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# Do Individual Directors Matter? Evidence of Director-Specific Quality

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## Abstract

We create a new measure called director-specific quality (DSQ) that captures the collection of value-relevant transferable attributes unique to a director and explains 10% of the variation in firm value. Directors with higher DSQ receive greater voter support, and investors respond more (less) favorably when they are appointed (die). Boards with higher DSQ make more value-increasing M&A deals, tie CEO compensation more closely to performance, produce more and higher quality innovation, and manage cash better. Difference-in-differences analyses exploiting director deaths confirm these effects. During the COVID-19 pandemic, firms with higher board-level DSQ also experienced relatively higher stock returns. Overall, our results suggest that directors have unique value-relevant attributes, and who firms hire matters.

Keywords: Board of Directors, Director Quality, Firm Value

JEL Classifications: G14, G30, G32, G34

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**ABSTRACT**

We create a new measure called director-specific quality (DSQ) that captures the collection of value-relevant transferable attributes unique to a director and explains 10% of the variation in firm value. Directors with higher DSQ receive greater voter support, and investors respond more (less) favorably when they are appointed (die). Boards with higher DSQ make more value-increasing M&A deals, tie CEO compensation more closely to performance, produce more and higher quality innovation, and manage cash better. Difference-in-differences analyses exploiting director deaths confirm these effects. During the COVID-19 pandemic, firms with higher board-level DSQ also experienced relatively higher stock returns. Overall, our results suggest that directors have unique value-relevant attributes, and who firms hire matters.

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# 1 Introduction

Although the law recognizes the board of directors as stewards of shareholders' interests (American Bar Association, 2009), it does not delineate the attributes associated with being an effective board member. Identifying these attributes is an important issue in corporate governance research. Prior work has focused largely on specific observable characteristics that can be easily measured, such as education, gender, financial expertise, CEO experience, and connections, and specific settings when these traits matter (e.g., Güner, Malmendier, and Tate, 2008; Goldman, Rocholl, and So, 2009; Fahlenbrach, Low, and Stulz, 2010; Wang, Xie, and Zhu, 2015). Absent from the literature is an investigation of whether individual directors possess unique characteristics that increase value, irrespective of which boards they sit on or the prevailing business conditions they face. Filling this gap is important given that practitioners frequently identify director-specific attributes that are easily transferable, such as creativity, communication skills, and integrity, as important characteristics of an effective board member (e.g., Walkling, 2010). However, addressing this gap is empirically challenging because the very nature of these attributes makes them difficult for econometricians to quantify.[1]

In this study, we overcome this limitation by using econometric techniques to develop a new measure of director-specific quality (DSQ) that captures any time-invariant, largely slow-moving, or previously learned value-relevant attributes of directors. Using our estimates of DSQ, we address three related questions: (i) How much does individual DSQ contribute to firm value, (ii) how distinct is our measure of DSQ from previously examined observable time-invariant director traits, and (iii) do boards with higher average DSQ make better decisions?

To estimate individual DSQ, we exploit the richness of the sources of variation in the structure of board and director databases. Individual directors often sit on a particular firm's board

[1] Walkling (2010) mentions 16 traits that boards are looking for in directors. He mentions the usual skills studied in prior research, such as business experience, financial expertise, and knowledge of corporate governance. Other skills are easier for board members to get a sense of but are difficult for outsiders to observe and quantify, such as good communication and interpersonal skills. Other sought-after personal attributes, such as integrity, desire to excel, ability to process concepts and ideas in a logical objective fashion, ability to think creatively and see the big picture, and willingness to question and challenge when necessary, may be observable to those with knowledge of the director but are especially difficult for econometricians to observe and quantify.

for several years, many sit on multiple boards simultaneously, and the boards that directors sit on change over time. This substantial cross-sectional and time-series variation allows us to decompose firm value into distinct components following the method in Abowd, Kramarz, and Margolis (1999) (AKM). We decompose firm value into variation attributable to (i) time-invariant firm-specific effects, (ii) time-varying firm, board, and director effects, (iii) year effects, and (iv) time-invariant director-specific effects. This last term represents the unique portable attributes of directors that contribute to firm value across all the boards they sit on and that are distinct from (i.e., after controlling for) time-varying director and firm-related aspects.

