Yes	Yes	Yes	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes
Observations	20,702	9,129	20,702	20,702	11,622
R-squared	0.390	0.468	0.390	0.326	0.395
IV F-stat	42.73	17.53	42.73	42.73	20.21
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001

Table 11 – Board diversity and firm performance

This table reports 2nd stage IV regression estimates of models where the dependent variable indicated in the column title is standardized to have zero mean and standard deviation equal to one. *Diversity Index* is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3. 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	2.038***	5.725***
	(2.627)	(3.402)
Firm, CEO, Board, and HQ County Controls	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes
Observations	21,572	21,572
R-squared	0.243	0.277
IV F-stat	27.57	36.49
Durbin pval	<0.001	<0.001

Table 12 – When is board diversity more beneficial? Conditional effects on performance

This table reports 2nd stage IV regression estimates of models where the dependent variable indicated in the panel title is standardized to have zero mean and standard deviation equal to one. *Diversity Index* and its interaction with the indicator variables are instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3. 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.

Panel A: Dependent Variable: Profitability

	(1)	(2)	(3)	(4)	(5)
Instrumented Diversity Index	1.445**	1.994**	2.078**	1.589**	1.642***
	(2.471)	(2.551)	(2.322)	(2.420)	(2.582)
High R&D Firm	-0.331**				
	(-2.384)				
(IV Diversity)×(High R&D)	0.078				
	(0.552)				
High M/B Firm		0.287***			
		(3.920)			
(IV Diversity)×(High M/B)		0.005			
		(0.042)			
High VIX Period			-1.479**		
			(-2.251)		
(IV Diversity)×(High VIX)			-0.435**		
			(-2.293)		
GroupThink Board				-0.050	
				(-0.562)	
(IV Diversity)×(GroupThink)				-0.102	
				(-0.809)	
Co-Opted Board					0.133**
					(1.996)
(IV Diversity)×(Co-Opted)					-0.220*
					(-1.882)
Firm, CEO, Board, and HQ County Controls	Yes	Yes	Yes	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572
R-squared	0.125	0.124	0.256	0.135	0.141
IV F-stat	17.78	17.78	18.12	17.78	17.78
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001

Panel B: Dependent Variable: ln(Q)

	(1)	(2)	(3)	(4)	(5)
Instrumented Diversity Index	2.978***	4.435***	3.763**	3.161***	3.096***
	(2.792)	(2.844)	(2.388)	(2.756)	(2.645)
High R&D Firm	-0.395*				
	(-1.770)				
(IV Diversity)×(High R&D)	-0.345				
	(-1.443)				
High M/B Firm		0.725***			
		(5.162)			
(IV Diversity)×(High M/B)		-0.119			
		(-0.456)			
High VIX Period			-2.691**		
			(-2.332)		
(IV Diversity)×(High VIX)			-0.572*		
			(-1.779)		
GroupThink Board				-0.294*	
				(-1.859)	
(IV Diversity)×(GroupThink)				-0.034	
				(-0.171)	
Co-Opted Board					0.245**
					(2.049)
(IV Diversity)×(Co-Opted)					-0.297
					(-1.400)
Firm, CEO, Board, and HQ County Controls	Yes	Yes	Yes	Yes	Yes
HQ County, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572
R-squared	0.125	0.124	0.280	0.138	0.129
IV F-stat	17.78	17.78	18.12	17.78	17.78
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001

Internet Appendix to

"Board Diversity, Firm Risk, and Corporate Policies"*

GENNARO BERNILE, VINEET BHAGWAT, and SCOTT YONKER

This Internet Appendix provides supplementary material to the paper "Board Diversity, Firm Risk, and Corporate Policies". In particular, this appendix presents tables that are referenced but not reported in the paper.

* Citation format: Bernile, Gennaro, Vineet Bhagwat, and Scott Yonker, Internet Appendix to "Board Diversity, Firm Risk, and Corporate Policies."

Figure IA.1

The figure displays the average value the diversity index component of firms headquartered in each state. Averages are based on firm year observations over the entire sample period. States with fewer than twenty firm year observations are set to missing (shown in black). Construction of the index is detailed in the data section of the text.

