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Board Ancestral Diversity and Firm-Performance Volatility

Mariassunta Giannetti and Mengxin Zhao*

Abstract

We proxy for board members' opinions and values using directors' ancestral origins and show that diversity has costs and benefits, leading to high performance volatility. Consistent with the idea that diverse groups experiment more, firms with ancestrally diverse boards have more numerous and more cited patents. In addition, their strategies conform less to those of the industry peers. However, firms with greater ancestral diversity also have more board meetings and make less predictable decisions. These findings suggest that diversity may lead to inefficiencies in the decision-making process and conflicts in the boardroom.

> To be sure, it could be assumed that all were seeking to maximize profits; but suppose they had different expectations of the future? They would then have different preferences over investment projects. I first supposed that they would decide, as the legal framework would imply, by majority voting.... It was immediately clear that majority voting did not necessarily lead to an ordering (Arrow (1984), pp. 2–3).

I. Introduction

The effects of diversity are studied in a variety of fields, ranging from macroeconomics to social psychology (see, e.g., Alesina, Michalopoulos, and

*Giannetti (corresponding author), mariassunta.giannetti@hhs.se, Stockholm School of Economics, Center for Economic Policy Research (CEPR), and European Corporate Governance Institute (ECGI); Zhao, zhaom@sec.gov, U.S. Securities and Exchange Commission. We thank an anonymous referee, Ken Ahern, Tom Bates, Alon Brav, Aiyesha Dey, Jarrad Harford (the editor), Andrew Karolyi, Alberto Manconi, Ron Masulis, David McLean, Joseph Pacelli, Oliver Spalt, and participants at the 2016 Association of Financial Economics/Allied Social Sciences Association meeting, the 2015 Ackerman Conference on Corporate Governance, the 2016 Society of Financial Studies Cavalcade, the U.S. Securities and Exchange Commission (SEC), the University of Rome III, the University of Lancaster, DePaul University, the University of Central Florida, and the Hong Kong Baptist University for comments. Giannetti acknowledges financial support from the Tom Hedelius and Jan Wallander Foundation. The SEC, as a matter of policy, disclaims responsibility for any private publication or statement by any of its employees. The views expressed herein are those of the author and do not necessarily reflect the views of the SEC or of the author's colleagues on the staff of the SEC.

Papaioannou (2016), Ashraf and Galor (2013), and Page (2007)). These studies typically conjecture that diversity may have costs and benefits. By widening the spectrum of individuals' abilities, cognitive approaches, and preferences, diversity is expected to yield benefits in terms of more rapid knowledge accumulation, but it may also frustrate the decision-making process and decrease trust and interpersonal cooperation (see Algan, Hemet, and Laitin (2016)). To date, there is little evidence on how diversity affects actual economic decisions.

This article attempts to fill this gap using the board of directors as a laboratory. It starts by documenting that differences in directors' ancestries represent an aspect of board diversity of U.S. listed companies that is not captured by common measures of board diversity. Although a large fraction of the directors of U.S. listed companies are of British ancestry, firms differ in the extent to which different ancestries are represented. Ancestry has been shown to affect the culture of immigrants even after several generations (see Guiso, Sapienza, and Zingales (2006)), not only because culture has a large component of intergenerational transmission but also because genetic differences between individuals with different ancestries are related to differences in their values and preferences (see Desmet, Ortuño-Ortín, and Wacziarg (2017)), Algan and Cahuc (2010), Fernandez (2011), Dohmen, Falk, Huffman, and Sunde (2012), and Alesina, Giuliano, and Nunn (2013)).

Controlling for other commonly used measures of diversity, such as gender diversity and diversity in industry experience, we show that ancestral diversity has costs and benefits, resulting in greater stock return and fundamental volatility for firms with more diverse boards. The effects appear to be driven by cultural as well as genetic differences between the directors. Consistent with the idea that diverse groups are better at solving complex problems, we find that firms with diverse boards have more numerous and more cited patents. The success in the innovation of firms with ancestrally diverse boards may result from more experimentation; we show that firms with ancestrally diverse boards enact strategies that differ more from those of the industry peers and change their strategies to a larger extent over time.

The downside of diverse preferences and perspectives is that diverse directors may disagree on which problems of the firm are pressing and on which policies optimize the firm's objectives. To the extent that individual preferences fail to aggregate into collective preferences, as highlighted by Arrow (1951), individuals have incentives to misrepresent their preferences and manipulate the agenda. As a consequence, the voting results of rational individuals may be hard to predict, and the decision-making process may be erratic. Also, conflict in the boardroom may arise.

Consistent with these conjectures, we find that firms with diverse boards have more frequent board meetings, suggesting difficulties in the decision-making process. There is no evidence that more frequent meetings are associated with more intense monitoring; board ancestral diversity appears unrelated to the sensitivity of executives' and chief executive officers' (CEOs) turnover to performance. There is instead evidence of bigger and more frequent announcements. Firms with ancestrally diverse boards make more frequent announcements concerning material changes in their financial conditions and operations. In addition, these firms

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have larger earnings-announcement abnormal returns, and analysts make larger forecast errors in predicting their performance. Consistent with disagreement between directors, we also find some evidence that director turnover is higher and unrelated to performance in firms with diverse boards.

Evoking Kenneth Arrows's intuition quoted at the beginning of the Introduction, this evidence suggests that the diverse preferences of different board members prevail in different board meetings, leading to hard-to-predict decisions and switches in strategies. The latter favor experimentation and innovation but also increase firms' performance volatility.

It is typically hard to go beyond the association between board composition and firm strategies and performance because the characteristics of board members are chosen optimally. However, whereas directors' skills, such as industry experience, are likely to be optimally selected depending on a firm's challenges and investment opportunities, the ancestral composition of the board tends to reflect the ancestral composition of the location where the firms' headquarters are located. This is because independent directors are largely selected locally, and the headquarters' locations are chosen early on in firms' life cycles (see Knyazeva, Knyazeva, and Masulis (2013), Alam, Chen, Ciccotello, and Ryan (2014)). Thus, concentrating on ancestral diversity allows us to focus on a dimension of board composition that is less likely to be the primary driver of the decision to hire a director but, rather, depends on the local supply of potential directors.

We also exploit ancestral diversity in the counties where firms are headquartered as an instrument for board ancestral diversity. Our main results are robust when we exploit the arguably exogenous component of board diversity reflecting the geographical composition of the counties where firms are headquartered. This finding supports a causal interpretation of our findings under the identifying assumption that county characteristics are not associated with firm-performance volatility after the inclusion of a host of firm-level controls. This identifying assumption appears to be supported by other tests, in which we exploit orthogonal sources of variation in the data and show that our results are robust to the inclusion of firm fixed effects (which fully control for the location of firms' headquarters). Thus, we find no evidence that our results may be driven by firms with ancestrally diverse boards being different along some unobserved time-invariant dimension, such as the county in which they are headquartered.

To mitigate any lingering doubts about the interpretation of our findings, we consider firm performance following the announcements of mergers and acquisitions (M&As). M&As are major corporate decisions, made by the board, which have a considerable impact on firm performance. Thus, an association between board ancestral diversity and the outcome of (subsequent) M&As cannot be driven by reverse causality. Higher variability in the announcement returns of M&As would be consistent with our interpretation that ancestrally diverse boards are more likely to make both extremely good and extremely bad decisions. It is thus comforting that we find that acquisition-announcement returns of firms with ancestrally diverse boards are more volatile.

We also explore to what extent firms with diverse boards take more risk. Firms with ancestrally diverse boards do not have higher leverage and do not invest more; if anything, they hold more cash than other firms. They are also as

inclined as other firms to make diversifying acquisitions, which are commonly considered to aim to decrease firm risk (Gormley and Matsa (2016)). Thus, according to conventional proxies for risk taking, firms with ancestrally diverse boards do not take more risk. However, our results indicate that firms with ancestrally diverse boards pursue and generate more ideas and experiment more by switching strategies. Also, the M&As they pursue have more variable performance. This behavior increases the performance volatility of firms with ancestrally diverse boards and makes it harder to predict their future valuations.

Our article is related to a body of research that explores how ancestral diversity affects cooperation and economic performance (see Alesina and La Ferrara (2005), Spolaore and Wacziarg (2013)). Genetic differences across countries have been shown to hamper communication and prevent the diffusion of economic development (Spolaore and Wacziarg (2009)). In addition, a number of influential articles show that genetic diversity, which depends on population ancestral origins, has a hump-shaped effect on macroeconomic performance (see Ashraf and Galor (2013), Ashraf, Galor, and Klemp (2015)). We provide similar evidence at the firm level.

By studying how boards with different ancestral diversity run companies, this article aims to provide microeconomic evidence on how diversity related to individuals' ancestral origins affects high-stake economic decisions. Because the identity of directors and the performance of listed companies are easily observed, boards provide an ideal laboratory to understand how ancestral diversity affects economic outcomes.

Our article also contributes to the literature on boards of directors. A growing literature explores the effects of directors' skills and board structure on performance (see, e.g., Guner, Malmendier, and Tate (2008), Ahern and Dittmar (2012), and Field, Lowry, and Mkrtchyan (2013)). The quality of a board's decision-making is likely to depend not only on the characteristics of the directors but also on the interaction between the directors, an aspect that has been largely neglected in previous literature and that we investigate in this article.[1] We highlight that diversity in culture and values has an effect on the decision-making process, which goes beyond the effect of distance on foreign directors' ability to monitor (see Masulis, Wang, and Xie (2012)).

A number of articles explore the effects of diversity on firm performance using composite indexes of directors' skills, including industry experience, tenure, and age (see Anderson, Reeb, Upadhyay, and Zhao (2011), Bernile, Bhagwat, and Yonker (2018), and Gompers, Mukharlyamov, and Xuan (2016)). These articles show mixed results on the effects of diversity on firm performance and risk taking.[2] We focus on diversity in ancestral origins and explore its effects on the working of the board while controlling for other aspects of board diversity. Ancestral diversity appears to increase firm-performance volatility and makes performance less predictable, whereas other sources of diversity, such as gender

[1] A notable exception is Schwartz-Ziv and Weisbach (2013), who analyze the minutes of boards of 11 Israeli companies.

[2] In contemporaneous work, Bernile et al. (2018) show that a composite index of board diversity has a negative effect on volatility. Our controls, especially the proxy for diversity in industry experience, also tend to have a negative effect on performance volatility, albeit not always significant.

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diversity, appear to be associated with an increase in transparency and make stock prices more informative (Gul, Srinidhi, and Ng (2011)). Our results highlight the necessity to distinguish between different types of diversity instead of relying on composite indexes.

Our work is also related to a strand of research exploring the effect of executives' and directors' ancestries, established using surnames, as we do. For instance, Ellahie, Tahoun, and Tuna (2017) study how the ancestry of the CEO is related to the structure of pay. Pan, Siegel, and Wang (2014), (2017) and Liu (2016) explore how cultural traits associated with different ancestries, such as risk tolerance, affect corporate policies. Instead of exploring specific cultural traits, we consider ancestral diversity.

Finally, our article helps to understand the determinants of idiosyncratic stock volatility. Idiosyncratic stock return volatility is a large component of total stock volatility (Campbell, Lettau, Malkiel, and Xu (2001)), which may be affected by corporate policies and characteristics. Existing studies have stressed the role of competition and uncertainty about managerial characteristics (see Irvine and Pontiff (2009), Pan, Wang, and Weisbach (2015), and Stern (2015)). We highlight the role of board decision-making.

II. Data and Main Variables

A. Sample Construction

Our board data are from RiskMetrics, which provides annual corporate governance information on Standard & Poor's (S&P) 1500 companies. From RiskMetrics, we extract data on directors' names, age, tenure, outside directorships, board size, board independence, whether the CEO is also the chair of the board, whether the director is an insider, and gender from 1996 to 2014. As is common practice, we exclude firms in the financial industry (Standard Industrial Classification (SIC) codes in the 6000s). Our final data set covers an unbalanced panel of 2,947 firms for a total of 23,970 firm-year observations. At the director level, we have information on 31,956 unique directors for a total number of 234,616 director-year observations.

We complement RiskMetrics with information on stock prices and returns from the Center for Research in Security Prices (CRSP) and financial statements from Compustat. In some tests, we merge our main data set with information on analyst forecasts as well as earnings-announcement dates from the Institutional Brokers' Estimate System (IBES), executive turnover from ExecuComp, and firms' patents from Kogan, Papanikolaou, Seru, and Stoffman (2017). Our M&A data are from the Thomson Reuters Securities Data Corporation (SDC) database. We also extract 8-K filings data from the U.S. Securities and Exchange Commission (SEC) Analytics Suites. For part of the sample period (2001–2014), we obtain the number of board meetings from GMI Ratings (formerly Board Analytics).

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B. Measuring Board Ancestral Diversity

Ancestry is often established using last names, a practice consolidated among demographers, geographers, geneticists, and epidemiologists (Mateos (2014)) but also used by economists (e.g., Kerr (2008), Liu (2016), and Pan et al. (2017)).[3]

We follow this practice and associate each last name with a country of origin using information from Ancestry.com. Ancestry.com provides information on the country of origin of passengers of ships arriving from foreign ports at the port of New York between 1820 and 1957. Because in a few instances the same last name may originate from several countries, in those cases, we associate each last name with equal probability to the three most frequent countries of origin of the ship passengers, similarly to Pan et al. (2017).

Although using last names for classifying individual ancestral origins involves noise, the approach we take has proven useful to study hereditary characters in a number of disciplines. Moreover, we do not see any reasons why misclassifications should exhibit a systematic correlation with firm-performance volatility and other corporate outcomes. Any noise should increase the standard errors of our estimates, thus biasing the estimates against finding any result.

Table 1 describes the 10 most frequent ancestral origins of the 31,956 directors in our sample. Most of the directors have British origin, followed by individuals of German ancestry and other predominantly Western European countries. We cannot identify the ancestral origin for 2.5% of the directors, whom we exclude from the sample. In addition, for 17.55% of the sample, we obtain American as the nationality of the passengers. This figure is similar to the one reported by Pan et al. ((2017), Table 1) and refers to individuals with relatively rare last names, who were already United States citizens when they arrival was recorded.[4]

TABLE 1
Directors' Top 10 Ancestral Origins

Table 1 reports the top 10 ancestral origins of the directors in our sample.

Origins	% of Sample Directors
United Kingdom	26.00%
Germany	11.89%
Ireland	7.79%
Italy	4.77%
Israel	2.42%
Spain	1.78%
Sweden	2.34%
France	2.31%
Netherlands	2.02%
Russian Federation	1.78%
United States	17.83%
Unidentified	2.55%
Total	31,956

[3]Research in demography, health, and genetics makes increasing use of names to classify populations and establish their hereditary characters and group identities. The U.S. government has been a key player in the use of this approach to population classification. It commissioned such an analysis in the first decade of the 20th century to inform migration policies and later on to ascribe ethnicity in the resident populations. The U.S. Census Bureau has been involved in the development and validation of these techniques over several decades, lending official support to the use of this method.

[4]Using a different source to establish the origin of last names, Ellahie et al. (2017) find that 47% of the CEOs in their sample have U.S. ancestry.