These director-specific attributes can reflect not only the usual observable traits that are time-invariant during a director's tenure, such as early life and work experiences and gender, but also difficult to quantify characteristics that are transferable across firms and over time, such as critical thinking skills, grit, creativity, interpersonal skills, work ethic, and willingness to challenge management. Importantly, this method enables us to capture all these traits in a single measure for a large sample of directors rather than requiring us to focus on collecting information on a subset of characteristics for a subset of directors. Moreover, this method captures the unique contribution of specific directors to firm value that is not contingent upon board interactions or particular settings (i.e., not context-specific). While group dynamics in the boardroom are important, we are interested in identifying how individual directors matter. In our framework, higher values of the estimated director-specific effects indicate that a director has attributes that contribute more to increasing firm value. We can therefore think of these effects as measuring individual director-specific quality.

We focus our analysis on non-executive/supervisor directors to better capture transferable director quality arising from their advising and monitoring roles and find that DSQ accounts for an economically significant fraction of the variation in firm value, as measured by Tobin's Q. After accounting for several other relevant factors, DSQ explains 10% of the total variation in firm value.[2] To account for any residual correlation between our measure of DSQ, firm value,

[2]The original AKM method decomposes the annual compensation of workers into firm- and worker-specific effects to isolate each worker's human capital. While this approach has its advantages, it is not appropriate for our purposes. Unlike employee compensation, director pay is determined more by firm policy than individual

and our outcomes of interest, we control for Tobin's Q net of the director- and firm-specific components in all our tests (e.g., Coles and Li, 2020).

While our estimates of DSQ are value-relevant, they are largely unrelated to director traits and experiences examined in prior studies. There is some evidence that female directors, directors who graduated from Ivy League schools, directors with prior managerial experience, and directors with MBA degrees have higher estimates of DSQ, but the correlations are low. Moreover, all our examined director traits collectively explain only up to 0.47% of the variation in DSQ. These results suggest that our estimates of DSQ capture meaningful variation in value-relevant director attributes that is not captured by previously studied and easily quantifiable factors and are consistent with practitioners' view that individual personal attributes are important contributors to director effectiveness.

To further validate whether our measure captures transferable individual director-specific value-relevant attributes, we examine whether DSQ is correlated with other measures of value and director performance. We first examine director election outcomes. While average support for directors is high and most directors receive at least 90% shareholder support, variation in director outcomes still reflects the market's assessment of director performance and has implications for career prospects (Iliev, Lins, Miller, and Roth, 2015; Aggarwal, Dahiya, and Prabhala, 2019). We find that high DSQ directors receive a significantly higher fraction of votes in favor of appointing them and are significantly less likely to receive a vote signaling lower confidence.

As a second validation test, we examine the relation between DSQ and shareholder reactions to announcements of director appointments.[3] We document larger cumulative abnormal returns (CARs) around the announcement of higher DSQ director appointments. Directors who also

contributions and effort. Firms often set a uniform base level of compensation for all directors and add meeting fees, committee fees, and extra pay for serving as a committee chair. Thus, heterogeneity in director pay within a firm is mostly driven by committee roles rather than a director's contribution to firm value (e.g., Farrell, Friesen, and Hersch, 2008). Consequently, we instead decompose Tobin's Q to isolate the component of director-specific quality that directly relates to firm value.

[3]Based on econometrics terminology, our DSQ measure captures both observable and unobservable director attributes. However, in our context, unobservable more broadly relates to information that is not available to the econometrician or is available but difficult to quantify. Thus, unobservable in this context does not mean that the attributes are unknown to the firm or investors or that the attributes cannot be incorporated into share prices.

improve the board's average DSQ more are met with larger returns. Similarly, we find that announcement CARs are lower when high DSQ directors die.