Figure IA1.A – Gender Diversity

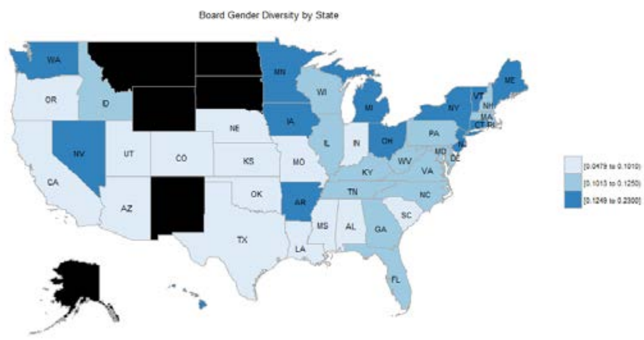

Figure IA1.B – Age Diversity

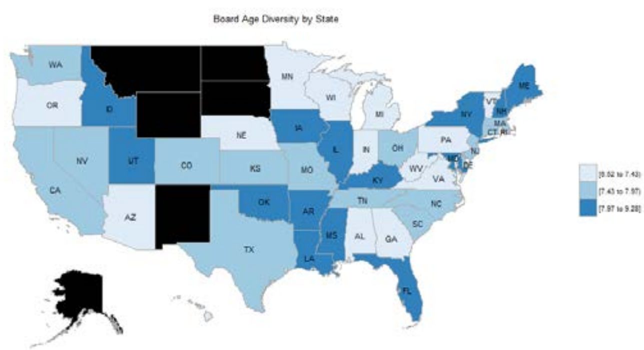

Figure IA1.C – Ethnic Diversity

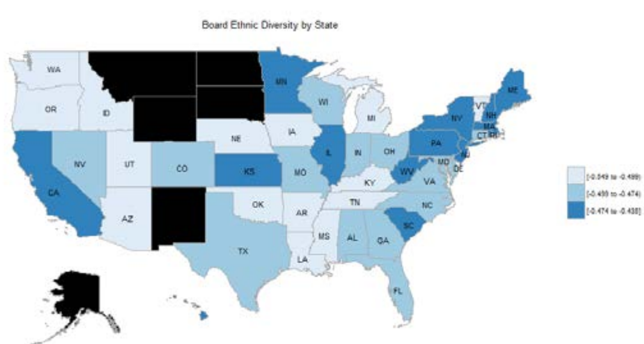

Figure IA1.D – Diversity in Financial Expertise

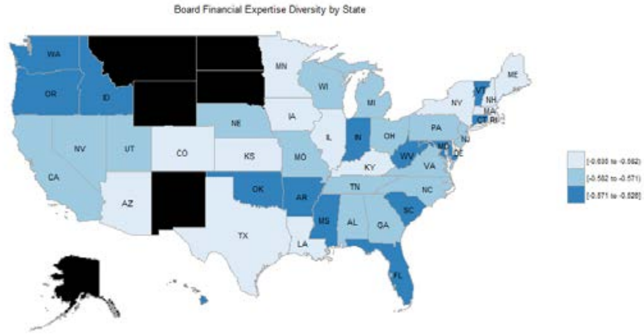

Figure IA1.E – Education Institution Diversity

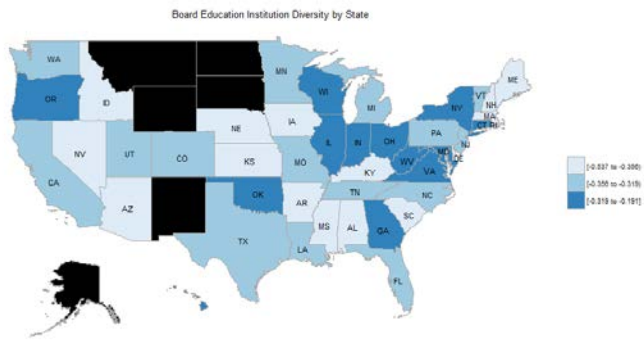

Figure IA1.F – Board Experience Diversity

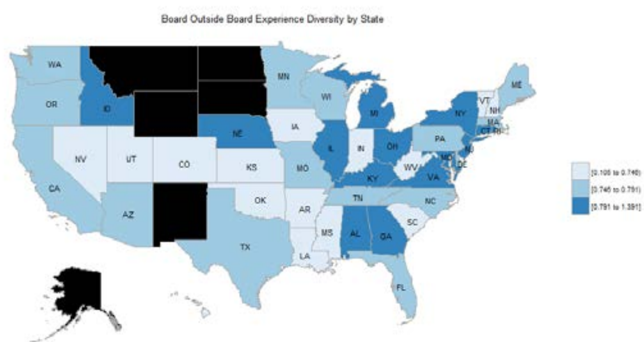

Table IA.1 – Alternative measures of stock return volatility

This table reports regression estimates of models where the dependent variable is the annualized standard deviation of firm stock returns for the current year. Across all panels, the dependent variable in column 1 is the standard deviation of daily idiosyncratic returns from the market model, while it is the standard deviation of monthly raw and idiosyncratic stock returns in columns 3 and 4, respectively. *Board Diversity Index* is normalized by its sample mean and standard deviation. Panel A reports OLS estimates from models with industry (Fama-French 49), headquarters county, and year fixed effects, while Panel B reports OLS estimates from models with firm and year fixed effects. Panel C report 2nd stage IV estimates from models with industry (Fama-French 49), headquarters county, and year fixed effects. All control variables from Panel A are also included in Panels B and C, but are omitted for brevity. All standard errors are cluster at the firm-level and, in Panel C, account for the two step nature of the estimation. The corresponding *t*-statistics are reported in parenthesis.