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We follow existing literature (Alesina and La Ferrara (2005)) and define FRACTIONALIZATION, a measure of board diversity capturing the probability that two randomly selected directors have different countries of origin, using a Herfindahl-based index as follows:

$$\text{FRACTIONALIZATION}_{f,t} = 1 - \sum_{1}^{n} s_{i,f,t}^2, \quad (1)$$

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

In our empirical tests, we also compute the fractionalization index using an alternative source to classify ancestries, the *Oxford Dictionary of American Family Names*, and show that our results are robust.

Besides FRACTIONALIZATION, we consider other measures of diversity, which help explain the mechanisms through which the fractionalization of directors' ancestries matters. A higher fractionalization of the directors' ancestries may be associated with higher genetic diversity. As Spolaore and Wacziarg (2009), (2013) argue, genetic diversity is an excellent *summary statistic* to capture divergence in the whole set of implicit beliefs, customs, habits, biases, conventions, and so forth that are transmitted across generations, biologically and/or culturally, with high persistence.

By widening the spectrum of individuals' skills, abilities, and cognitive approaches, genetic diversity may stimulate productivity. However, genetic diversity may also reflect a low level of trust and interpersonal cooperation (Spolaore and Wacziarg (2009)). For this reason, existing studies find a hump-shaped effect of genetic diversity on macroeconomic performance and country-level productivity (Ashraf and Galor (2013), Ashraf et al. (2015)).

Following existing literature, we recognize that genetic diversity has two components. First, individuals within each ancestral group have different degrees of ancestral diversity. Population geneticists typically measure the extent of diversity in genetic material across individuals within a given population (e.g., within a country) using an index called "expected heterozygosity." Like most other measures of diversity, this index may be interpreted as the probability that two individuals, selected at random from the relevant population, differ genetically from one another with respect to a given spectrum of traits.

Second, there are genetic differences between individuals of different ancestries, which are typically captured using a measure of genetic distance (Spolaore and Wacziarg (2009)). For any subpopulation pair, the genetic distance between the two subpopulations captures the proportion of their combined genetic diversity that is unexplained by the weighted average of their respective (within-origin) genetic diversities (see Ashraf and Galor (2013)). Put differently, the overall diversity of a group of individuals from different ancestries is increasing in the weighted average of the genetic diversity within their different ancestries and in the genetic distance between their ancestries.

We obtain a firm-level measure of the genetic distance between the members of the board with different ancestries (GENETIC_DISTANCE) by averaging the genetic distances between the ancestries of each pair of board members.

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Given the definition of GENETIC_DISTANCE, we control for the weighted average of the individuals' (within-origin) genetic diversities. We measure (within-origin) genetic diversity using the country-level measure of (within-country) genetic differences constructed by Ashraf and Galor (2013). We average this measure of genetic differences across all board members' ancestries to obtain an average of the genetic diversity of the board members; we refer to these average within-ancestry genetic differences as GENETIC_DIVERSITY.

Fractionalization may increase in within-group genetic diversity because diverse boards tend to have more individuals with ancestral origins that are associated with greater genetic differences. Because populations that are originally from areas closer to Africa are more genetically diverse, it is typically the case that directors with non-British ancestries originate from populations with high heterozygosity. Desmet et al. (2017) provide evidence that both between- and within-ancestry genetic differences, that is, GENETIC_DIVERSITY and GENETIC_DISTANCE, are related to differences in culture and trust.

Because differences between individuals with different ancestries are not necessarily fully captured by genetic differences, we also consider two alternative proxies for cultural differences. The first cultural differences measure exploits the World Value Survey, the largest investigation of attitudes, values, and beliefs around the world (Inglehart and Baker (2000)). The World Value Survey consists of a detailed questionnaire on concrete aspects of life (about 250 questions) and covers approximately 80 countries.

We base our measure of cultural distance on a commonly used procedure aiming to exploit, in the most efficient way, the full set of answers gathered in the survey. Inglehart (1997) and Inglehart and Baker (2000) show that answers to survey questions tend to cluster together in coherent patterns. Consequently, they use factor analysis to summarize the salient features of different cultures along two dimensions (values): i) the extent to which a society emphasizes traditional as opposed to secular values and ii) the extent to which a society emphasizes values related to survival as opposed to self-expression. To measure cultural differences in heritage within the board, we use the Euclidean distance in these two dimensions between the countries of origin of any two pairs of directors of a company.

We also show that our results are robust when we measure cultural differences based on Hofstede's (2001) survey, another common source to measure differences in values and norms across the world. Answers to Hofstede's survey are typically summarized using three dimensions (power distance, uncertainty avoidance, and individualism).[5] For each pair of directors on a board, we compute cultural differences between their countries of origin using the Euclidean distance between these three dimensions.

Panel A of Table 2 summarizes the measures of board diversity. There appears to be a large dispersion in the measures of diversity across the sample firms. This reflects that in some firms, the majority of the directors have British origin, whereas in others, there are a number of directors with different ancestries.

[5]The Appendix provides a brief description of these three dimensions.

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TABLE 2
Summary Statistics

Table 2 reports summary statistics for different proxies for board diversity (Panel A), firm-performance volatility (Panel B), board characteristics (Panel C), and firm characteristics (Panel D). The definitions of each variable are provided in the Appendix.

	Mean	Median	Std. Dev.	P25	P75	*N*
Panel A. Board Diversity						
FRACTIONALIZATION	0.725	0.739	0.075	0.685	0.779	24,050
FRAC_OXFORD	0.561	0.583	0.144	0.490	0.664	24,022
GENETIC_DIVERSITY	0.912	0.770	0.698	0.451	1.175	24,050
GENETIC_DISTANCE	0.069	0.048	0.070	0.023	0.091	24,050
CUL_DIFF	0.754	0.720	0.300	0.532	0.936	24,073
CUL_DIFF_HOFSTEDE	0.067	0.065	0.028	0.046	0.085	24,034
FEM_DIRECTOR	0.096	0.100	0.097	0.000	0.154	21,809
TENURE_DIVERSITY	0.737	0.723	0.271	0.565	0.893	19,448
AGE_DIVERSITY	0.133	0.127	0.048	0.101	0.159	21,806
INDUS_DIVERSITY	0.398	0.417	0.252	0.204	0.603	24,077
HHI_FIN_EXPERT	0.062	0.050	0.052	0.023	0.100	9,459
DIRSHIP_DIVERSITY	0.729	0.724	0.252	0.559	0.886	13,965
SCHOOL_RANK_DIVERSITY	0.443	0.485	0.192	0.320	0.595	10,109
DEGREE_DIVERSITY	0.751	0.773	0.136	0.673	0.850	10,109
COUNTY_DIVERSITY	0.983	0.984	0.004	0.983	0.985	30,034
Panel B. Performance Volatility						
TOT_RET_VOL	0.113	0.095	0.074	0.068	0.136	21,758
EPS_VOL	−9.541	−9.884	3.036	−11.605	−7.774	22,285
IDIO_VOL	0.073	0.061	0.051	0.042	0.090	22,032
Panel C. Board Characteristics						
BOARD_SIZE	9.086	9.000	2.363	7.000	11.000	21,809
PERC_IND_DIRECTOR	0.698	0.727	0.174	0.600	0.833	21,809
CHAIR_CEO	0.673	1.000	0.469	0.000	1.000	21,809
CEO_ONLY_INSIDER	0.539	1.000	0.498	0.000	1.000	21,809
BUSY_DIRECTOR	0.559	0.560	0.300	0.336	0.773	19,462
DIRECTOR_AGE	60	60	5	58	63	21,809
DIRECTOR_TENURE	8.677	8.125	3.981	5.923	10.800	19,458
DIRECTOR_TURN	0.636	1.00	0.481	0.00	1.00	20,621
BOARD_MEETINGS	2.154	2.079	0.395	1.946	2.398	24,891
Panel D. Firm Characteristics						
ASSETS	7,382.091	1,593.897	26,813.190	606.286	4,959.337	23,585
ln(Q)	0.540	0.443	0.490	0.186	0.800	23,529
NUM_SEGMENTS	1.732	1.000	1.136	1.000	2.000	24,077
FIRM_AGE	26.085	20.000	19.937	11.000	36.000	23,578
RD_SALES	0.058	0.000	0.348	0.000	0.040	23,576
CAPEX_ASSETS	0.065	0.044	0.071	0.024	0.079	23,406
LEVERAGE	0.199	0.187	0.172	0.040	0.304	23,495
ROA	0.035	0.049	0.169	0.020	0.086	23,577
EXEC_ FRAC	0.646	0.667	0.104	0.593	0.720	22,920
CASH_ASSETS	0.098	0.059	0.109	0.019	0.140	23,217
MA	0.195	0.000	0.396	0.000	0.000	24,050
DIVERSIFYING_MA	0.083	0.000	0.276	0.000	0.000	24,050
MA_RET_VOL	0.029	0.018	0.032	0.008	0.037	8,441
8K_FILINGS	1.994	2.303	1.001	1.386	2.708	24,520
SP	0.042	1.087	3.087	−0.456	1.677	11,978
SC	−3.972	−3.510	2.080	−4.746	−2.637	17,040
AFE_MEDIAN	0.005	0.001	0.011	0.000	0.004	72,582
AFE_MEAN	0.005	0.001	0.011	0.000	0.004	72,582
STD_AFE	0.317	0.020	12.171	0.010	0.040	68,579
EARNINGS_CAR11	5.701	3.802	6.279	1.656	7.558	75,811
PAT_APP	0.725	0.000	1.428	0.000	0.693	19,652
PAT_CITED	0.970	0.000	1.959	0.000	0.693	19,652
CEO_TURN	0.100	0.000	0.300	0.000	0.000	22,123
EXEC_TURN	0.589	1.000	0.492	0.000	1.000	18,531
ln(CEO_PAY)	2.075	2.088	0.141	1.990	2.170	18,190

C. Measuring Firm Volatility and Other Firm Characteristics

We use several proxies to capture firm-performance volatility, which are summarized in Panel B of Table 2. First, we use the total stock return volatility,

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defined as the standard deviation of monthly stock returns over 12 months, starting from the most recent fiscal year-end.

Because stock return volatility may reflect changes in both firms' expected cash flows and investors' discount rates, to focus on the volatility of cash flows, we define an alternative measure of fundamental volatility, which relies on earnings per share. Similar to Irvine and Pontiff (2009), we measure the standard deviation of quarterly earnings shocks between month t and month t +12. We assume that earnings follow a random walk, and we measure an earnings shock as the difference between earnings per share in month t and month t –12. Measuring the shock over a 1-year period controls for seasonality. If a firm reports its earnings on a quarterly basis, then the 12-month earnings volatility is the standard deviation of four earnings shocks. We use the natural logarithm of this volatility measure as the dependent variable in the empirical analysis.

Finally, to capture the fact that volatility resulting from the effect of diversity on decision-making is more likely to arise from idiosyncratic firm factors, rather than from exposure to systematic risk factors, we define a measure of idiosyncratic volatility. The 12-month idiosyncratic volatility is computed as the residual of a 4-factor model including the 3 Fama and French (1993) factors and the momentum factor (Carhart (1997)) and estimated on monthly returns.

We also evaluate the volatility of the outcome of a major board decision, M&As. We extract all M&As made by U.S. public companies during the 1996–2014 period from the SDC's U.S. Mergers and Acquisitions database. As is common in the literature, we require that the acquisition is completed; the deal value disclosed in SDC is more than $1 million and is at least 1% of the acquirer's market value of total assets, measured at the fiscal year-end immediately before the acquisition announcement; and the acquirer controls less than 50% of the target shares prior to the announcement and owns more than 50% of target shares after the transaction. For each acquisition, we compute the announcement returns for the acquirer as the market-adjusted abnormal return on the announcement date. Our results are robust if we use the cumulative abnormal returns over a window of 1 or 2 days before the M&A announcement date to 1 or 2 days after the announcement date. The abnormal return is calculated by subtracting from the raw return the value-weighted return of the market portfolio from CRSP. We measure the volatility of the acquisition performance by using the absolute value of the announcement returns and label this variable MA_RET_VOL.

D. Other Firm Characteristics

Throughout the analysis, we control for a variety of firm characteristics, including other measures of board diversity, unrelated to ancestral diversity, that have been used in the literature, as summarized in Panel A of Table 2. The other measures of board diversity include the percentage of female directors on a board; director age heterogeneity, proxied by the coefficient of variation of the directors' ages; and a similarly defined measure of directors' tenure heterogeneity. In addition, we proxy for the directors' diverse industry experience using the Herfindahl index of the number of directorships that a firm's directors hold in other 2-digit SIC code industries. We also construct proxies for diversity in the number of

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directors' outside directorships, diversity in financial expertise, and diversity in education, which are defined in the Appendix.[6]

Panel C of Table 2 provides summary statistics for board characteristics, and Panel D lists the remaining firm-level controls. All variables' definitions are provided in the Appendix.

III. Determinants of Board Diversity

To what extent is ancestral diversity a salient characteristic of board diversity? Do cross-sectional differences in other features of the boards, such as diversity in industry experience, already capture the effects of board ancestral diversity? To answer these questions, we perform factor analysis for the different proxies for board diversity in our data set. We find that three eigenvalues are larger than 1, with the first largely dominating the other two, indicating that three factors capture the main dimensions of variation in board diversity. Columns 1–3 in Panel A of Table 3 show the factor loadings on the different diversity proxies associated with the three factors corresponding to the eigenvalues larger than 1.

The first two factors (principal components) mostly load on the proxies for ancestral diversity as well as on the diversity of industry experience, whereas the third factor loads on diversity due to age and tenure. Overall, ancestral diversity does not seem to be subsumed by other measures of board diversity, and among the measures of diversity we use, it accounts for a large part of the variation in board diversity across U.S. listed companies. Thus, ancestral diversity may affect firm performance differently from other aspects of board diversity.

In columns 4–6 of Table 3, we explore whether this conclusion changes when we include additional measures of board diversity, such as diversity in financial expertise, diversity in the number of directorships, and two measures of diversity in educational background, which respectively capture the diversity in the type of degrees earned by the directors and diversity in the rank of the university attended by the directors.[7] Adding these additional measures of diversity leaves the relative importance of ancestral diversity unaffected.

The fact that ancestral, genetic, and cultural diversities are not subsumed by other proxies for diversity used in the literature is also evident from Panel B of Table 3. The measures of ancestral, genetic, and cultural diversities have low correlation with other diversity proxies, such as diversity in experience and education.

Panel C of Table 3 shows that average genetic differences, genetic distance, and cultural differences between board members jointly contribute to explain ancestral fractionalization, our main firm-level measure of ancestral diversity in board members.

[6]To capture more potential boards in which a director may seat, we construct the diversity in the number of directors' outside directorships using Board Analytics, which covers a broader cross section of firms. Diversity in education is constructed using BoardEx. The use of these data sets limits the time-series dimension of the observations. For these reasons, we use these additional variables only in a few robustness checks.

[7]Precise definitions of the additional diversity variables are provided in the Appendix.