After these validation tests, we examine whether boards with higher average DSQ make better decisions that increase firm value. High-quality directors can facilitate better firm-level decisions by helping set and ultimately approving a firm's strategic direction, providing advice on potential acquisition targets, designing compensation packages that better align CEO incentives with shareholders' interests, and preventing managerial misuse of firm resources (e.g., Bebchuk and Fried, 2003; Coles, Daniel, and Naveen, 2014; Balsmeier, Fleming, and Manso, 2017; Field and Mkrtchyan, 2017). Thus, through their advising and monitoring roles, directors can affect (i) the quality of merger and acquisition (M&A) decisions, (ii) the design of CEO compensation packages, (iii) the quality and quantity of innovation, and (iv) cash management.

Overall, our evidence suggests that boards with higher average DSQ make better decisions. At firms with higher board-level DSQ, bidder M&A announcement CARs are significantly higher, especially for larger deals in which directors are more likely involved. CEOs at firms with higher average DSQ also receive more of their compensation in the form of stock and option awards and have more wealth that is sensitive to stock price fluctuations. Further, firms with higher board-level DSQ create more value from patenting activities, produce more total patents, and receive more citations per patent. Lastly, we capture the quality of a firm's cash management policies with its marginal value of cash (Faulkender and Wang, 2006) and find that the marginal value of a dollar of cash is higher at firms with higher board-level DSQ.

Like all studies examining the effect of directors, endogenous matching can be a concern; for example, if high-quality directors seek directorships at high-quality firms. In our setting, as long as the matching mechanism is time-invariant or driven by the time-varying observable characteristics that we include in our regressions, controlling for firm and director fixed effects and these other variables mitigates this concern. This concern remains, though, if the matching mechanism is unrelated to these factors. Prior work uses instrumental variables based on geographic variation in the supply of directors to address this and other endogeneity concerns (e.g., Knyazeva, Knyazeva, and Masulis, 2013; Bernile, Bhagwat, and Yonker, 2018). These instruments produce a weak first-stage correlation in our setting because they tend to vary little over time, and we orthogonalize DSQ to time-invariant firm-specific factors. Without a valid instrumental variable, we instead alleviate endogeneity concerns by conducting two tests.

First, similar to Fracassi and Tate (2012), we reexamine our findings using a stacked difference-in-differences approach around director deaths. We capture treatment intensity by comparing how firm outcomes change based on the DSQ of the directors who die and by how much board-level DSQ changes after the directors die. The results are consistent with our previous findings and suggest a causal effect of DSQ on outcomes. After a high DSQ director dies or after the death of a director that causes board-level DSQ to decrease more, M&A announcement returns are lower, CEO compensation is tied less to performance, innovation declines, and the marginal value of cash decreases. Second, we exploit the COVID-19 pandemic and examine whether firms with higher average DSQ perform better during a large negative economic shock. We estimate board-level DSQ using data through 2019 so that we have a true out-of-sample test. The idea is that, as of 2019, firms have optimized their board composition for normal operating conditions, but when the pandemic started, it shocked firms out of this equilibrium. To the extent that high DSQ directors have value-relevant attributes irrespective of prevailing business conditions, firms with higher pre-pandemic board-level DSQ should perform better during the pandemic. Consistent with Ding, Levine, Lin, and Xie (2021), increases in COVID-19 cases are associated with negative stock returns, but this affect is attenuated at firms with higher average DSQ.

In our last set of analyses, we test the robustness of our results by performing additional analyses beyond controlling for any residual correlation between DSQ, firm value, and our outcomes of interest and conducting validation tests of our primary measure of DSQ. Our director election voting outcome, appointment announcement CAR, and firm-level outcome results are robust to estimating DSQ using different approaches to address potential concerns associated with our primary approach, including estimating DSQ (i) using the mover dummy variables method that restricts the analysis to directors who sit on at least two different boards (Bertrand and Schoar, 2003), (ii) after replacing the firm fixed effects with CEO-firm pair fixed effects to account for CEO-firm match quality (Eisfeldt and Kuhnen, 2013), (iii) using only information up to $t$-1 to reduce concerns about look ahead biases, and (iv) using characteristic-based abnormal stock returns over a firm's fiscal year instead of Tobin's Q. Our results also hold on the subsamples of directors with multiple and single board appointments, suggesting that differences between mover and non-mover directors do not drive our findings. As a further validity check, we show that when we estimate DSQ over shorter non-overlapping windows, DSQ displays persistence over time, consistent with DSQ capturing dimensions of transferable director quality.