Panel A: OLS Estimates

Dependent Variable:	(1) *Idiosyncratic Daily Vol.*	(2) *Total Monthly Vol.*	(3) *Idiosyncratic Monthly Vol.*
Board Diversity Index	-0.729***	-0.788***	-0.791***
	(-4.111)	(-3.698)	(-3.963)
Ln(Assets)	-3.266***	-2.266***	-3.095***
	(-12.028)	(-7.296)	(-10.546)
M/B	0.534**	0.721**	0.516*
	(2.343)	(2.379)	(1.800)
Mkt. Lev.	3.082***	3.753***	3.551***
	(10.320)	(10.643)	(10.733)
Tangibility	0.912***	1.111***	1.106***
	(3.110)	(3.229)	(3.379)
Cash/Asset	2.099***	2.490***	2.207***
	(9.500)	(9.054)	(8.977)
I(Dividend Paying)	-2.385***	-2.456***	-2.432***
	(-11.704)	(-10.213)	(-10.751)
ROA	-4.071***	-4.726***	-4.170***
	(-4.261)	(-3.927)	(-4.242)
(R&D/Assets)	1.096***	1.308***	1.003***
	(3.278)	(3.087)	(2.751)
Ln(1+Firm Age)	-1.462***	-1.408***	-1.429***
	(-7.236)	(-5.892)	(-6.459)
Ln (Board Size)	-0.932***	-1.005***	-0.924***
	(-4.521)	(-4.212)	(-4.032)
Ln(Average Board Age)	-1.247***	-1.422***	-1.185***
	(-6.781)	(-6.292)	(-5.441)
Ln(1+CEO Tenure)	-0.527***	-0.382**	-0.434**
	(-3.217)	(-1.972)	(-2.413)
CEO is Chair and President	-0.054	-0.111	0.006
	(-0.391)	(-0.680)	(0.037)
County Per Capita Income Growth	0.195	-0.256	0.604**
	(0.821)	(-0.839)	(2.315)
County Population Growth	-0.246*	-0.428**	-0.292**

	(-1.713)	(-2.286)	(-2.109)
Ln(County Per Capita Income)	2.570**	4.157***	1.379
	(2.389)	(3.088)	(1.095)
Ln(County Population)	-5.258*	-6.049*	-6.269**
	(-1.781)	(-1.827)	(-1.996)
Diversity of Local Directors	-0.572***	-0.449**	-0.279
	(-3.424)	(-2.308)	(-1.447)
Year FE	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes
Observations	21,572	21,572	21,572
R-squared	0.591	0.487	0.470

Panel B: OLS Estimates with Firm Fixed Effects

	(1)	(3)	(4)
Dependent Variable:	*Idiosyncratic Daily Vol.*	*Total Monthly Vol.*	*Idiosyncratic Monthly Vol.*
Board Diversity Index	-0.477**	-0.764***	-0.741***
	(-2.006)	(-2.679)	(-2.915)
All Time-varying Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	21,572	21,572	21,572
R-squared	0.742	0.649	0.634

Panel C: 2nd Stage IV Estimates

	(1)	(3)	(4)
Dependent Variable:	*Idiosyncratic Daily Vol.*	*Total Monthly Vol.*	*Idiosyncratic Monthly Vol.*
Instrumented Board Diversity Index	-25.608***	-27.211***	-26.841***
	(-2.631)	(-2.618)	(-2.646)
All Time-varying Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes
Observations	21,572	21,572	21,572
R-squared	0.392	0.411	0.380
IV F-stat	23.08	23.08	23.08
Durbin pval	<0.001	<0.001	<0.001