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TABLE 3
Board Diversity

In Panel A of Table 3, we extract the principal components of the proxies for diversity listed in the first column of the table. A total of three eigenvalues are larger than 1, corresponding to different sets of variables included in the 2 factor analysis exercises (in columns 1–3 and columns 4–6, respectively). We list the eigenvectors associated with these eigenvalues. Panel B reports Pearson correlation coefficients between different measures of board diversity. *p*-values are reported in parentheses. The definitions of the variables are provided in the Appendix. Panel C relates our main measure of board ancestral diversity to genetic and cultural diversity. Detailed variable definitions are provided in the Appendix. We report *t*-statistics in parentheses, with standard errors clustered at the firm level and corrected for heteroscedasticity. Panel D relates firm characteristics to our main measure of board ancestral diversity, FRACTIONALIZATION. Variable definitions are provided in the Appendix. We present ordinary least squares (OLS) parameter estimates. We include industry and year fixed effects in all regressions. We report *t*-statistics in parentheses. Standard errors are double-clustered at the county and year levels and corrected for heteroscedasticity. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Factor Analysis

	Baseline Diversity Measures			Additional Diversity Measures		
Variable	First Factor	Second Factor	Third Factor	First Factor	Second Factor	Third Factor
FRACTIONALIZATION	0.432	0.394	−0.221	0.544	0.372	0.149
GENETIC_DIVERSITY	0.513	−0.145	0.236	0.725	−0.118	−0.167
GENETIC_DISTANCE	0.492	0.067	0.15	0.656	0.084	−0.089
CUL_DIFF	0.287	0.567	−0.33	0.345	0.455	0.238
INDUS_DIVERSITY	0.353	−0.43	−0.026	0.483	−0.388	0.028
TENURE_DIVERSITY	0.092	0.099	0.716	0.096	0.032	−0.023
AGE_DIVERSITY	−0.129	0.437	0.501	−0.135	0.200	−0.116
FEM_DIRECTOR	0.276	−0.334	0.009	0.338	−0.201	0.104
HHI_FIN_EXPERT				−0.193	0.249	0.357
DIRSHIP_DIVERSITY				−0.042	−0.118	0.39
SCHOOL_RANK_DIVERSITY				0.261	−0.213	0.168
DEGREE_DIVERSITY				0.019	0.254	−0.188

Panel B. Correlation among Measures of Board Diversity

	FRACTIONALIZATION	GENETIC_DIVERSITY	GENETIC_DISTANCE	CUL_DIFF	INDUS_DIVERSITY	TENURE_DIVERSITY	AGE_DIVERSITY	FEM_DIRECTOR	HHI_FIN_EXPERT	DIRSHIP_DIVERSITY	SCHOOL_RANK_DIVERSITY	DEGREE_DIVERSITY
FRACTIONALIZATION	1.000											
GENETIC_DIVERSITY	0.338 (0.00)	1.000										
GENETIC_DISTANCE	0.337 (0.00)	0.713 (0.00)	1.000									
CUL_DIFF	0.500 (0.00)	0.072 (0.00)	0.236 (0.00)	1.000								
INDUS_DIVERSITY	0.155 (0.00)	0.376 (0.00)	0.231 (0.00)	0.013 (0.05)	1.000							
TENURE_DIVERSITY	0.058 (0.00)	0.108 (0.00)	0.059 (0.00)	0.028 (0.00)	0.028 (0.00)	1.000						
AGE_DIVERSITY	−0.042 (0.00)	−0.089 (0.00)	−0.038 (0.00)	0.031 (0.00)	−0.227 (0.00)	0.084 (0.00)	1.000					
FEM_DIRECTOR	0.115 (0.00)	0.200 (0.00)	0.136 (0.00)	0.030 (0.00)	0.232 (0.00)	0.046 (0.00)	−0.130 (0.00)	1.000				
HHI_FIN_EXPERT	−0.126 (0.00)	−0.309 (0.00)	−0.208 (0.00)	0.008 (0.43)	−0.223 (0.00)	−0.079 (0.00)	0.047 (0.00)	−0.168 (0.00)	1.000			
DIRSHIP_DIVERSITY	−0.032 (0.00)	−0.028 (0.00)	−0.017 (0.05)	0.005 (0.55)	0.078 (0.00)	0.073 (0.00)	−0.079 (0.00)	0.090 (0.00)	−0.031 (0.00)	1.000		
SCHOOL_RANK_DIVERSITY	0.119 (0.00)	0.160 (0.00)	0.095 (0.00)	0.074 (0.00)	0.254 (0.00)	0.012 (0.24)	0.000 (0.98)	0.145 (0.00)	−0.035 (0.01)	0.051 (0.00)	1.000	
DEGREE_DIVERSITY	0.075 (0.00)	0.055 (0.00)	0.065 (0.00)	0.067 (0.00)	−0.110 (0.00)	0.035 (0.00)	0.017 (0.11)	−0.045 (0.00)	0.008 (0.57)	−0.078 (0.00)	−0.244 (0.00)	1.000

(continued on next page)

TABLE 3 (continued)
Board Diversity

Panel C. Fractionalization and Other Measures of Ancestral Diversity

Variable	Dependent Variable: FRACTIONALIZATION
GENETIC_DIVERSITY	0.043***
	(17.58)
GENETIC_DISTANCE	0.069***
	(4.05)
CUL_DIFF	0.118***
	(33.09)
Constant	0.598***
	(164.74)
No. of obs.	24,050
R^2	0.34

Panel D. Determinants of Board Ancestral Diversity

	Dependent Variable: FRACTIONALIZATION	
Variable	1	2
COUNTY_DIVERSITY	1.143***	1.118***
	(2.97)	(2.92)
ln(ASSETS)	−0.000	−0.001
	(−0.30)	(−0.45)
ln(Q)	0.007**	0.007**
	(2.50)	(2.27)
LEVERAGE	−0.001	−0.001
	(−0.10)	(−0.12)
CAPEX_ASSETS	−0.027	−0.026
	(−1.67)	(−1.63)
ln(FIRM_AGE)	−0.000	−0.000
	(−0.01)	(−0.03)
ln(NUM_SEGMENTS)	−0.003	−0.003
	(−1.30)	(−1.33)
BOARD_SIZE	0.012***	0.013***
	(16.54)	(15.97)
PERC_IND_DIRECTOR	0.017*	0.015
	(2.04)	(1.73)
TENURE_DIVERSITY	0.004	0.004
	(0.66)	(0.85)
AGE_DIVERSITY	−0.022	−0.020
	(−0.79)	(−0.72)
INDUS_DIVERSITY	−0.010	−0.015**
	(−1.52)	(−2.30)
FEM_DIRECTOR	0.022	0.022
	(1.45)	(1.48)
AVG_AGE	−0.000	−0.000
	(−0.25)	(−0.25)
AVG_TENURE	−0.001	−0.001
	(−1.51)	(−1.41)
CHAIR_CEO		0.004
		(1.59)
CEO_ONLY_INSIDER		−0.000
		(−0.03)
BUSY_DIRECTOR		0.006
		(0.94)
ROA		−0.003
		(−0.50)
RD_SALES		0.002
		(0.80)
No. of obs.	18,164	18,163
R^2	0.17	0.17

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Panel D of Table 3 relates FRACTIONALIZATION to predetermined firm characteristics and ancestral diversity in the county where a firm is headquartered. We proxy for county ancestral diversity using the 2000 U.S. Census Integrated Public Use Microdata Series (IPUMS) database at the University of Minnesota (Ruggles, Alexander, Genadek, Goeken, Schroeder, and Sobek (2010)). The census provides information on the respondents' self-reported ancestry. Over 74% of the respondents trace their roots to a particular foreign country. Importantly for our purposes, IPUM reports each respondent's Public Use Microdata Area (PUMA), which generally follows the boundaries of a county. Using these data, we can construct the fractionalization of the ancestries of the individuals in a county (COUNTY_DIVERSITY), as we do for the board-level fractionalization.

We double-cluster standard errors at the time and county levels because county ancestral diversity does not vary across firms with headquarters in a county. We also cluster at the time level because in the discussion that follows, we use the specifications in Panel C of Table 3 as a first stage in the instrumental variable (IV) estimation of the effect of FRACTIONALIZATION on firm-performance volatility; firm-performance volatility in turn may be correlated across firms at the same time.

Board ancestral diversity appears to be positively correlated to the extent of ancestral diversity in the county where a firm is headquartered. A 1-standard-deviation increase in the county's ancestral diversity increases FRACTIONALIZATION by over 5% of the standard deviation. This finding is consistent with the previous literature indicating that directors, and independent directors in particular, are mostly selected locally and suggests a possible instrument for board diversity, arguably capturing exogenous variation in the supply of directors with different ancestries (Knyazeva et al. (2013), Alam et al. (2014), and Giannetti, Liao, and Yu (2015)). In what follows, we provide evidence in support of the instrument's exclusion restriction.

A firm's Tobin's Q also appears to be associated with board ancestral diversity. This is consistent with the notion that diversity benefits firms that, having strong growth opportunities, are engaged in nonroutine activities. Interestingly, in column 2 of Table 3, diversity in industry experience appears to be negatively related to board ancestral diversity. For this reason, we include controls for Tobin's Q, other proxies for board diversity, and firm characteristics throughout the analysis.

FRACTIONALIZATION appears to be largely unrelated to other firm characteristics, such as firm size, captured by the natural logarithm of the book value of assets, or the firm's leverage, mitigating concerns about selection problems.

IV. Board Diversity and Firm-Performance Volatility

In this section, we explore whether board ancestral diversity increases firm-performance volatility. Table 4 relates alternative proxies for firm-performance volatility to FRACTIONALIZATION. Throughout the analysis, we control for a host of board and firm characteristics. The controls include proxies for board diversity other than ancestral diversity, such as diversity in industry experience, age, and tenure and the percentage of female directors; controls for other board

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TABLE 4
Board Ancestral Diversity and Performance Volatility

Table 4 relates several proxies for firm-performance volatility to our main proxy for board ancestral diversity, FRACTIONALIZATION. The dependent variables are, respectively, the 1-year total stock return volatility, the fundamental volatility, and the idiosyncratic return volatility, as indicated at the top of each column. Variable definitions are provided in the Appendix. We present ordinary least squares (OLS) parameter estimates in Panel A and instrumental variable (IV) estimates in Panel B. The IV for FRACTIONALIZATION is ancestral diversity in the county where a firm is headquartered, and the first stage is presented in Panel D of Table 3. All models include fixed effects, whose coefficients are not reported, as indicated at the bottom of the table. We report *t*-statistics in parentheses. Standard errors are corrected for heteroscedasticity and double-clustered at the firm and time levels in Panel A and at the county and time levels in Panel B. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. OLS Estimates

	Dependent Variable					
	TOT_RET_VOL	EPS_VOL	IDIO_VOL	TOT_RET_VOL	EPS_VOL	IDIO_VOL
Variable	1	2	3	4	5	6
FRACTIONALIZATION	0.022**	0.806*	0.017**	0.016*	0.830**	0.012**
	(2.38)	(2.06)	(2.77)	(1.70)	(2.02)	(2.52)
ln(ASSETS)	−0.006***	−0.150***	−0.005***	−0.007***	−0.203*	−0.008***
	(−4.63)	(−2.99)	(−7.40)	(−2.62)	(−1.85)	(−5.19)
ROA	−0.099***	−4.496***	−0.051***	−0.054***	−3.774***	−0.025**
	(−5.91)	(−4.53)	(−3.04)	(−4.60)	(−4.81)	(−2.40)
ln(Q)	−0.008	−2.574***	−0.007**	−0.004	−2.156***	−0.005*
	(−1.61)	(−17.21)	(−2.21)	(−0.97)	(−15.10)	(−1.94)
LEVERAGE	0.027***	1.618***	0.021***	0.037***	1.168***	0.028***
	(3.59)	(7.55)	(4.96)	(4.81)	(4.81)	(5.52)
CAPEX_ASSETS	0.089***	1.202	0.050***	0.041**	0.893*	0.017
	(3.66)	(1.42)	(3.30)	(2.03)	(1.76)	(1.40)
RD_SALES	0.007***	0.141	0.006***	−0.001	−0.058	0.000
	(6.84)	(1.59)	(3.04)	(−0.27)	(−1.01)	(0.01)
ln(FIRM_AGE)	−0.007***	−0.061	−0.004***	−0.028***	−0.139	−0.015***
	(−3.38)	(−0.87)	(−4.70)	(−4.06)	(−1.17)	(−4.03)
ln(NUM_SEGMENTS)	−0.004***	−0.185**	−0.003***	0.000	0.086	0.001
	(−3.14)	(−2.56)	(−3.53)	(0.26)	(1.27)	(0.86)
TENURE_DIVERSITY	0.008*	0.185	0.004**	−0.002	−0.044	−0.001
	(1.84)	(1.67)	(2.18)	(−0.51)	(−0.37)	(−0.35)
AGE_DIVERSITY	−0.002	1.143	0.012	−0.025*	−0.484	−0.005
	(−0.15)	(1.67)	(1.05)	(−1.68)	(−0.74)	(−0.45)
INDUS_DIVERSITY	−0.013**	−0.308	−0.010***	0.008	0.121	0.002
	(−2.69)	(−1.43)	(−3.72)	(1.39)	(0.67)	(0.50)
FEM_DIRECTOR	−0.020*	0.112	−0.009	0.000	0.588	0.007
	(−2.03)	(0.28)	(−1.50)	(0.04)	(1.44)	(1.16)
AVG_AGE	−0.001***	−0.007	−0.000***	−0.001***	0.005	−0.001***
	(−3.51)	(−0.61)	(−3.15)	(−4.38)	(0.35)	(−3.40)
AVG_TENURE	−0.001**	−0.068***	−0.001***	0.001**	−0.029**	0.000
	(−2.75)	(−5.83)	(−3.20)	(2.57)	(−2.25)	(1.59)
BOARD_SIZE	−0.002***	−0.048**	−0.001***	−0.001**	−0.004	−0.000*
	(−4.30)	(−2.83)	(−3.91)	(−2.06)	(−0.23)	(−1.94)
CHAIR_CEO	0.001	−0.080	0.001	0.001	0.040	0.001
	(0.80)	(−1.35)	(1.39)	(1.18)	(0.74)	(0.67)
CEO_ONLY_INSIDER	0.001	0.153**	0.001	−0.001	0.075	0.000
	(1.10)	(2.72)	(1.59)	(−0.47)	(1.58)	(0.14)
BUSY_DIRECTOR	0.007	0.536***	0.004	−0.008*	0.315**	−0.004
	(1.66)	(3.39)	(1.64)	(−1.80)	(2.34)	(−1.60)
PERC_IND_DIRECTOR	−0.011*	−0.359	−0.012***	−0.002	−0.423**	−0.005
	(−1.99)	(−1.61)	(−3.26)	(−0.29)	(−2.32)	(−1.34)
Industry fixed effects	Yes	Yes	Yes	No	No	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	Yes	Yes	Yes
No. of obs.	17,674	18,148	17,936	17,674	18,148	17,936
R^2	0.41	0.41	0.38	0.56	0.63	0.58

(continued on next page)

TABLE 4 (continued)
Board Ancestral Diversity and Performance Volatility

Panel B. IV Estimates

	Dependent Variable		
	TOT_RET_VOL	EPS_VOL	IDIO_VOL
Variable	1	2	3
FRACTIONALIZATION	0.411*	20.586**	0.317**
	(2.09)	(2.35)	(2.51)
ln(ASSETS)	−0.005***	−0.136*	−0.005***
	(−3.34)	(−2.11)	(−5.00)
ROA	−0.099***	−4.491***	−0.051***
	(−6.18)	(−4.67)	(−3.18)
ln(Q)	−0.011*	−2.693***	−0.009**
	(−1.92)	(−14.87)	(−2.46)
LEVERAGE	0.026***	1.594***	0.020***
	(3.08)	(6.19)	(4.31)
CAPEX_ASSETS	0.101***	1.658	0.058***
	(3.64)	(1.65)	(3.44)
RD_SALES	0.006***	0.077	0.005**
	(4.03)	(0.88)	(2.49)
ln(FIRM_AGE)	−0.007**	−0.046	−0.004***
	(−2.66)	(−0.45)	(−3.00)
ln(NUM_SEGMENTS)	−0.003*	−0.126	−0.002*
	(−1.87)	(−1.28)	(−1.83)
TENURE_DIVERSITY	0.007	0.147	0.004
	(1.62)	(0.99)	(1.62)
AGE_DIVERSITY	0.011	1.830*	0.022
	(0.59)	(1.89)	(1.35)
INDUS_DIVERSITY	−0.005	0.086	−0.005
	(−0.67)	(0.26)	(−1.05)
FEM_DIRECTOR	−0.027*	−0.301	−0.015
	(−1.92)	(−0.56)	(−1.68)
AVG_AGE	−0.001**	0.001	−0.000*
	(−2.82)	(0.05)	(−2.04)
AVG_TENURE	−0.001	−0.061***	−0.000**
	(−1.67)	(−3.95)	(−2.15)
BOARD_SIZE	−0.007**	−0.307**	−0.005***
	(−2.66)	(−2.73)	(−3.08)
CHAIR_CEO	−0.001	−0.165*	−0.000
	(−0.49)	(−1.98)	(−0.17)
CEO_ONLY_INSIDER	0.001	0.147*	0.001
	(0.76)	(1.94)	(1.04)
BUSY_DIRECTOR	0.004	0.382	0.002
	(0.71)	(1.65)	(0.51)
PERC_IND_DIRECTOR	−0.019*	−0.696**	−0.017**
	(−2.08)	(−2.32)	(−2.87)
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Kleibergen–Paap Wald rk *F*-statistic	11.69	10.39	11.40
No. of obs.	16,938	17,395	17,191

characteristics, such as average director tenure, average director age, board size, percentage of independent directors, average number of the directors' outside directorships, a dummy for whether the CEO is the only insider who is a member of the board, and a dummy capturing whether the CEO is also the chair of the board; and controls for firm characteristics, such as Tobin's Q, ratio of research and development (R&D) to sales, the number of firm segments (a measure of firm diversification and complexity), leverage, investment, and age.

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In addition, all specifications include year and either industry or firm fixed effects. We double-cluster standard errors at the firm and time levels to account for the fact that, besides being correlated for the same firm, volatility tends to increase for all firms at the same time when there are economic shocks.[8]

In Table 4, board diversity is associated with higher firm-performance volatility. The estimates in column 1 of Panel A suggest a small but not economically irrelevant effect: A 1-standard-deviation increase in the measure of diversity leads to over 2% of a 1-standard-deviation increase in total return volatility. This effect is present not only when we consider the total return volatility but also if we concentrate on fundamental volatility (column 2) and if we abstract from possible differences in exposure to systematic risk factors by considering a firm's idiosyncratic volatility (column 3).

Importantly, the effect of FRACTIONALIZATION differs from that of other proxies for board diversity, such as diversity in industry experience, that have been used in previous literature and have been found to have a negative effect on the volatility of stock returns (Bernile et al. (2018)).

The effects of FRACTIONALIZATION on the different proxies for firm-performance volatility are similar, qualitatively and quantitatively, when we include firm fixed effects in columns 4–6 of Table 4, indicating that differences in time-invariant firm characteristics do not drive our findings. In particular, our results cannot be driven by the fact that a firm's location is related to the firm's volatility because including firm fixed effects absorbs location and any other time-invariant factors.

Therefore, to further mitigate any concerns about omitted factors driving the relation between volatility and fractionalization, we exploit cross-sectional differences in population fractionalization across counties. Because the fixed-effects results demonstrate that time-invariant county-specific factors do not drive our findings, an instrument based on county diversity is expected to satisfy the exclusion restriction. The Kleibergen–Paap Wald rk F-statistics, reported in Panel B of Table 4, mitigate concerns that our instrument is weak. We thus instrument FRACTIONALIZATION using ancestral diversity in the county in which a firm is headquartered.

The instrument allows us to abstract from firm-specific factors that may lead firms to choose more or less diverse boards. In these tests, because county ancestral diversity does not vary between firms headquartered in the same county, we double-cluster standard errors at the county and time levels.

Panel B of Table 4 shows that not only is the direction of our estimates invariant when we rely on 2-stage least squares, but also the magnitude of the estimates increases significantly. A 1-standard-deviation increase in FRACTIONALIZATION explains over 40% of the standard deviation of the total return volatility of a firm. The analogous effects for the firm's fundamental volatility and the firm's idiosyncratic volatility are 51% and 47%.

[8]When the dependent variable is different from firm volatility, we cluster at the firm level because concerns of shocks affecting all firms at the same time can be addressed with the inclusion of time effects. We also note that none of our results depends on the specific assumption on clustering.

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We recognize that the large increase in estimates may depend on a local average-treatment effect. For instance, in counties with high ancestral diversity, the effects of board ancestral diversity may be magnified by a more diverse workforce and executive team.[9] The large increase in the magnitude of the estimates may also depend on the fact that the IV estimates allow us to concentrate on the supply of directors. In counties where firms' choices are constrained by the supply of available directors, even the firms for which the costs of having a diverse board are highest may end up having directors with different ancestries. Furthermore, firms with headquarters in highly diverse geographical areas are subject to pressure to increase the diversity of their boards. They may thus increase board diversity even if this increases their performance volatility to a larger extent than for other firms.

We also note that FRACTIONALIZATION is measured with noise because we use directors' last names. Thus, using IVs may reduce the attenuation bias due to the measurement error and leads to larger estimates.

Overall, it is comforting that our measure of board diversity is associated with higher firm-performance volatility when we exploit orthogonal sources of variation in the data (i.e., within-firm variation in the firm-fixed-effects estimates and cross-county variation in the IV estimates). The consistency of the results between estimation methods supports our initial conjecture that board ancestral diversity is not endogenous. Nevertheless, in the discussion that follows, where possible (because our instruments are not weak), we also report the IV estimates for other corporate outcomes.[10]

Table 5 explores the robustness of our main result to alternative proxies for board ancestral diversity, which can help to shed light on why ancestral diversity matters. For brevity, we report the estimates only for the proxy of total return volatility. In column 1, we compute a measure of executive fractionalization, as we do for our main proxy for board ancestral diversity, FRACTIONALIZATION, and include it as a control. We also include as controls the additional measures of board diversity considered in the factor analysis in columns 4–6 of Panel A in Table 3. The results appear to be driven by the FRACTIONALIZATION of the board because the estimates are qualitatively and quantitatively invariant when we control the ancestral diversity of the executive team. The additional controls for board diversity appear to have limited statistical significance.

In column 2 of Table 5, we test whether our results are robust when we use a different source, the *Oxford Dictionary of American Family Names*, to classify directors' ancestries. The estimates are broadly consistent with the ones reported in Table 4.

[9] In Table 6, we show that our results are robust when we control for the ancestral diversity of the executive team. Also, the fixed-effects estimates demonstrate that our results do not merely derive from cross-sectional differences between firms arising from the counties in which they are headquartered.

[10] Although in these tests the Kleibergen–Paap Wald rk F-statistic is often below the Staiger and Stock (1997) rule of thumb that the F-statistics of the excluded instruments should be above 10, in no case do the critical values suggest a bias of the IV estimates above 20% (see Stock and Yogo (2005)), which is encouraging, especially in a setting like ours in which the IV estimates are much larger than the ordinary least squares (OLS) estimates.

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TABLE 5
Genetic Diversity, Genetic Distance, and Culture Differences

Table 5 relates firm-performance volatility to alternative proxies for board ancestral diversity. In column 1, we control for executive fractionalization along with some additional proxies for board diversity; in column 2, we compute board ancestral diversity using the *Oxford Dictionary of American Family Names*. In columns 3–5, we consider two proxies for board ancestral diversity, GENETIC_DIVERSITY and GENETIC_DISTANCE, and two alternative proxies for cultural differences. The dependent variable is the 1-year total stock return volatility. All variables are defined in the Appendix. All regressions include year and industry fixed effects, whose coefficients are not reported. We report *t*-statistics in parentheses. Standard errors are corrected for heteroscedasticity and double-clustered at the firm and time levels. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: TOT_RET_VOL				
		Oxford Dictionary		Culture: WVS	Culture: Hofstede
Variable	1	2	3	4	5
FRACTIONALIZATION	0.034***	0.011**			
	(3.29)	(2.33)			
EXEC_FRAC	−0.008				
	(−1.07)				
GENETIC_DIVERSITY			0.007		
			(1.65)		
GENETIC_DISTANCE			0.032**		
			(2.18)		
CUL_DIFF				0.006**	0.074**
				(2.63)	(2.84)
ln(ASSETS)	−0.006***	−0.007**	−0.006***	−0.006***	−0.006***
	(−7.82)	(−2.38)	(−4.68)	(−4.73)	(−4.73)
ROA	−0.143***	−0.054***	−0.099***	−0.099***	−0.099***
	(−9.28)	(−3.58)	(−5.89)	(−5.90)	(−5.91)
ln(Q)	−0.013***	−0.004	−0.008	−0.008	−0.008
	(−5.42)	(−0.95)	(−1.60)	(−1.59)	(−1.60)
LEVERAGE	0.025***	0.037***	0.027***	0.027***	0.027***
	(4.08)	(4.33)	(3.62)	(3.62)	(3.64)
CAPEX_ASSETS	0.072***	0.040*	0.088***	0.089***	0.089***
	(3.69)	(1.87)	(3.62)	(3.65)	(3.67)
RD_SALES	0.007	−0.001	0.007***	0.007***	0.007***
	(1.40)	(−0.25)	(6.86)	(6.64)	(6.83)
ln(FIRM_AGE)	−0.004***	−0.027***	−0.007***	−0.007***	−0.007***
	(−2.67)	(−3.67)	(−3.35)	(−3.35)	(−3.35)
ln(NUM_SEGMENTS)	−0.003	0.000	−0.004***	−0.004***	−0.004***
	(−1.53)	(0.19)	(−3.12)	(−3.14)	(−3.12)
TENURE_DIVERSITY	0.002	−0.002	0.008*	0.008*	0.008*
	(0.68)	(−0.40)	(1.90)	(1.81)	(1.87)
AGE_DIVERSITY	0.026	−0.002	−0.002	−0.003	−0.003
	(1.20)	(−0.12)	(−0.20)	(−0.22)	(−0.27)
INDUS_DIVERSITY	−0.004	0.008	−0.013**	−0.013**	−0.013**
	(−0.74)	(1.26)	(−2.71)	(−2.71)	(−2.73)
FEM_DIRECTOR	−0.010	0.002	−0.018*	−0.020*	−0.021**
	(−1.09)	(0.20)	(−1.98)	(−2.05)	(−2.13)
AVG_AGE	−0.000*	−0.001*	−0.001***	−0.001***	−0.001***
	(−1.82)	(−1.84)	(−3.56)	(−3.56)	(−3.60)
AVG_TENURE	−0.000	0.000	−0.001***	−0.001**	−0.001**
	(−0.27)	(1.01)	(−2.93)	(−2.82)	(−2.81)
BOARD_SIZE	−0.002***	−0.001*	−0.004***	−0.002***	−0.002***
	(−3.87)	(−2.00)	(−3.21)	(−3.98)	(−4.00)
CHAIR_CEO	0.002	0.001	0.001	0.001	0.001
	(0.91)	(1.09)	(0.77)	(0.81)	(0.78)

(continued on next page)

TABLE 5 (continued)
Genetic Diversity, Genetic Distance, and Culture Differences

	Dependent Variable: TOT_RET_VOL				
		Oxford Dictionary		Culture: WVS	Culture: Hofstede
Variable	1	2	3	4	5
CEO_ONLY_INSIDER	−0.001 (−0.34)	−0.001 (−0.51)	0.001 (1.02)	0.001 (1.13)	0.001 (1.17)
BUSY_DIRECTOR	0.004 (0.94)	−0.008 (−1.68)	0.007 (1.60)	0.007 (1.69)	0.007 (1.67)
PERC_IND_DIRECTOR	−0.003 (−0.51)	−0.003 (−0.43)	−0.011* (−1.87)	−0.011* (−1.90)	−0.011* (−1.90)
HHI_FIN_EXPERT	−0.051* (−1.89)				
DIRSHIP_DIVERSITY	0.005 (1.21)				
SCHOOL_RANK_DIVERSITY	−0.002 (−0.49)				
DEGREE_DIVERSITY	0.002 (0.27)				
No. of obs.	8,398	17,341	17,694	17,692	17,683
R^2	0.41	0.62	0.42	0.41	0.42

In column 3 of Table 5, we consider the effect of GENETIC_DIVERSITY and GENETIC_DISTANCE, which we have shown to be positively correlated with a firm's FRACTIONALIZATION in Table 3. Both GENETIC_DIVERSITY and GENETIC_DISTANCE increase total return volatility, although the effect is statistically significant at conventional levels only for the measure of GENETIC_DISTANCE. A 1-standard-deviation change in GENETIC_DISTANCE explains almost 3% of the standard deviation of the dependent variable.

Differences in genes have been found to be associated with more cultural fractionalization and are thought to result in intergenerationally transmitted traits that hinder interaction and communication (Desmet et al. (2017)). It is therefore fully consistent with our hypothesis that the lack of (genetic) relatedness of the individuals sitting on the board of a firm is associated with higher performance volatility.

The literature on human evolution points out that a large part of the variance in intergenerationally transmitted traits among humans stems from cultural transmission, rather than genetic differences. For this reason, we also explore whether cultural differences between board members affect firm-performance volatility. In columns 4 and 5 of Table 5, it is apparent that cultural differences between board members are associated with higher firm-performance volatility. In column 4, a 1-standard-deviation change in the CUL_DIFF, the proxy constructed using the World Value Survey, explains 2% of the standard deviation of the firm's total return volatility. The effect is similar in column 5, where the measure of cultural differences between board members is constructed using Hofstede's (2001) survey.