Table IA.2 – Board Diversity and Firm Volatility – No Local Director Control

This table reports 1st and 2nd stage IV regression estimates obtained when the board diversity is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects. All 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) IV 1st Stage	(2) IV 2nd Stage
Instrumented Diversity Index		-21.492***
		(-2.902)
Diversity of Nonlocal Directors	0.060***	
w/in Non-Stop Flight	(3.347)	
Ln(Assets)	0.253***	3.289
	(12.162)	(1.539)
M/B	0.026**	1.751***
	(2.109)	(3.739)
Mkt. Lev.	-0.011	2.635***
	(-0.712)	(5.951)
Tangibility	0.005	1.120*
	(0.219)	(1.914)
Cash/Asset	-0.007	2.275***
	(-0.427)	(5.267)
I(Dividend Paying)	0.005	-2.363***
	(0.339)	(-5.869)
ROA	0.023**	-4.144***
	(2.110)	(-4.049)
(R&D/Assets)	0.067***	2.428***
	(3.644)	(3.239)
Ln(1+Firm Age)	0.035**	-0.699
	(2.040)	(-1.402)
Ln (Board Size)	0.214***	3.334**
	(11.317)	(2.043)
Ln(Average Board Age)	-0.051***	-2.455***
	(-3.012)	(-4.551)
Ln(1+CEO Tenure)	-0.026**	-0.949**
	(-2.044)	(-2.576)
CEO is Chair and President	0.018*	0.294
	(1.751)	(0.994)
County Per Capita Income Growth	-0.024**	-0.553
	(-2.530)	(-1.507)
County Population Growth	0.000	-0.251
	(0.036)	(-0.999)
Ln(County Per Capita Income)	0.040	5.448**
	(0.474)	(2.565)
Ln(County Population)	-0.152	-6.817
	(-0.658)	(-1.137)

Year FE	Yes	Yes
Industry (FF-49) FE	Yes	Yes
HQ County FE	Yes	Yes
Firm FE	No	No
Observations	21,572	21,572
R-squared	0.390	0.298
IV F-stat		32.72
Durbin p-val.		< 0.001

Table IA.3 – Board Diveristy and Firm Stock Volatility by subsamples of local diversity

This table reports 1st and 2nd stage IV regression estimates obtained when the board diversity is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. The first two columns restrict the sample to those counties with below median local potential board member diversity while the last two columns restrict the sample to those counties with above median local potential board member diversity. All models include industry (Fama-French 49), headquarters county, and year fixed effects and all control variables (omitted for brevity) from Table 3. All 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) IV 1st Stage	(2) IV 2nd Stage	(3) IV 1st Stage	(4) IV 2nd Stage
County-year Subsamples:	*Low Local Diversity*		*High Local Diversity*	
Instrumented Diversity Index		-25.041**		-25.376**
		(-2.261)		(-2.227)
Diversity of Nonlocal Directors	0.043**		0.065***	
w/in Non-Stop Flight	(2.397)		(2.581)	
Diversity of Local Directors	0.016	0.262	0.090**	2.386
	(1.120)	(0.558)	(2.202)	(1.564)
All Time-varying Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Observations	10,779	10,779	10,783	10,783
R-squared	0.319	0.398	0.286	0.380
IV F-stat		13.45		16.72
Durbin p-val.		< 0.001		< 0.001

Table IA.4 – Board diversity index components and firm stock volatility

This table reports OLS regression estimates of models where the dependent variable is the annualized standard deviation of the firm's daily stock returns. 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 reports estimates obtained when each component of the diversity index is examined separately, Panel B reports estimates obtained by excluding each component of the diversity index in turn. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3 in the main text. Standard errors are clustered at the firm level and the corresponding *t*-statistics are reported in parenthesis.

Panel A: OLS Estimates using Individual Components of the Diversity Index

	(1)	(2)	(3)	(4)	(5)	(6)
N(% Board Female)	-0.093					
	(-0.348)					
N(STDEV Age)		-0.414*				
		(-1.716)				
- N(HHI Ethnicity)			-0.436			
			(-1.376)			
- N(HHI Bachelors)				-0.150		
				(-0.634)		
- N(HHI Financial Expert)					-0.118	
					(-0.538)	
N(Mean # of Other Boards)						-0.380
						(-1.606)
All Time-varying Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572	21,572
R-squared	0.745	0.745	0.745	0.745	0.745	0.745

Panel B: OLS Estimates using Restricted Diversity Index

	(1)	(2)	(3)	(4)	(5)	(6)
Diversity Index excl. Female	-0.615**					
	(-2.287)					
Diversity Index excl. Age		-0.508*				
		(-1.705)				
Diversity Index excl. Ethnicity			-0.622**			
			(-2.272)			
Diversity Index excl. Education				-0.509**		
				(-2.102)		
Diversity Index excl. Fin. Expert					-0.667**	
					(-2.494)	
Diversity Index excl. Other Boards						-0.508**
						(-1.992)
All Time-varying Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572	21,572
R-squared	0.745	0.746	0.745	0.745	0.745	0.745

Table IA.5 – Components of Added Non-Executives Diversity and Non-Local Supply Diversity

This table reports OLS estimates of models where the incremental diversity added by non-executives along each dimension is regressed on the corresponding component of diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3 in the main text. Standard errors are clustered at the firm level and the corresponding *t*-statistics are reported in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variable: (Board Diversity - Exec. Diversity) for each component						
Diversity Component:	ΔFemale	ΔAge	ΔBachelors	ΔEthnic	ΔFin. Expert	ΔBoard Exp.	ΔAll
%Female Non-Local	0.022**						
	(1.96)						
Std. Age Non-Local		0.002					
		(0.141)					
-1*HHI_Bachelors Non-Local			-0.002				
			(-0.118)				
-1*HHI_Ethnicity Non-Local				0.023**			
				(2.032)			
-1*HHI_FinExpert Non-Local					0.040***		
					(3.021)		
Board Exp. Non-Local						0.030**	
						(2.287)	
Non-Local Diversity Index							0.039**
							(2.019)
All Time-varying Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572	21,572	21,572
R-squared	0.212	0.147	0.270	0.179	0.211	0.166	0.188