Table 6 explores the effects of board ancestral diversity on firm performance, measured by firm profitability. We present both OLS estimates and IV estimates. On average, board ancestral diversity appears to be negatively associated with

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firm profitability in column 3, where we present IV estimates: A 1-standard-deviation increase in FRACTIONALIZATION is associated with a drop in profitability of 3.6% of a standard deviation. This effect must, however, be interpreted cautiously because the coefficient of FRACTIONALIZATION is statistically

TABLE 6
Board Ancestral Diversity and Firm Performance

Table 6 relates firm performance to our proxy for board diversity, FRACTIONALIZATION. Firm performance is measured as the average return on assets (ROA) between year $t+1$ and $t+3$. All variables are defined in the Appendix. In columns 1 and 2, we present ordinary least squares (OLS) estimates; in columns 3 and 4, we present instrumental variable (IV) estimates. The IV for FRACTIONALIZATION is ancestral diversity in the county where a firm is headquartered, and the first stage is presented in Panel D of Table 3; the instrument for the square of FRACTIONALIZATION is the square of the predicted FRACTIONALIZATION from the first-stage residual as suggested by Wooldridge ((2002), p. 237). All regressions include year and 2-digit Standard Industrial Classification (SIC) code industry fixed effects, whose coefficients are not reported. We report t-statistics in parentheses, with standard errors corrected for heteroscedasticity and clustered at the firm level in columns 1 and 2 and at the county level in columns 3 and 4. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: ROA			
	OLS		IV	
Variable	1	2	3	4
FRACTIONALIZATION	0.014 (0.54)	0.462* (1.74)	−0.083* (−1.77)	21.582*** (3.44)
FRACTIONALIZATION^2		−0.330* (−1.68)		−15.309*** (−3.87)
ln(ASSETS)	0.009*** (2.99)	0.009*** (3.01)	0.008** (2.27)	0.060* (1.84)
SALES_GROWTH	0.045*** (3.25)	0.045*** (3.25)	0.050*** (3.62)	−0.043 (−0.35)
LEVERAGE	−0.039* (−1.82)	−0.039* (−1.82)	−0.042* (−1.88)	0.060 (0.40)
CAPEX_ASSETS	−0.009 (−0.34)	−0.010 (−0.37)	−0.015 (−0.43)	−0.288 (−0.52)
ln(FIRM_AGE)	0.003 (0.83)	0.003 (0.82)	0.004 (1.12)	−0.008 (−0.14)
ln(NUM_SEGMENTS)	−0.007** (−2.54)	−0.008*** (−2.61)	−0.011** (−2.48)	−0.064 (−1.28)
TENURE_DIVERSITY	−0.003 (−0.41)	−0.003 (−0.43)	0.000 (0.03)	−0.091 (−0.73)
AGE_DIVERSITY	−0.019 (−0.45)	−0.016 (−0.37)	−0.042 (−0.73)	1.773 (1.63)
INDUS_DIVERSITY	0.052*** (4.07)	0.052*** (4.06)	0.034* (1.87)	0.098 (0.45)
FEM_DIRECTOR	0.044** (2.31)	0.044** (2.32)	0.059** (2.13)	−0.012 (−0.03)
AVG_AGE	−0.001 (−0.71)	−0.001 (−0.73)	−0.000 (−0.32)	−0.008 (−0.77)
AVG_TENURE	0.002*** (3.55)	0.002*** (3.56)	0.002** (2.18)	0.011 (1.13)
BOARD_SIZE	0.001 (0.98)	0.001 (1.14)	0.012* (1.92)	−0.039 (−0.40)
CHAIR_CEO	−0.001 (−0.36)	−0.001 (−0.35)	0.002 (0.69)	−0.020 (−0.29)
CEO_ONLY_INSIDER	−0.004 (−1.10)	−0.004 (−1.15)	−0.004 (−0.94)	−0.070 (−1.05)
BUSY_DIRECTOR	−0.036*** (−3.39)	−0.036*** (−3.38)	−0.025** (−2.25)	−0.050 (−0.33)
PERC_IND_DIRECTOR	0.019 (1.21)	0.019 (1.20)	0.031 (1.46)	−0.231 (−1.12)
Kleibergen–Paap Wald rk F-statistic			7.22	7.03
No. of obs. R^2	13,869 0.12	13,869 0.12	13,397	13,397

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insignificant in the OLS estimates presented in column 1, and the critical values of the Kleibergen–Paap Wald rk F-statistics indicate that the bias of the IV estimator relative to the OLS estimator due to weak instruments may be above 15% (but below 20%).

In column 2 and 4 of Table 6, we consider whether board ancestral diversity has nonmonotonic effects on profitability. We instrument the quadratic term of FRACTIONALIZATION using the square of the predicted value of FRACTIONALIZATION from the first stage as a second instrument, as suggested by Wooldridge (2002). Ancestral diversity has a positive linear effect on performance for low levels of diversity, and then it increases performance at decreasing rates (even though its effect never turns negative because levels of FRACTIONALIZATION above 1 are not possible by definition). As in our earlier estimates for firm-performance volatility, Table 6 suggests quantitatively larger effects of board ancestral diversity when we estimate the equation using IV.

Although the OLS estimates may be a better benchmark given that the instruments are somewhat weaker in the specifications with the quadratic term (the Kleibergen–Paap Wald rk F-statistics, however, indicate that the bias due to a weak instrument is below 10%), our findings are evocative of the hump-shaped effect of population diversity on countries' macroeconomic performance, highlighted by Ashraf and Galor (2013). This result suggests that ancestral diversity has costs and benefits. Although in macroeconomic studies it is hard to provide systematic evidence on how diversity benefits and hampers economic performance, in the discussion that follows, we can provide detailed microeconomic evidence on the mechanisms through which ancestral diversity affects corporate boards.

V. Why Does Board Ancestral Diversity Affect Firm-Performance Volatility?

A. Fractionalization and Risk Taking

This section provides evidence on the mechanisms through which board diversity leads to higher firm-performance volatility. We start by considering conventional proxies for corporate risk taking. Table 7 reports both OLS (Panel A) and IV (Panel B) estimates for the effects of FRACTIONALIZATION on several risk-taking proxies. Table 7 shows that firms with ancestrally diverse boards hold more cash than (column 1) and have similar leverage to (column 2) other firms, suggesting that they do not take more risk. These firms also have similar capital expenditures (column 3) and propensity to engage in M&As (column 4) as other firms. In addition, they are equally prone to engage in diversifying acquisitions (column 5) as other firms. Because diversifying acquisitions are often interpreted as aiming to decrease firm risk (Gormley and Matsa (2016)), this result also suggests that firms with ancestrally diverse boards do not take more risk than other firms.

Thus, according to some conventional proxies for corporate risk taking, firms with ancestrally diverse boards do not appear to take more risk. If anything, they take less risk because they hold more cash. We show that, nevertheless, the

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decision-making process and the propensity to experiment with new strategies lead these firms to have more volatile performance.

TABLE 7

Board Ancestral Diversity and Risk Taking

Table 7 relates board ancestral diversity to several corporate policies. In Panel A, we present ordinary least squares (OLS) estimates; in Panel B, we present instrumental variable (IV) estimates. The IV for FRACTIONALIZATION is ancestral diversity in the county where a firm is headquartered, and the first stage is presented in Panel D of Table 3. All variables are defined in the Appendix. All regressions include year and 2-digit Standard Industrial Classification (SIC) code industry fixed effects, whose coefficients are not reported. We report *t*-statistics in parentheses, with standard errors corrected for heteroscedasticity and clustered at the firm level in Panel A and clustered at the county level in Panel B. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. OLS Estimates

	Dependent Variable				
	CASH_ASSETS	LEVERAGE	CAPEX_ASSETS	MA	DIVERSIFYING_MA
Variable	1	2	3	4	5
FRACTIONALIZATION	0.063***	0.001	−0.003	−0.053	−0.039
	(3.49)	(0.11)	(−0.79)	(−1.02)	(−0.86)
ln(ASSETS)	−0.009***	0.003***	−0.002***	0.059***	0.043***
	(−6.58)	(3.58)	(−4.98)	(13.74)	(11.20)
ROA	−0.032***	−0.024***	0.004***	0.064***	0.025**
	(−4.72)	(−2.58)	(2.60)	(4.98)	(2.27)
ln(Q)	0.052***	−0.000	0.014***	0.067***	0.050***
	(13.91)	(−0.24)	(12.82)	(7.96)	(6.80)
LEVERAGE	−0.095***	0.838***	−0.007***	−0.076***	−0.072***
	(−9.48)	(98.00)	(−2.75)	(−3.70)	(−4.24)
CAPEX_ASSETS	−0.162***	0.054***	0.602***	−0.103*	−0.085**
	(−8.31)	(3.40)	(29.85)	(−1.80)	(−2.03)
RD_SALES	0.021***	0.005	−0.002	−0.002	−0.003
	(2.76)	(1.59)	(−1.20)	(−0.36)	(−0.89)
ln(FIRM_AGE)	−0.004*	0.001	0.001	−0.016**	−0.010*
	(−1.75)	(1.18)	(1.45)	(−2.42)	(−1.80)
ln(NUM_SEGMENTS)	−0.011***	0.003**	0.000	0.005	0.030***
	(−3.94)	(2.06)	(0.57)	(0.55)	(4.11)
TENURE_DIVERSITY	0.011**	−0.006*	−0.000	0.020	0.017
	(2.41)	(−1.73)	(−0.23)	(1.42)	(1.40)
AGE_DIVERSITY	0.022	0.045**	0.019**	−0.021	−0.112*
	(0.83)	(2.48)	(2.06)	(−0.27)	(−1.71)
INDUS_DIVERSITY	−0.030***	−0.007	0.002	−0.067***	−0.016
	(−3.15)	(−1.22)	(0.66)	(−2.84)	(−0.80)
FEM_DIRECTOR	−0.001	0.002	−0.003	−0.073*	−0.047
	(−0.06)	(0.15)	(−0.76)	(−1.72)	(−1.40)
AVG_AGE	−0.001	0.000	0.000	−0.002	−0.001
	(−1.44)	(0.44)	(1.05)	(−1.44)	(−1.20)
AVG_TENURE	−0.001*	−0.000**	−0.000	−0.000	−0.000
	(−1.83)	(−2.04)	(−0.42)	(−0.09)	(−0.18)
BOARD_SIZE	−0.003***	0.000	0.000	0.000	0.003
	(−4.42)	(0.25)	(1.34)	(0.15)	(1.61)
CHAIR_CEO	0.002	−0.002	0.000	−0.004	−0.004
	(0.63)	(−1.16)	(0.31)	(−0.57)	(−0.65)
CEO_ONLY_INSIDER	0.000	0.002	−0.000	0.007	0.010
	(0.11)	(0.99)	(−0.12)	(0.84)	(1.49)
BUSY_DIRECTOR	0.015**	0.006	−0.002	0.032*	0.004
	(2.19)	(1.47)	(−0.82)	(1.72)	(0.26)
PERC_IND_DIRECTOR	0.013	0.003	0.004	0.065**	0.026
	(1.42)	(0.38)	(1.24)	(2.19)	(1.03)
No. of obs.	18,909	17,271	17,262	19,164	19,164
R^2	0.35	0.75	0.65	0.10	0.08

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TABLE 7 (continued)
Board Ancestral Diversity and Risk Taking

Panel B. IV Estimates

	Dependent Variable				
	CASH_ASSETS	LEVERAGE	CAPEX_ASSETS	MA	DIVERSIFYING_MA
Variable	1	2	3	4	5
FRACTIONALIZATION	0.839**	−0.149	−0.115	−0.336	−0.191
	(2.23)	(−1.64)	(−0.68)	(−0.45)	(−0.30)
ln(ASSETS)	−0.009***	−0.002***	0.002***	0.060***	0.044***
	(−4.81)	(−4.95)	(3.51)	(10.46)	(8.22)
ROA	−0.032***	0.004**	−0.023***	0.063***	0.024**
	(−2.83)	(2.45)	(−2.64)	(5.83)	(2.44)
ln(Q)	0.048***	0.014***	0.001	0.067***	0.049***
	(8.49)	(9.37)	(0.27)	(6.87)	(5.59)
LEVERAGE	−0.093***	−0.008***	0.841***	−0.074***	−0.069***
	(−8.71)	(−2.58)	(79.81)	(−3.33)	(−3.50)
CAPEX_ASSETS	−0.140***	0.603***	0.045***	−0.135*	−0.100**
	(−5.78)	(27.29)	(3.03)	(−1.93)	(−2.11)
RD_SALES	0.018**	−0.001	0.006*	−0.002	−0.003
	(2.28)	(−0.85)	(1.74)	(−0.18)	(−0.63)
ln(FIRM_AGE)	−0.004	0.001*	0.002	−0.021***	−0.013**
	(−1.42)	(1.76)	(1.58)	(−3.08)	(−2.00)
ln(NUM_SEGMENTS)	−0.008**	0.000	0.002	0.004	0.030***
	(−2.29)	(0.03)	(1.26)	(0.50)	(4.09)
TENURE_DIVERSITY	0.008	0.000	−0.005	0.021	0.017
	(1.23)	(0.12)	(−1.54)	(1.51)	(1.24)
AGE_DIVERSITY	0.046	0.014	0.037*	−0.039	−0.120*
	(1.18)	(1.39)	(1.84)	(−0.51)	(−1.71)
INDUS_DIVERSITY	−0.017	−0.002	−0.010	−0.072**	−0.018
	(−1.35)	(−0.50)	(−1.52)	(−2.54)	(−0.69)
FEM_DIRECTOR	−0.017	−0.000	0.003	−0.067	−0.042
	(−0.85)	(−0.06)	(0.28)	(−1.35)	(−0.90)
AVG_AGE	−0.001	0.000	0.000	−0.002	−0.001
	(−0.99)	(0.63)	(0.33)	(−1.44)	(−1.12)
AVG_TENURE	−0.000	−0.000	−0.001**	−0.000	−0.000
	(−0.39)	(−1.44)	(−2.12)	(−0.18)	(−0.32)
BOARD_SIZE	−0.013***	0.002*	0.002	0.004	0.005
	(−2.59)	(1.74)	(0.71)	(0.42)	(0.63)
CHAIR_CEO	−0.002	0.001	−0.001	−0.005	−0.004
	(−0.52)	(0.84)	(−0.56)	(−0.66)	(−0.59)
CEO_ONLY_INSIDER	−0.000	−0.000	0.002	0.008	0.011*
	(−0.13)	(−0.38)	(0.97)	(0.94)	(1.75)
BUSY_DIRECTOR	0.009	−0.000	0.009**	0.027	0.001
	(0.98)	(−0.10)	(2.10)	(1.54)	(0.04)
PERC_IND_DIRECTOR	0.003	0.005*	0.003	0.075**	0.029
	(0.24)	(1.66)	(0.35)	(2.25)	(0.98)
Kleibergen–Paap Wald rk *F*-statistic	8.33	7.25	7.18	8.30	8.31
No. of obs.	17,919	16,555	16,563	18,163	18,163

B. Fractionalization and Frictions in Decision-Making

If board diversity is indeed associated with greater performance volatility because difficulties in aggregating the diverse preferences of board members make the decision-making process more erratic, we should observe more changes in corporate strategies as different opinions prevail in different meetings.

We consider several indicators of strategy changes. First, following Finkelstein and Hambrick (1990), we proxy for the (lack of) persistence of a firm's strategy using the sum of the (standardized) variance between t and $t+4$ of each

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of the following indicators of corporate policies: i) advertising intensity (advertising/sales), ii) R&D intensity (R&D/sales), iii) plant and equipment (P&E) newness (net P&E/gross P&E), iv) nonproduction overhead (selling, general, and administrative expenses/sales), v) inventory levels (inventories/sales), and vi) financial leverage (debt/equity). We standardize the variance of each indicator by subtracting the industry's mean of the indicator and dividing by its standard deviation. To have an indicator of strategy persistence (SP), we multiply this variable by −1.

Both the OLS and the IV estimates in columns 1 and 4 of Panel A in Table 8 indicate that firms with diverse boards have less persistent strategies, further supporting the idea that these firms have more erratic decision-making processes. Once again, the effects are economically larger when we estimate the parameters by IV: In column 4, a 1-standard-deviation increase in FRACTIONALIZATION leads to a 1.12-standard-deviation drop in strategy persistence; the effect is just 4% of a standard deviation in column 1.

The coordination problems that lead to a more cumbersome and erratic decision process may also favor experimentation and more creative solutions to the firms' problems. To start shedding light on this issue, in columns 2 and 5 of Table 8, we consider how a firm's strategy conforms to the industry's strategy in year t using a proxy proposed by Finkelstein and Hambrick (1990). We first standardize each of the indicators of corporate policies used to define strategy persistence by subtracting the industry mean and dividing by the industry standard deviation, and then we take the absolute difference between a firm's value and the average value for all firms in the same 2-digit SIC industry. We multiply the absolute differences by –1 to have an indicator of conformity.

The results indicate that firms with more ancestrally diverse boards pursue strategies that are more different from the ones of the industry peers. In column 5 of Table 8, a 1-standard-deviation increase in FRACTIONALIZATION leads to a 0.97-standard-deviation drop in conformity. Together with the evidence that they have less persistent strategies, this result suggests that firms with ancestrally diverse boards end up experimenting more. As we show in Section V.C, this benefits their innovation output.

To provide further evidence that firms with ancestrally diverse boards experiment more, we consider that when firms experience material changes in financial conditions or operations, they need to file SEC Form 8-K to inform shareholders. These filings capture companies' events, such as entry or termination of agreements, acquisitions or disposals of activities and assets, and amendments to corporate bylaws and the code of ethics, and indicate material changes in strategy. It is therefore supportive of our hypothesis, and consistent with our previous results, that firms with ancestrally diverse boards more often experience changes in financial conditions and operations and therefore more frequently file the SEC Form 8-K (columns 3 and 6 of Table 8).

Panel B of Table 8 provides further suggestive evidence that the decision-making process is more cumbersome in firms with higher board ancestral diversity. For instance, if there were problems in the decision-making process, we would expect the board of directors to have to meet more often to reach an agreement. In columns 1 and 2 of Panel B, board ancestral diversity is positively associated with the number of board meetings: A 1-standard-deviation change

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TABLE 8
Board Ancestral Diversity and the Decision-Making Process

Table 8 relates board ancestral diversity to several corporate events and outcomes, such as strategy persistence (SP) and strategy conformity (SC), number of extraordinary events requiring 8-K filings, the natural logarithm of the number of board meetings in a year, director turnover, and merger and acquisition (M&A) return volatility. We present ordinary least squares (OLS) and instrumental variable (IV) estimates for SP and SC, number of extraordinary events requiring 8-K filings, and the natural logarithm of the number of board meetings in a year. The IV for FRACTIONALIZATION is ancestral diversity in the county where a firm is headquartered, and the first stage is presented in Panel D of Table 3. All variables are defined in the Appendix. All regressions include year and 2-digit Standard Industrial Classification (SIC) code industry fixed effects, whose coefficients are not reported. We report *t*-statistics in parentheses, with standard errors corrected for heteroscedasticity and clustered at the firm level in the OLS estimates and at the county level in the IV estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Strategy Persistence and Conformity

	Dependent Variable					
	OLS			IV		
	SP	SC	8K_FILINGS	SP	SC	8K_FILINGS
Variable	1	2	3	4	5	6
FRACTIONALIZATION	−1.728**	−0.958**	0.218***	−46.239**	−26.904**	1.505*
	(−2.35)	(−2.12)	(2.59)	(−2.43)	(−2.35)	(1.65)
ln(ASSETS)	0.262***	0.129***	0.072***	0.232**	0.118**	0.073***
	(3.92)	(3.17)	(10.46)	(2.24)	(2.08)	(18.81)
ROA	2.343***	1.347***	−0.131***	2.161***	1.304***	−0.222***
	(4.38)	(5.08)	(−3.73)	(3.96)	(4.79)	(−6.18)
ln(Q)	−0.013	−0.147	−0.037**	0.484*	0.087	−0.055***
	(−0.08)	(−1.62)	(−2.52)	(1.72)	(0.64)	(−4.41)
LEVERAGE	−2.265***	−2.430***	0.176***	−2.425***	−2.542***	0.153***
	(−4.40)	(−8.70)	(4.13)	(−3.71)	(−7.50)	(5.41)
CAPEX_ASSETS	−0.057	1.103	0.308***	−1.798	0.096	0.417***
	(−0.05)	(1.25)	(3.01)	(−0.96)	(0.08)	(4.73)
RD_SALES	−2.813***	−2.287***	0.027*	−3.159***	−2.453***	0.011
	(−3.11)	(−5.21)	(1.81)	(−3.21)	(−5.79)	(0.73)
ln(FIRM_AGE)	0.064	0.142**	0.006	0.071	0.092	0.014*
	(0.62)	(2.24)	(0.52)	(0.42)	(0.94)	(1.80)
ln(NUM_SEGMENTS)	−0.001	−0.073	0.030*	−0.072	−0.150	0.029***
	(−0.01)	(−0.89)	(1.85)	(−0.36)	(−1.27)	(3.16)
TENURE_DIVERSITY	0.116	0.002	0.023	0.340	0.167	−0.007
	(0.58)	(0.01)	(1.00)	(1.02)	(0.83)	(−0.40)
AGE_DIVERSITY	−2.133*	−1.272	0.021	−3.662	−2.169	0.096
	(−1.69)	(−1.53)	(0.14)	(−1.57)	(−1.63)	(0.73)
INDUS_DIVERSITY	0.638*	−0.248	−0.080**	−0.234	−0.669**	−0.069**
	(1.65)	(−1.21)	(−2.05)	(−0.36)	(−2.02)	(−2.20)
FEM_DIRECTOR	0.349	−0.547	−0.019	0.748	−0.323	−0.032
	(0.52)	(−1.33)	(−0.27)	(0.68)	(−0.54)	(−0.66)
AVG_AGE	0.002	−0.002	0.003*	0.017	0.006	0.003**
	(0.09)	(−0.20)	(1.87)	(0.54)	(0.37)	(2.02)
AVG_TENURE	0.045**	0.014	−0.013***	0.004	−0.004	−0.012***
	(2.25)	(1.18)	(−5.69)	(0.11)	(−0.18)	(−7.03)
BOARD_SIZE	0.082**	0.051***	−0.005	0.676***	0.399**	−0.020*
	(2.49)	(2.62)	(−1.26)	(2.58)	(2.55)	(−1.77)
CHAIR_CEO	−0.087	−0.027	−0.008	0.020	0.053	−0.014
	(−0.71)	(−0.39)	(−0.65)	(0.11)	(0.50)	(−1.50)
CEO_ONLY_INSIDER	−0.127	0.080	−0.006	−0.045	0.112	−0.012
	(−1.09)	(1.19)	(−0.46)	(−0.23)	(1.08)	(−1.20)
BUSY_DIRECTOR	−0.450	0.053	0.092***	0.018	0.291	0.092***
	(−1.42)	(0.34)	(2.74)	(0.04)	(1.13)	(3.88)
PERC_IND_DIRECTOR	−0.076	0.397*	−0.003	0.274	0.663*	0.006
	(−0.19)	(1.69)	(−0.07)	(0.43)	(1.85)	(0.15)
Kleibergen–Paap Wald rk *F*-statistic				6.83	9.26	9.97
No. of obs.	9,877	14,486	17,869	9,418	13,583	15,582
R^2	0.15	0.19	0.52			

(continued on next page)

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TABLE 8 (continued)
Board Ancestral Diversity and the Decision-Making Process

Panel B. Other Mechanisms

	Dependent Variable				
	OLS	IV	OLS		
Variable	BOARD_MEETINGS	BOARD_MEETINGS	DIRECTOR_TURN	DIRECTOR_TURN	MA_RET_VOL
	1	2	3	4	5
FRACTIONALIZATION	0.092*	2.723***	0.224***	0.136	0.015*
	(1.92)	(2.92)	(3.30)	(1.27)	(1.78)
FRACTIONALIZATION × ROA				0.459	
				(0.88)	
ln(ASSETS)	0.031***	0.031***	0.018***	0.048***	−0.006***
	(9.59)	(7.88)	(3.89)	(3.43)	(−9.54)
ROA	−0.270***	−0.278***	0.024	−0.336	−0.028***
	(−5.85)	(−5.52)	(0.67)	(−0.89)	(−3.59)
ln(Q)	−0.064***	−0.086***	−0.005	0.003	−0.004**
	(−6.72)	(−6.04)	(−0.41)	(0.17)	(−2.45)
LEVERAGE	0.131***	0.187***	−0.030	0.013	−0.004
	(5.16)	(5.26)	(−0.92)	(0.28)	(−0.92)
CAPEX_ASSETS	−0.056	0.023	0.096	−0.058	0.030**
	(−0.83)	(0.24)	(1.17)	(−0.65)	(2.42)
RD_SALES	0.039*	0.037	−0.006	0.027	−0.010
	(1.76)	(1.56)	(−0.31)	(1.29)	(−1.58)
ln(FIRM_AGE)	0.031***	0.038***	0.016*	−0.240***	−0.002*
	(5.08)	(5.10)	(1.88)	(−6.91)	(−1.95)
ln(NUM_SEGMENTS)	0.011	0.018**	0.030***	0.011	−0.005***
	(1.58)	(2.00)	(3.20)	(0.68)	(−3.87)
TENURE_DIVERSITY	0.029*	0.031*	0.033*	−0.065***	0.002
	(1.87)	(1.77)	(1.75)	(−2.61)	(1.01)
AGE_DIVERSITY	0.072	0.137	0.304**	1.008***	0.020
	(0.75)	(1.22)	(2.40)	(6.18)	(1.08)
INDUS_DIVERSITY	−0.093***	−0.023	0.032	−0.076*	−0.000
	(−3.84)	(−0.61)	(0.92)	(−1.75)	(−0.04)
FEM_DIRECTOR	−0.025	−0.054	0.108*	0.036	0.004
	(−0.66)	(−1.18)	(1.83)	(0.44)	(0.52)
AVG_AGE	0.004***	0.005***	0.006***	0.015***	−0.000
	(3.63)	(4.01)	(3.61)	(5.13)	(−0.52)
AVG_TENURE	−0.016***	−0.015***	−0.003*	0.016***	0.000
	(−13.58)	(−10.11)	(−1.87)	(5.20)	(0.62)
BOARD_SIZE	−0.006***	−0.041***	0.032***	0.044***	−0.001***
	(−2.90)	(−3.45)	(11.59)	(10.88)	(−3.20)
CHAIR_CEO	−0.070***	−0.081***	−0.008	0.024**	0.000
	(−9.51)	(−8.40)	(−0.74)	(2.01)	(0.00)
CEO_ONLY_INSIDER	0.023***	0.016	−0.014	−0.024*	−0.000
	(2.73)	(1.60)	(−1.31)	(−1.95)	(−0.15)
BUSY_DIRECTOR	−0.004	−0.045*	0.014	0.032	0.004
	(−0.19)	(−1.72)	(0.52)	(0.98)	(1.26)
PERC_IND_DIRECTOR	0.099***	0.069*	0.059	−0.014	0.000
	(2.74)	(1.65)	(1.49)	(−0.26)	(0.01)
DEAL_SIZE					0.006***
					(14.15)
STOCK_MA					0.003**
					(2.14)
Kleibergen–Paap Wald rk *F*-statistic		6.28			
No. of obs.	9,840	9,520	16,505	16,505	3,655
R^2	0.15		0.21	0.44	0.17

in FRACTIONALIZATION explains approximately 2% of the standard deviation of board meetings in the OLS estimates in column 1, notwithstanding that we control for a number of firm characteristics aiming to capture complexity

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in the decisions that directors have to take. A 1-standard-deviation change in FRACTIONALIZATION explains approximately half of the standard deviation of the number of board meetings in the IV estimates.

Difficulties in reaching decisions and the fact that some members may manipulate the outcomes of decisions when individual preferences cannot be easily aggregated should increase disagreement between board members. This in turn may lead to higher board turnover in ancestrally diverse boards. This is precisely what we find in columns 3 and 4 of Panel B in Table 8, where we estimate a linear probability model to have a more direct interpretation of the interaction terms. A marginal increase in board ancestral diversity increases director turnover by almost 20%. This effect, however, is no longer statistically significant at conventional levels when we include an interaction between FRACTIONALIZATION and firm profitability (return on assets (ROA)). The latter interaction is also not significant, indicating that director turnover is unrelated to performance. If anything, director turnover is affected by idiosyncratic factors related to an erratic decision-making process.[11]

Column 5 of Table 8 provides direct evidence on the volatility of ancestrally diverse boards' decisions. The absolute value of the announcement returns of M&As is larger in firms with ancestrally diverse boards. There is no evidence that the mean announcement returns are higher, indicating that firms with diverse boards announce both good and bad M&As more frequently. This result is fully consistent with our earlier findings on firm-performance volatility.

Our maintained hypothesis is that board ancestral diversity makes firms' decisions more erratic and unpredictable and thus increases firm-performance volatility. Higher fundamental volatility in firms with ancestrally diverse boards should imply that analysts find it more difficult to forecast firm performance (Dichev and Tang (2009)).

This is precisely what we find in Table 9. Mean (median) earnings-forecast errors are larger for firms with ancestrally diverse boards in both the OLS and the IV estimates. Importantly, in column 3, we find no evidence that the standard deviation of analysts' forecast errors is larger when board ancestral diversity increases. This indicates that our results on forecast errors are not driven by the fact that analysts disagree on the prospects of firms with ancestrally diverse boards. Rather, it appears that analysts make larger forecast errors because these firms make less predictable decisions.[12]

The conjecture that firms with ancestrally diverse boards surprise their shareholders to a larger extent than other firms is also supported by the earnings-announcement returns, which are consistently higher in absolute value for firms with higher FRACTIONALIZATION (column 4 of Table 9).

Overall, these findings suggest that due to frequent strategy changes and experimentation, firms with ancestrally diverse boards surprise market participants more frequently and to a larger extent.

[11] We do not provide IV estimates for turnover because the instruments are too weak to account for the interaction term. Also, the sample for the M&A returns is too small to allow for IV estimates; the event-study methodology mitigates endogeneity concerns in this setting.

[12] In unreported results, we also find no evidence that analysts exhibit systematic upward or downward biases.