Table IA.6 – Board Diversity and Firm Diversity

This table reports OLS estimates of models where KLD scores of firm strength and weakness in terms of workforce diversity is regressed on the firm board diversity index. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3 in the main text. Standard errors are clustered at the firm level and the corresponding *t*-statistics are reported in parenthesis.

	(1)	(2)
Dependent Variable:	*KLD Diversity Concerns Index*	*KLD Diversity Strengths Index*
Board Diversity Index	-0.090***	0.125***
	(-9.346)	(6.558)
All Time-varying Controls	Yes	Yes
Year FE	Yes	Yes
Industry (FF-49) FE	Yes	Yes
HQ County FE	Yes	Yes
Observations	16,004	16,004
R-squared	0.319	0.471

Table IA.7 – Instrumented added diversity of non-executives and firm policies

This table reports 2nd stage IV regression estimates of models where the dependent variable indicated in the column title is standardized to have zero mean and standard deviation equal to one. *Board Diversity Added by Non-Executives* is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3 in the main text. 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/Equity*	*Capex/Asset*	*R&D/Asset*
Instrumented Board Diversity Added by Non-Executives	-1.612**	-0.751**	1.430*	0.187	1.208**
	(-2.016)	(-2.097)	(1.742)	(0.566)	(2.572)
All Time-varying Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572
R-squared	0.256	0.288	0.244	0.245	0.262
IV F-stat	19.98	19.98	19.99	19.35	19.35
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001

Table IA.8 – Instrumented added diversity of non-executives and firm innovation

This table reports the 2nd stage IV regression estimates of models where the dependent variable indicated in the column title is standardized to have zero mean and standard deviation equal to one. *Board Diversity Added by Non-Executives* is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3 in the main text. 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 Board Diversity Added by Non-Executives	3.564***	1.608*	3.360***	2.154***
	(2.891)	(1.931)	(2.892)	(2.793)
All Time-varying Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Observations	20,702	9,129	20,702	20,702
R-squared	0.184	0.261	0.195	0.264
IV F-stat	24.39	15.65	24.39	24.39
Durbin pval	<0.001	<0.001	<0.001	<0.001

Table IA.9 – Board diversity and board frictions

This table reports regression estimates of models where the dependent variable indicated in the column title is standardized to have zero mean and standard deviation equal to one. Columns (1) and (3) display OLS estimates, and columns (2) and (4) display 2^{nd} stage IV estimates. *Diversity Index* is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3. Standard errors are clustered at the firm level and account for the two-stage nature of the estimation where appropriate. The corresponding *t*-statistics are reported in parenthesis.

	(1)	(2)	(3)	(4)
Dependent Variable:	*Board 3-Year Turnover Rate*		*% Directors Attend <75% Meetings*	
	OLS	IV 2^{nd} Stage	OLS	IV 2^{nd} Stage
Diversity Index	0.003**	-0.109	0.001***	0.003
	(2.154)	(-0.630)	(2.952)	(0.494)
All Time-varying Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Observations	17,981	17,981	21,488	21,488
R-squared	0.512	0.522	0.322	0.333

Table IA.10 – Instrumented added diversity of non-executives and firm performance

This table reports second stage IV regression estimates of models where the dependent variable indicated in the column title is standardized to have zero mean and standard deviation equal to one. *Board Diversity Added by Non-Executives* is instrumented with the diversity of potential directors who reside more than 150 miles away but within a non-stop flight of the firm headquarters. All models include industry (Fama-French 49), headquarters county, and year fixed effects, along with all time-varying control variables from Table 3 in the main text. 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 Board Diversity Added by Non-Executives	2.737*	6.595***
	(1.910)	(2.705)
All Time-varying Controls	Yes	Yes
Year FE	Yes	Yes
Industry (FF-49) FE	Yes	Yes
HQ County FE	Yes	Yes
Observations	21,572	21,572
R-squared	0.188	0.185
IV F-stat	19.91	19.87
Durbin pval	<0.001	<0.001

Table IA.11 – Robustness: Instrumented board diversity and volatility, controlling for non-linear effects of firm and board sizes

The table reports 2nd stage IV estimates for the relation between board diversity and stock return volatility when the baseline specification in Table 3 of the main text is augmented with additional controls for firm and board size. All specifications are identical to those in the main text, except for the inclusion of additional controls for firm and board size. Standard errors are clustered at the firm level and account for the two-stage nature of the estimation. The corresponding t-statistics are in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Instrumented Diversity Index	-20.76***	-22.98**	-15.33***	-24.66***	-25.69***	-23.73***	-19.74***	-25.46**	-15.39***
	(-2.641)	(-2.550)	(-6.878)	(-2.623)	(-2.838)	(-2.731)	(-2.770)	(-2.544)	(-6.916)
All Time-varying Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	Yes	No	Yes	No	No	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	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	21,572	21,572	21,572	21,572	21,572	21,572	21,572	21,572	21,572
R-squared	0.390	0.395	0.318	0.387	0.386	0.393	0.387	0.395	0.318
IV F-stat	27.20	24.11	275.7	24.30	27.47	26.90	30.56	22.10	27.76
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Table IA.12 – Robustness: Instrumented board diversity and volatility, dropping extreme sizes and most-connected cities

The table reports 2nd stage IV estimates for the relation between board diversity and stock return volatility similar to Table 3 of the main text while excluding from the sample extreme firm and board sizes, i.e., top and bottom decile (Columns 1-4), and most-connected cities (Column 5). Note that in Column 5 the most-connected cities are excluded from pool of potential directors when calculating the instrument and not the final regression, thus the sample size remains the same. All specifications are identical to those in the main text. Standard errors are clustered at the firm level and account for the two-stage nature of the estimation. The corresponding t-statistics are in parenthesis.

	(1) No small firms	(2) No large firms	(3) No small boards	(4) No large boards	(5) No most-connected cities
Instrumented Diversity Index	-23.455*** (-2.815)	-20.075* (-1.650)	-25.531*** (-2.786)	-22.072** (-2.001)	-16.471*** (-3.801)
All Time-varying Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes	Yes
Observations	19,584	19,603	16,483	18,199	21,572
R-squared	0.384	0.375	0.390	0.372	0.265
IV F-stat	29.39	19.92	25.26	14.25	55.98
Durbin pval	<0.001	<0.001	<0.001	<0.001	< 0.001

Table IA.13 – Robustness: Instrumented board diversity and volatility, by firm size

Non-Local Supply Diversity IV	-13.263***
	(-3.967)
IV * Size Tercile 2	2.425
	(1.049)
IV * Size Tercile 3	-2.108
	(-0.921)
Size Tercile 2	-1.367
	(-1.390)
Size Tercile 3	1.196
	(0.779)
All Time-varying Controls	Yes
Year FE	Yes
Industry (FF-49) FE	Yes
HQ County FE	Yes
Observations	21,572
R-squared	0.393
IV F-stat	35.23
Durbin pval	<0.001

Table IA.14 – Alternative IV: Board diversity and stock return volatility

The table reports 2nd stage IV estimates for the relation between board diversity and stock return volatility (Panel A), persistence of firm policies (Panel B), the level of firm policies (Panel C), innovation (Panel D), and performance (Panel E) using a demand-based instrument for board diversity instead of the baseline supply-based instrument. *FF5/Size Matched Diversity* is the average director diversity across firms in the same size quintile and Fama-French 49 industry – excluding each firm actual board. All specifications are identical to those in the main text, except for the alternative instrument of board diversity. Standard errors are clustered at the firm level and account for the two-stage nature of the estimation. The corresponding t-statistics are in parenthesis.

Panel A: Effect of Demand-based Instrument for Diversity on Stock Volatility

	(1) First Stage	(2) Second Stage
Instrumented Diversity Index		-5.167***
		(-7.358)
FF5/Size Matched Diversity	0.613***	
	(7.114)	
All Time-varying Controls	Yes	Yes
Year FE	Yes	Yes
Industry (FF-49) FE	Yes	Yes
County HQ FE	Yes	Yes
Observations	21,572	21,572
R-squared	0.561	0.417
IV F-stat		45.53
Durbin pval		<0.001

Panel B: Effect of Demand-based Instrument for Diversity on Persistence of Firm Policies

Dependent Variable:	(1) Net Book Leverage$_{t+1}$	(2) (Dividends/ Equity)$_{t+1}$	(3) (Capex/ Assets)$_{t+1}$	(4) (Advertising / Sales)$_{t+1}$	(5) (R&D/ Assets)$_{t+1}$	(6) Policy Index$_{t+1}$	(7) Policy Index$_{t+2}$	(8) Policy Index$_{t+3}$
(Policy Variable)$_t$	0.872***	0.383***	0.937***	0.907***	0.881***	0.851***	0.797***	0.754***
	(2.935)	(2.818)	(2.904)	(2.783)	(2.918)	(2.790)	(2.837)	(2.993)
(Instr. Diversity)$_t$ × (Policy Variable)$_t$	0.023***	0.252***	0.009***	0.029	0.077*	0.048***	0.052***	0.050**
	(2.636)	(3.466)	(2.749)	(1.630)	(1.890)	(3.863)	(3.447)	(2.493)
Instrumented Diversity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All Time-varying Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HQ Country, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,073	19,073	19,073	19,073	19,073	19,073	16,812	14,786
R-squared	0.639	0.312	0.566	0.807	0.681	0.846	0.797	0.754
IV F-stat	16.72	16.51	16.45	19.40	18.80	17.57	15.32	13.83
Durbin p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Panel C: Effect of Demand-based Instrument for Diversity on Firm Policies