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TABLE 9

Board Ancestral Diversity, Analyst Forecasts, and Earnings Announcements

In columns 1–3 of Table 9, we relate analyst forecasts to our main proxy for board ancestral diversity, FRACTIONALIZATION. The dependent variables are the median (AFE_MEDIAN), mean (AFE_MEAN), and standard deviation (STD_AFE) of analysts' earnings-forecast errors, computed using the quarterly number of observations. In column 4, the dependent variable is the absolute value of the firm's cumulative abnormal returns on a window [−1,1] around the earnings-announcement date (EARNINGS_CAR11). Abnormal returns are computed as the difference between a firm's stock returns and the return on the value-weighted total stock market index from the Center for Research in Security Prices (CRSP). In Panel A, we present ordinary least squares (OLS) estimates; in Panel B, we present instrumental variable (IV) estimates. The IV for FRACTIONALIZATION is ancestral diversity in the county where a firm is headquartered, and the first stage is presented in Panel D of Table 3. Variable definitions are provided in the Appendix. All regressions include year and 2-digit Standard Industrial Classification (SIC) code industry fixed effects, whose coefficients are not reported. We report *t*-statistics in parentheses, with standard errors corrected for heteroscedasticity and clustered at the firm level in Panel A and at the county level in Panel B. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. OLS Estimates

	Dependent Variable			
Variable	AFE_MEDIAN 1	AFE_MEAN 2	STD_AFE 3	EARNINGS_CAR11 4
FRACTIONALIZATION	0.003** (2.15)	0.003** (2.07)	0.161 (0.57)	1.280** (2.22)
ln(ASSETS)	−0.000 (−1.35)	−0.000 (−1.29)	0.233 (1.09)	−0.532*** (−11.26)
ROA	−0.008*** (−5.62)	−0.008*** (−5.62)	−0.239** (−2.31)	−4.121*** (−5.73)
ln(Q)	−0.004*** (−14.90)	−0.004*** (−14.94)	0.105 (0.89)	0.092 (0.78)
LEVERAGE	0.004*** (5.08)	0.004*** (5.01)	−0.385 (−1.12)	0.426 (1.43)
CAPEX_ASSETS	0.008*** (3.96)	0.008*** (3.96)	−0.004 (−0.01)	2.682*** (4.16)
RD_SALES	0.001** (2.18)	0.001** (2.16)	0.083 (0.97)	−0.274 (−1.64)
ln(FIRM_AGE)	−0.000 (−1.20)	−0.000 (−1.16)	−0.173 (−1.11)	−0.362*** (−4.87)
ln(NUM_SEGMENTS)	−0.001*** (−3.38)	−0.001*** (−3.43)	0.087 (0.65)	−0.194** (−2.30)
TENURE_DIVERSITY	0.001* (1.67)	0.001 (1.60)	0.083 (0.60)	0.344** (2.31)
AGE_DIVERSITY	0.002 (0.83)	0.002 (0.88)	2.504 (1.01)	−0.462 (−0.43)
INDUS_DIVERSITY	−0.001 (−1.32)	−0.001 (−1.33)	0.200 (1.16)	−0.309 (−1.17)
FEM_DIRECTOR	−0.002 (−1.57)	−0.002 (−1.52)	−0.061 (−0.24)	0.132 (0.25)
AVG_AGE	−0.000 (−1.11)	−0.000 (−1.09)	0.012 (0.75)	−0.045*** (−3.14)
AVG_TENURE	−0.000*** (−2.71)	−0.000*** (−2.83)	0.012 (0.61)	0.000 (0.03)
BOARD_SIZE	−0.000** (−2.05)	−0.000** (−2.15)	−0.023 (−0.75)	−0.052** (−2.30)
CHAIR_CEO	0.000* (1.91)	0.000* (1.88)	0.055 (0.78)	−0.024 (−0.26)
CEO_ONLY_INSIDER	0.000 (0.16)	0.000 (0.21)	−0.079 (−0.78)	0.138 (1.51)
BUSY_DIRECTOR	0.002*** (3.19)	0.002*** (3.15)	−0.050 (−0.47)	−0.002 (−0.01)
PERC_IND_DIRECTOR	−0.001 (−1.06)	−0.001 (−1.26)	−0.176 (−0.46)	−0.232 (−0.68)
CHANGE_EPS	−0.000*** (−5.29)	−0.000*** (−5.12)	−0.002 (−0.56)	
NUM_ANALYST	−0.002*** (−8.88)	−0.002*** (−9.12)	−0.420 (−1.20)	0.274*** (3.76)
FORECAST_HORIZON	0.002*** (10.23)	0.002*** (10.30)	0.154 (1.56)	
No. of obs.	63,457	63,457	60,426	54,709
R^2	0.14	0.15	0.08	0.11

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TABLE 9 (continued)
Board Ancestral Diversity, Analyst Forecasts, and Earnings Announcements

Panel B. IV Estimates

	Dependent Variable			
Variable	AFE_MEDIAN 1	AFE_MEAN 2	STD_AFE 2	EARNINGS_CAR11 4
FRACTIONALIZATION	0.028*** (3.42)	0.027*** (3.26)	−10.173 (−1.10)	8.485* (1.94)
ln(ASSETS)	−0.000*** (−3.60)	−0.000*** (−3.44)	0.256 (1.10)	−0.518*** (−15.92)
ROA	−0.008*** (−9.35)	−0.008*** (−9.48)	−0.236** (−2.10)	−4.083*** (−6.54)
ln(Q)	−0.004*** (−27.03)	−0.004*** (−27.16)	0.168 (1.00)	0.054 (0.55)
LEVERAGE	0.004*** (9.46)	0.004*** (9.41)	−0.414 (−1.08)	0.355* (1.67)
CAPEX_ASSETS	0.008*** (7.55)	0.008*** (7.55)	−0.242 (−0.37)	2.776*** (5.21)
RD_SALES	0.001*** (3.15)	0.001*** (3.18)	0.140 (1.19)	−0.322*** (−3.13)
ln(FIRM_AGE)	−0.000* (−1.96)	−0.000* (−1.90)	−0.192 (−1.11)	−0.360*** (−7.22)
ln(NUM_SEGMENTS)	−0.001*** (−6.80)	−0.001*** (−6.93)	0.050 (0.41)	−0.181*** (−3.29)
TENURE_DIVERSITY	0.000** (2.08)	0.000** (2.01)	0.117 (0.68)	0.329*** (2.91)
AGE_DIVERSITY	0.002** (2.44)	0.002** (2.48)	2.434 (1.00)	0.270 (0.34)
INDUS_DIVERSITY	−0.000 (−0.66)	−0.000 (−0.72)	0.034 (0.26)	−0.178 (−0.82)
FEM_DIRECTOR	−0.002*** (−4.35)	−0.002*** (−4.26)	0.243 (0.68)	−0.024 (−0.07)
AVG_AGE	−0.000 (−1.13)	−0.000 (−1.13)	0.009 (0.61)	−0.042*** (−4.12)
AVG_TENURE	−0.000*** (−5.47)	−0.000*** (−5.68)	0.006 (0.33)	0.001 (0.07)
BOARD_SIZE	−0.000*** (−4.03)	−0.000*** (−3.94)	0.098 (1.12)	−0.141** (−2.52)
CHAIR_CEO	0.000* (1.85)	0.000* (1.86)	0.088 (0.92)	−0.069 (−0.99)
CEO_ONLY_INSIDER	0.000 (1.33)	0.000 (1.44)	−0.091 (−0.78)	0.181*** (2.72)
BUSY_DIRECTOR	0.001*** (4.94)	0.001*** (4.87)	0.063 (0.34)	−0.066 (−0.39)
PERC_IND_DIRECTOR	−0.002*** (−3.64)	−0.002*** (−3.87)	0.003 (0.01)	−0.408 (−1.60)
CHANGE_EPS	−0.000*** (−5.14)	−0.000*** (−5.02)	0.001 (0.12)	
NUM_ANALYST	−0.002*** (−16.42)	−0.002*** (−16.86)	−0.440 (−1.20)	0.236*** (4.08)
FORECAST_HORIZON	0.002*** (9.98)	0.002*** (10.04)	0.154 (1.53)	
Kleibergen–Paap Wald rk *F*-statistic	11.15	11.15	10.07	11.18
No. of obs.	60,709	60,709	57,873	52,202

C. Fractionalization and Innovation

Frequent strategy changes and experimentation may become an advantage in performing complex, creative tasks. In this case, objectives may be imprecisely defined and discovered through experimentation.

Radical innovation is an example of a complex task with imprecisely defined objectives. In Table 10, we measure the quantity and quality of a firm's innovation using the number of patents and the average number of yearly citations of the

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TABLE 10
Board Ancestral Diversity and Innovation

Table 10 relates the natural logarithm of 1 plus the number of patent applications of a firm in a year (columns 1 and 3) and the natural logarithm of 1 plus the number of patent citations per patent in a given year (columns 2 and 4) to our proxy for board diversity, FRACTIONALIZATION. We set the number of citations to 0 if a firm has no patents. In columns 1 and 2, we present Tobit regressions to take into account that the dependent variables are truncated at 0. In columns 3 and 4, we present instrumental variable (IV) estimates. The IV for FRACTIONALIZATION is ancestral diversity in the county where a firm is headquartered, and the first stage is presented in Panel D of Table 3. All variables are defined in the Appendix. All regressions include 2-digit Standard Industrial Classification (SIC) code industry and year fixed effects, whose coefficients are not reported. We report *t*-statistics in parentheses, with standard errors corrected for heteroscedasticity and clustered at the firm level in the OLS estimates and at the county level in the IV estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable			
	OLS		IV	
	PAT_APP	PAT_CITED	PAT_APP	PAT_CITED
Variable	1	2	3	4
FRACTIONALIZATION	0.176***	0.457***	7.994***	9.048***
	(2.89)	(5.22)	(3.93)	(3.36)
ln(ASSETS)	0.811***	1.057***	0.397***	0.445***
	(140.16)	(127.01)	(31.21)	(27.72)
ROA	0.813***	1.261***	0.393***	0.591***
	(25.89)	(28.38)	(13.95)	(15.06)
ln(Q)	−1.356***	−1.870***	−0.694***	−0.872***
	(−13.38)	(−12.97)	(−10.26)	(−9.23)
LEVERAGE	−0.890***	−1.169***	0.065	0.208
	(−3.14)	(−2.91)	(0.34)	(0.79)
CAPEX_ASSETS	0.223***	0.227***	0.052	0.014
	(9.90)	(7.24)	(1.25)	(0.22)
RD_SALES	0.378***	0.589***	0.171***	0.274***
	(16.76)	(19.24)	(3.17)	(3.27)
ln(FIRM_AGE)	0.156***	0.126***	0.058***	0.027
	(11.27)	(6.35)	(2.90)	(1.01)
ln(NUM_SEGMENTS)	−0.155***	−0.222***	−0.010	−0.022
	(−5.19)	(−5.19)	(−0.42)	(−0.69)
TENURE_DIVERSITY	0.068	0.062	−0.026	−0.012
	(1.42)	(0.90)	(−0.64)	(−0.22)
AGE_DIVERSITY	−1.770***	−2.671***	−0.666**	−1.296***
	(−6.40)	(−6.77)	(−2.48)	(−3.55)
INDUS_DIVERSITY	−0.044	−0.054	0.144*	0.128
	(−0.62)	(−0.53)	(1.79)	(1.19)
FEM_DIRECTOR	0.483**	0.526*	0.071	0.123
	(2.43)	(1.82)	(0.54)	(0.71)
AVG_AGE	−0.029***	−0.041***	−0.007**	−0.008*
	(−38.13)	(−38.01)	(−2.11)	(−1.75)
AVG_TENURE	−0.016***	−0.012**	−0.004	−0.000
	(−4.04)	(−2.25)	(−0.97)	(−0.05)
BOARD_SIZE	−0.008*	−0.020***	−0.122***	−0.144***
	(−1.79)	(−2.99)	(−4.69)	(−4.18)
CHAIR_CEO	−0.033	−0.110*	−0.062**	−0.083**
	(−0.84)	(−1.95)	(−2.46)	(−2.48)
CEO_ONLY_INSIDER	0.015	−0.000	−0.044*	−0.079**
	(0.46)	(−0.00)	(−1.74)	(−2.36)
BUSY_DIRECTOR	0.635***	1.032***	0.176***	0.299***
	(11.78)	(13.47)	(2.82)	(3.58)
PERC_IND_DIRECTOR	1.290***	1.925***	0.500***	0.782***
	(21.21)	(21.98)	(5.73)	(6.53)
Kleibergen–Paap Wald rk *F*-statistic			7.88	7.88
No. of obs.	14,746	14,746	13,936	13,936
R^2	0.30	0.28		

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firm's patents, respectively. Both the Tobit and the IV estimates show that not only do firms with diverse boards have more patents, but diverse boards are also associated with more patent citations, indicating that more original innovation takes place in companies with ancestrally diverse boards. The effects are not only statistically but also economically significant: In column 3, a 1-standard-deviation increase in FRACTIONALIZATION is associated with an increase in the number of patents equivalent to over 40% of a standard deviation. The corresponding effect for the number of citations per patent is 35% of a standard deviation. Thus, erratic decision-making and experimentation appear to lead to more significant innovations, proxied by highly cited patents. To the extent that innovation has broad applications in society, ancestral diversity may create positive externalities that further increase the positive effects on economic performance.

D. Fractionalization and Monitoring

Because ancestrally diverse boards meet more often, one may wonder whether they are better at performing their monitoring function. To explore whether this is the case, we test whether CEO and executive turnovers are more sensitive to performance as FRACTIONALIZATION increases.

In Table 11, we estimate the probability of CEO (columns 1 and 2) and executive (columns 3 and 4) turnovers using linear probability models. We find no evidence that a drop in profitability is associated with a higher probability of turnover in firms with more ancestrally diverse boards. This suggests that these boards do not monitor more.

TABLE 11

Board Ancestral Diversity and Monitoring

Table 11 relates board ancestral diversity to chief executive officer (CEO) forced turnover, executive turnover, and the natural logarithm of the CEO's total compensation. For CEO forced turnover, we use data from Eisfeldt and Kuhnen (2013). To capture forced executive turnover, we consider only turnover affecting individuals younger than age 63. Variable definitions are provided in the Appendix. All regressions include year and 2-digit Standard Industrial Classification (SIC) code industry fixed effects, whose coefficients are not reported. We present ordinary least squares (OLS) estimates. We report t-statistics in parentheses, with standard errors clustered at the firm level and corrected for heteroscedasticity. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable					
	CEO_TURN		EXEC_TURN		ln(CEO_PAY)	
Variable	1	2	3	4	5	6
FRACTIONALIZATION	0.024	0.024	0.107	0.097	0.046**	0.047**
	(0.49)	(0.49)	(1.46)	(1.25)	(1.97)	(2.01)
ln(ASSETS)	0.003	0.003	0.010**	0.010**	0.052***	0.052***
	(0.76)	(0.75)	(2.15)	(2.12)	(24.33)	(24.35)
ROA	−0.070**	−0.124	−0.335***	−0.599	0.035**	0.061
	(−2.33)	(−0.80)	(−4.06)	(−1.06)	(1.98)	(0.67)
FRACTIONALIZATION × ROA		0.078		0.366		−0.036
		(0.35)		(0.46)		(−0.30)
ln(Q)	−0.012	−0.012	−0.000	−0.000	0.049***	0.049***
	(−1.55)	(−1.57)	(−0.01)	(−0.03)	(9.39)	(9.39)
LEVERAGE	−0.031	−0.031	−0.039	−0.040	0.002	0.002
	(−1.34)	(−1.35)	(−1.13)	(−1.15)	(0.16)	(0.17)
CAPEX_ASSETS	−0.057	−0.057	−0.023	−0.024	0.007	0.007
	(−1.04)	(−1.04)	(−0.25)	(−0.27)	(0.23)	(0.23)
RD_SALES	−0.008	−0.008	−0.023*	−0.022	0.008	0.007
	(−1.32)	(−1.26)	(−1.74)	(−1.61)	(1.55)	(1.54)

(continued on next page)