	(1)	(2)	(3)		(4)
Dependent Variable:	*Net Book Leverage*	*Net Market Leverage*	*Dividend/ Equity*	*CAPX/Assets*	*R&D/Asset*
Instrumented Diversity Index	0.029	-0.132***	0.121***	0.091	0.056
	(0.644)	(-2.847)	(3.229)	(1.211)	(1.509)
All Time-varying Controls	Yes	Yes	Yes	Yes	Yes
HQ Country, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572
R-squared	0.297	0.051	0.131	0.150	0.474
IV F-stat	41.41	41.41	38.88	38.88	39.31
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001

Panel D: Effect of Demand-based Instrument for Diversity on Innovation

	(1)	(2)	(3)	(4)
Dependent Variable:	*Ln(1+Patents)*	*Patents/R&D*	*Ln(1+Citations)*	*Ln(1+Cit./Pat.)*
Instrumented Diversity Index	0.182***	0.092	0.133***	0.087**
	(4.052)	(1.081)	(3.009)	(2.085)
All Time-varying Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572
R-squared	0.352	0.249	0.396	0.294
IV F-stat	43.47	28.85	43.47	43.47
Durbin pval	<0.001	<0.001	<0.001	<0.001

Panel E: Effect of Demand-based Instrument for Diversity on Performance

	(1)	(2)
Dependent Variable:	*EBITDA/Assets*	*ln(Q)*
Instrumented Diversity Index	0.213***	0.559***
	(4.533)	(11.971)
All Time-varying Controls	Yes	Yes
Year FE	Yes	Yes
Industry (FF-49) FE	Yes	Yes
HQ County FE	Yes	Yes
Observations	21,572	21,572
R-squared	0.212	0.255
IV F-stat	38.62	49.19
Durbin pval	<0.001	<0.001

Table IA.15 – Principal Component Analysis of Board Diversity

This table reports the results of the principal component analysis conducted on the six measures of diversity used to construct the board diversity index in the main text. Panel A reports the eigenvectors with the corresponding loadings. Panel B reports the eigenvalues associated with each principal component and the fraction of common variation of the six measures that is explained by each component. Panel C reports simple OLS regression estimates for the relation between the first principal component and each measure of diversity, with standard errors clustered at the firm-level. The corresponding *t*-statistics are in parenthesis.

Panel A – Eigenvectors and factor loadings

	1st Comp.	*2nd Comp.*	*3rd Comp.*	*4th Comp.*	*5th Comp.*	*6th Comp.*
% Female	-0.3477	0.435	-0.2632	0.7521	-0.109	0.2077
Std. Dev. Age	0.3598	-0.4675	0.2254	0.5836	0.51	0.0216
HHI Ethnicity	0.0747	0.603	0.7739	0.0017	0.1594	-0.0798
HHI Bachelors	0.5773	0.1976	-0.1132	-0.1119	-0.0806	0.7719
HHI Fin. Expert	0.4038	0.4342	-0.5111	-0.0571	0.4235	-0.4522
Mean Boards	-0.4978	0.0303	-0.083	-0.2794	0.7188	0.3869

Panel B – Eigenvalues and Common Variation

	Eigenvalue	*Difference*	*Proportion*	*Cumulative*
1st Comp.	1.7144	0.6920	0.2857	0.2857
2nd Comp.	1.0223	0.0294	0.1704	0.4561
3rd Comp.	0.9928	0.1175	0.1655	0.6216
4th Comp.	0.8753	0.0842	0.1459	0.7675
5th Comp.	0.7910	0.1869	0.1318	0.8993
6th Comp.	0.6040	--	0.1007	1

Panel C – Regression of first principal component of diversity on each factor

	(1)	(2)	(3)	(4)	(5)	(6)
% Board Female	-4.584***					
	(-75.086)					
STDEV Age		0.194***				
		(78.441)				
-1 × HHI Ethnicity			-0.732***			
			(14.437)			
-1 × HHI Bachelors				-2.824***		
				(169.542)		
-1 × HHI Fin. Expert					-5.217***	
					(91.497)	
Mean # of Other Boards						-1.099***
						(-126.207)
Observations	21,572	21,572	21,572	21,572	21,572	21,572
R-squared	0.207	0.222	0.010	0.571	0.280	0.425

Table IA.16 – Principal Components Analysis: Effects of board diversity

The table reports regression estimates for the effects board diversity using the PCA-based measure of diversity instead of the diversity index with predetermined weights used in the main text. The panels analyze the effect of board diversity on stock return volatility (Panel A), persistence of firm policies (Panel B), the level of firm policies (Panel C), innovation (Panel D), and performance (Panel E) using the first principal component of the diversity index. All specifications are identical to those reported in the main text, except for the alternative underlying measure of board diversity. Standard errors are clustered at the firm level in all panels and account for the two-stage nature of the estimation where appropriate. The corresponding t-statistics are reported in parenthesis.

Panel A: First Principal Component of Board Diversity and Stock Volatility

	(1)	(3)	(4)
	OLS	IV 1st Stage	IV 2nd Stage
PC Diversity	-0.690*** (-3.196)		
Instrumented PC Diversity			-19.800*** (-3.592)
Diversity of Directors w/ Non-Stop Flight		0.067*** (4.311)	
All Time-varying Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes
Observations	21,572	21,572	21,572
R-squared	0.600	0.391	0.468
IV F-stat			23.82
Durbin p-val.			< 0.001

Panel B: First Principal Component of Board Diversity and Persistence of Corporate Policies

Dependent Variable:	(1) Net Book $Leverage_{t+1}$	(2) (Dividends/ $Equity)_{t+1}$	(3) (Capex/ $Assets)_{t+1}$	(4) (Advertising / $Sales)_{t+1}$	(5) (R&D/ $Assets)_{t+1}$	(6) Policy $Index_{t+1}$	(7) Policy $Index_{t+2}$	(8) Policy $Index_{t+3}$
(Policy $Variable)_t$	0.879***	0.466***	0.938***	0.904***	0.871***	0.852***	0.792***	0.748***
	(2.930)	(3.756)	(2.899)	(2.870)	(2.998)	(3.576)	(2.719)	(2.984)
(Instr. PC $Diversity)_t$ ×	0.061***	0.220***	0.016***	0.082**	0.051*	0.088***	0.143***	0.138***
(Policy $Variable)_t$	(3.296)	(2.675)	(3.528)	(2.507)	(1.879)	(3.780)	(4.539)	(4.000)
Instrumented Diversity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All Time-varying Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HQ Country, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,073	19,073	19,073	19,073	19,073	19,073	16,812	14,786
R-squared	0.834	0.085	0.764	0.806	0.768	0.844	0.789	0.745
IV F-stat	26.03	21.06	21.06	21.38	18.32	20.05	21.3	18.8
Durbin p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Panel C: First Principal Component of Board Diversity and Corporate Policies

Dependent Variable:	(1) *Net Book Leverage*	(2) *Net Market Leverage*	(3) *Dividend/ Equity*	(4) *Capex/ Asset*	(5) *R&D/ Asset*
Instr. PC Diversity	-0.831***	-0.387***	0.808***	0.012	0.711***
	(-3.580)	(-4.434)	(2.669)	(0.340)	(3.820)
All Time-varying Controls	Yes	Yes	Yes	Yes	Yes
HQ Country, Industry (FF-49), and Year FE	Yes	Yes	Yes	Yes	Yes
Observations	21,572	21,572	21,572	21,572	21,572
R-squared	0.222	0.289	0.240	0.247	0.261
IV F-stat	22.15	22.15	19.19	15.12	20.01
Durbin pval	<0.001	<0.001	<0.001	<0.001	<0.001

Panel D: First Principal Component of Board Diversity and Innovation

Dependent Variable:	(1) *Ln(1+Patents)*	(2) *Patents/R&D*	(3) *Ln(1+Citations)*	(4) *Ln(1+Cit./Pat.)*
Instrumented (-1×First PC)	2.139***	2.140*	2.016***	1.293***
	(5.622)	(1.926)	(5.560)	(4.905)
All Time-varying Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry (FF-49) FE	Yes	Yes	Yes	Yes
HQ County FE	Yes	Yes	Yes	Yes
Observations	20,702	9,129	20,702	20,702
R-squared	0.390	0.468	0.390	0.326
IV F-stat	42.73	17.53	42.73	42.73
Durbin pval	<0.001	<0.001	<0.001	<0.001

Panel E: First Principal Component of Board Diversity and Performance

Dependent Variable:	(1) *EBITDA/Assets*	(2) *ln(Q)*
Instrumented (-1×First PC)	1.509***	4.430***
	(3.444)	(4.725)
All Time-varying Controls	Yes	Yes
Industry (FF-49) FE	Yes	Yes
HQ County FE	Yes	Yes
Observations	21,572	21,572
R-squared	0.243	0.277
IV F-stat	27.57	36.49
Durbin pval	<0.001	<0.001