TABLE 11 (continued)
Board Ancestral Diversity and Monitoring

	Dependent Variable					
	CEO_TURN		EXEC_TURN		ln(CEO_PAY)	
Variable	1	2	3	4	5	6
ln(FIRM_AGE)	0.012**	0.012**	−0.002	−0.002	0.001	0.001
	(2.14)	(2.14)	(−0.20)	(−0.20)	(0.22)	(0.22)
ln(NUM_SEGMENTS)	−0.011	−0.011	0.007	0.007	−0.001	−0.001
	(−1.42)	(−1.42)	(0.64)	(0.65)	(−0.34)	(−0.34)
TENURE_DIVERSITY	0.011	0.011	0.068***	0.068***	−0.012**	−0.012**
	(0.82)	(0.81)	(3.52)	(3.53)	(−1.99)	(−1.99)
AGE_DIVERSITY	−0.194***	−0.194***	−0.231*	−0.230*	0.036	0.036
	(−2.65)	(−2.64)	(−1.84)	(−1.83)	(0.71)	(0.71)
INDUS_DIVERSITY	0.029	0.029	−0.004	−0.003	−0.004	−0.004
	(1.12)	(1.12)	(−0.12)	(−0.10)	(−0.40)	(−0.41)
FEM_DIRECTOR	−0.011	−0.011	0.090	0.090	0.008	0.008
	(−0.23)	(−0.23)	(1.51)	(1.50)	(0.41)	(0.42)
AVG_AGE	0.002	0.002	−0.002	−0.002	0.002**	0.002**
	(1.50)	(1.51)	(−1.16)	(−1.14)	(2.39)	(2.39)
AVG_TENURE	−0.002**	−0.002**	−0.010***	−0.010***	−0.004***	−0.004***
	(−2.14)	(−2.15)	(−5.74)	(−5.74)	(−5.59)	(−5.59)
BOARD_SIZE	0.002	0.002	0.000	0.000	0.001	0.001
	(1.16)	(1.16)	(0.14)	(0.16)	(0.78)	(0.77)
CHAIR_CEO	0.008	0.008	−0.032***	−0.032***	0.007**	0.007**
	(0.91)	(0.92)	(−2.90)	(−2.87)	(2.39)	(2.38)
CEO_ONLY_INSIDER	−0.048***	−0.048***	0.013	0.013	0.014***	0.014***
	(−5.56)	(−5.55)	(1.18)	(1.18)	(4.45)	(4.46)
BUSY_DIRECTOR	0.002	0.002	0.009	0.008	0.026***	0.026***
	(0.10)	(0.09)	(0.33)	(0.31)	(3.32)	(3.32)
PERC_IND_DIRECTOR	0.029	0.029	0.031	0.031	0.021	0.021
	(1.22)	(1.22)	(0.77)	(0.76)	(1.62)	(1.62)
No. of obs.	7,319	7,319	13,272	13,272	12,743	12,743
R^2	0.02	0.02	0.07	0.07	0.47	0.47

We also consider whether CEO compensation is sensitive to performance. Higher pay–performance sensitivity is often considered an indication of good corporate governance, but it may also indicate that boards provide high-powered incentives instead of monitoring. Firms with ancestrally diverse boards, however, seem to be similar to other firms along this dimension. Interestingly, CEO total compensation is higher in firms with ancestrally diverse boards, possibly because these firms, which have more volatile performance, have to compensate the CEO for a riskier compensation profile.

Overall, this evidence suggests that ancestrally diverse boards do not perform their monitoring function differently but that they are special in the way they perform their advisory role.

VI. Conclusions

We provide evidence on the costs and benefits of board ancestral diversity. We conjecture that diversity may make the decision-making process more erratic not only because it increases communication costs but also because diverse preferences cannot be univocally aggregated. We take firm-performance volatility as an indicator of erratic decision-making and provide evidence that board diversity increases firms' idiosyncratic and fundamental volatility.

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We argue that differences in opinions, values, and perspectives are likely to encourage experimentation in firms with ancestrally diverse boards. This in turn produces the costs and benefits that we have highlighted in this article. Firms with ancestrally diverse boards appear to have more board meetings and to experience higher director turnover unrelated to performance, indicating frictions in the decision-making process.

When objectives are imprecisely defined and discovered through experimentation, however, erratic decision-making may become an advantage. Having less persistent and conforming strategies, firms with diverse boards experiment more. They thus end up innovating more and having more numerous patents that are cited more often.

Appendix. Variable Definitions and Data Sources

Board Diversity

FRACTIONALIZATION: Herfindahl-based index of the ancestral countries of origin of a firm's directors. Countries of origin are based on the directors' last names. The index varies between 1 and 0. A value of the index closer to 1 indicates that directors' ancestries are less diverse. *Source*: Ancestry.com and RiskMetrics.

FRAC_OXFORD: Herfindahl-based index of the ancestral countries of origin of a firm's directors. Countries of origin are based on the directors' last names. The index varies between 1 and 0. A value of the index closer to 1 indicates that directors' ancestries are less diverse. *Source*: Oxford Dictionary and RiskMetrics.

GENETIC_DIVERSITY: The average of the genetic diversity in the ancestral country of origin of the directors based on Ashraf and Galor (2013). This measure captures the extent of diversity in genetic material across individuals within a country. It may be interpreted as the probability that two individuals, selected at random from the relevant population, differ genetically from one another with respect to a given spectrum of traits. *Source*: Ashraf and Galor (2013), Ancestry.com, and RiskMetrics.

GENETIC_DISTANCE: A firm-level measure of the genetic distance between the members of the board obtained by averaging the genetic distances between the ancestral countries of origin of each pair of board members. Countries of origin are based on directors' last names. *Source*: Spolaore and Wacziarg (2009), (2013), Ancestry.com, and RiskMetrics.

CUL_DIFF: The Euclidean distance in the cultural values between any two pairs of directors of a company. The cultural values are based on the World Value Survey. *Source*: World Value Survey, Ancestry.com, and RiskMetrics.

CUL_DIFF_HOFSTEDE: The Euclidean distance in the cultural values between any two pairs of directors of a company. The cultural values are based on Hofstede (2001). The power distance index measures perceptions of equality in the distribution of power in a society. Uncertainty avoidance measures a society's tolerance for ambiguity. Individualism captures the degree to which a society appreciates the individual versus the group. *Source*: Hofstede (2001), Ancestry.com, and RiskMetrics.

FEM_DIRECTOR: The percentage of female directors on a firm's board. *Source*: RiskMetrics.

TENURE_DIVERSITY: The average distance of tenure of each director in a firm from the mean tenure of the other directors, scaled by the mean tenure of all directors. *Source*: RiskMetrics.

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AGE_DIVERSITY: The average distance of the age of each director in a firm from the mean age of the firm's directors, scaled by the mean age of the firm's directors. *Source*: RiskMetrics.

INDUS_DIVERSITY: The diversity in the industry experience of a firm's directors, defined as 1 – sum(square of *xk*), where *xk* is the fraction of board seats that the firm's directors hold in firms in 2-digit SIC industry *k*, and *k* is different from the industry of the current firm. The variable is scaled by the total number of board seats held by the firm's directors. *Source*: RiskMetrics.

HHI_FIN_EXPERT: Diversity in the financial expertise of the directors is defined as the Herfindahl index of financial expert directors. Financial expert directors are identified using a flag, which is available starting from 2007. *Source*: RiskMetrics.

DIRSHIP_DIVERSITY: The average distance of the number of outside directorships of each director in a firm from the mean number of outside directorships of the firm's directors, scaled by the mean number of outside directorships of the firm's directors. *Source*: Corporate Library's Board Analyst.

SCHOOL_RANK_DIVERSITY: Herfindahl index of the rank of schools attended by directors. We capture school rank using the proportion of directors who attended top 25 undergraduate programs, the proportion of directors who attended top 25 MBA programs, the proportion of directors who attended both top 25 undergraduate and top 25 MBA programs, and the proportion of directors who did not attend any top 25 programs. We obtain rankings from U.S. News and World Report 2012 rankings for U.S. universities and from the *Financial Times* for overseas universities. *Source*: BoardEx.

DEGREE_DIVERSITY: Herfindahl index of the type of degrees obtained by board members. We consider the following types of degrees: MBA degree, law degree, non-MBA/non-law graduate degrees, and undergraduate degrees. *Source*: BoardEx.

COUNTY_DIVERSITY: Ancestral diversity of the county in which a firm's headquarters are located. It is the Herfindahl index of the dispersion of ancestral origins of the population of the county. The ancestral origins of the population in the county are based on the 2000 U.S. census data, which provide information on the respondents' self-reported ancestry. *Source*: 2000 U.S. census data.

Firm Volatility

TOT_RET_VOL: The standard deviation of a firm's monthly stock returns over 12 months. *Source*: CRSP.

EPS_VOL: The natural logarithm of the standard deviation of a firm's earnings-per-share shocks over 4 quarters. Earnings-per-share shocks are defined following Irvine and Pontiff (2009). *Source*: CRSP and Compustat.

IDIO_VOL: The standard deviation of the residuals of the regression of a firm's monthly returns on the 4 Fama–French factors (including the Carhart momentum factor) over a 12-month interval. *Source*: CRSP.

Board Characteristics

BOARD_SIZE: The number of board members. Source: RiskMetrics.

PERC_IND_DIRECTOR: The percentage of independent directors in a firm. *Source*: RiskMetrics.

CHAIR_CEO: A dummy variable that takes a value of 1 if the CEO is also the chair of the board, and 0 otherwise. *Source*: RiskMetrics.

CEO_ONLY_INSIDER: A dummy variable that takes a value of 1 if the CEO is the only insider on the board, and 0 otherwise. *Source*: RiskMetrics.

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BUSY_DIRECTOR: The natural logarithm of the average number of the directors' outside directorships. *Source*: RiskMetrics.

AVG_AGE: The average age of the directors. *Source*: RiskMetrics.

AVG_TENURE: The average tenure of the directors. *Source*: RiskMetrics.

BOARD_MEETINGS: The natural logarithm of the number of board meetings. *Source*: Corporate Library's Board Analyst.

DIRECTOR_TURN: A dummy variable equal to 1 if at least one director of the firm leaves the firm in a given year, and 0 otherwise. *Source*: RiskMetrics.

Firm Characteristics

ln(ASSETS): The natural logarithm of a firm's book value of assets. *Source*: Compustat.

ln(Q): The natural logarithm of a firm's market-to-book ratio, defined as (price × shares outstanding + book value of assets – book value of equity)/book value of assets. *Source*: Compustat.

ln(NUM_SEGMENTS): The natural logarithm of a firm's number of 3-digit SIC code business segments. *Source*: Compustat.

ln(FIRM_AGE): The natural logarithm of a firm's age, defined as the number of years since the firm's initial public offering (IPO). *Source*: RiskMetrics.

RD_SALES: A firm's R&D expenditures, divided by the firm's sales. *Source*: Compustat.

CAPEX_ASSETS: A firm's ratio of capital expenditures to total assets. *Source*: Compustat.

LEVERAGE: A firm's ratio of long-term debt to total assets. *Source*: Compustat.

ROA: A firm's income before extraordinary items, divided by the firm's total assets. *Source*: Compustat.

SALES_GROWTH: A firm's growth of sales. *Source*: Compustat.

EXEC_ FRAC: Herfindahl-based index of the ancestral countries of origin of a firm's top executives. Countries of origin are based on the executives' last names. The index varies between 1 and 0. A value of the index closer to 1 indicates that executives' ancestries are less diverse. *Source*: Ancestry.com and ExecuComp.

CASH_ASSETS: A firm's cash savings divided by the book value of assets. *Source*: Compustat.

MA: A dummy variable equal to 1 if a firm is engaged in an M&A in a given year, and 0 otherwise. *Source*: Thomson Reuters SDC.

DIVERSIFYING_MA: A dummy variable equal to 1 if a firm is engaged in a diversifying acquisition in a given year, and 0 otherwise. A diversifying acquisition is defined as an M&A in which the target and acquirer do not share the same 4-digit SIC code. *Source*: Thomson Reuters SDC.

STOCK_MA: A dummy variable equal to 1 if a firm concluded an acquisition offering stocks in a given year, and 0 otherwise. *Source*: Thomson Reuters SDC.

DEAL_SIZE: The natural log of the value of the merger transaction in million dollars. *Source*: Thomson Reuters SDC.

MA_RET_VOL: The absolute value of the acquiring firm's abnormal stock market reaction on the M&A announcement date. The abnormal stock return is the firm's stock return adjusted by the return of the value-weighted total market index from CRSP. *Source*: SDC and CRSP.

8K_FILINGS: The natural logarithm of the number of 8-K filings. *Source*: SEC.

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Analytics Suites

SP: Persistence of a firm's strategy, defined using the sum of the standardized variance between t and $t+4$ of each of the following indicators of corporate policies: i) advertising intensity (advertising/sales), ii) R&D intensity (R&D/sales), iii) P&E newness (net P&E/gross P&E), iv) nonproduction overhead (selling, general, and administrative expenses/sales), v) inventory levels (inventories/sales), and vi) financial leverage (debt/equity). The variance of each variable is standardized by subtracting the mean and dividing by the standard deviation of the industry. We multiply this variable by –1 to have an indicator of strategy persistence. *Source*: Compustat.

SC: Strategy conformity. We standardize each of the indicators of corporate policies (listed in the definition of strategy persistence) by subtracting the industry mean and dividing by the industry standard deviation, and then we take the absolute difference between a firm's value and the average value for all firms in the same 2-digit SIC industry. We multiply the absolute differences by –1 to have an indicator of strategy conformity. *Source*: Compustat.

AFE_MEDIAN: Absolute value of the difference between the median analyst quarterly earnings-per-share forecast and the actual earnings per share, scaled by stock price. *Source*: IBES.

AFE_MEAN: Absolute value of the difference between the mean analyst quarterly earnings-per-share forecast and the actual earnings per share, scaled by stock price. *Source*: IBES.

STD_AFE: Standard deviation of analysts' quarterly earnings-per-share forecasts. *Source*: IBES.

NUM_ANALYST: The natural logarithm of the number of analysts covering the firm. *Source*: IBES.

FORECAST_HORIZON: The natural logarithm of the number of days between the analyst earnings-forecast date and the earnings-announcement date. *Source*: IBES.

EARNINGS_CAR11: Absolute value of the firm's cumulative abnormal stock return from 1 day before the earnings-announcement date to 1 day after the earnings-announcement date. The abnormal stock return is the firm's stock return adjusted by the return of the value-weighted total stock market index from CRSP. *Source*: IBES and CRSP.

CHANGE_EPS: The change in the earning per share from the previous quarter. *Source*: IBES.

PAT_APP: The natural logarithm of 1 plus the number of patent applications during a year. *Source*: Kogan et al. (2017).

PAT_CITED: The natural logarithm of 1 plus the number of citations of each patent granted to a firm in a year. *Source*: Kogan et al. (2017).

CEO_TURN: A dummy variable equal to 1 if there is an event of a forced CEO turnover in a given year. A forced CEO turnover is identified using data from Eisfeldt and Kuhnen (2013). *Source*: Eisfeldt and Kuhnen (2013) and ExecuComp.

EXEC_TURN: A dummy variable equal to 1 if at least one top executive of the firm who is less than 63 years old leaves the firm in a given year, and 0 otherwise. *Source*: ExecuComp.

ln(CEO_PAY) ($millions): The natural logarithm of the sum of a CEO's annual salary, bonus, restricted stock grants, payouts from long-term incentive plans, value of option grants, and other compensation. *Source*: ExecuComp.

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