Our study contributes to the literature in several ways. First, we extend work on the value of boards and directors in particular, which tend to study a single attribute or a specific setting (Adams, 2017). One exception is Burt, Hrdlicka, and Harford (2020), who derive director value from stock return comovement between firms that share a director, finding that 6.5% of the variation in stock prices is attributable to directors. In our study, we create a new measure of director quality (DSQ) for *all* directors that captures *all* value-relevant individual director-specific attributes that are transferable across firms and over time. We find that DSQ is related to various measures of firm value and performance in normal times and periods of distress after including common controls from previous studies. Further, in addition to extending research on the value of directors, we document several different mechanisms through which DSQ shapes firm value. Moreover, given that DSQ is largely unexplained by easily quantifiable director characteristics, our study highlights the importance of hard to quantify attributes in the director selection process. Thus, a fruitful area for future research could be to provide an in-depth investigation of what some of these difficult to measure attributes may be, possibly through case studies and surveys. Overall, our findings suggest that director-specific attributes are important drivers of value, are related to good decision-making, and should be considered when establishing and assessing policy. Thus, our study has implications for the ongoing discussion on whether directors matter, what makes an effective board, and how boards should be structured (e.g., Boone, Field, Karpoff, and Raheja, 2007).

Second, our findings relate to work on the importance of teams, culture, and human behavior in board-level decision-making (e.g., Frijns, Dodd, and Cimerova, 2016; Adams, Akyol, and Verwijmeren, 2018; Bernile et al., 2018). As Adams (2017) notes, "As with any team, a good structure is unlikely to make a board effective if the wrong people are on the board. [Similarly], a bad structure may not make the board ineffective if it contains the right people." While we focus on documenting the value-relevancy of individual directors, we also show that firm value increases more when a director increases a board's average DSQ. Thus, our finding that boards with higher average DSQ make better decisions implies that who is on the board matters, which may be as or even more important than board structure – the focus of many governance studies.

Third, our findings speak to the surge in public policies calling for the representation of specific observable director traits. For example, while the intent of policies mandating females on the board is to improve decision-making and reduce group-think, there is debate on whether focusing on a particular trait rather than how the director contributes to the overall board is in shareholders' interests (e.g., Carter, Simkins, and Simpson, 2003; Adams and Ferreira, 2009; Ahern and Dittmar, 2012; Kuzmina and Melentyeva, 2021). Another concern is that certain traits like being from a foreign country, having banking expertise, or representing venture capital appear to add value only under specific circumstances, such as when the firm engages in cross-border M&A, needs external capital, or is early in its life cycle (Hellmann and Puri, 2002; Güner et al., 2008; Masulis, Wang, and Xie, 2012). Mandating specific traits can limit a firm's flexibility to optimize the board structure. Our results suggest that director-specific skills other than easily quantifiable traits like gender or other time-varying traits may be important in aiding firms and shareholders in selecting directors that will strike the right balance between monitoring and advising, building trust, strengthening the culture of productive discussions, and promoting good decision-making. Thus, our study also relates to work proposing non-traditional methods of inferring director quality, such as Erel, Stern, Tan, and Weisbach (2021) who show that machine learning algorithms can help identify high-quality directors.

Finally, our study contributes to work identifying individual-specific effects in corporate settings. This research mostly focuses on executives and finds that CEO-, CFO-, and other managerial-specific effects explain a significant amount of the variation in financing decisions, investment policies, compensation incentive schemes, and earnings quality (e.g., Bertrand and Schoar, 2003; Graham, Li, and Qiu, 2012; Demerjian, Lev, Lewis, and McVay, 2013; Coles and

Li, 2020). While our methods are similar, we extend the analysis of individual-specific effects to directors. Two papers examining the importance of directors are Bird, Borochin, Knopf, and Ma (2019) who find that corporate policies reflect director styles and Cavaco, Crifo, Rebérioux, and Roudaut (2017) who show that the relation between board independence and firm performance is attenuated after controlling for director fixed effects. Compared to these studies, we focus on proposing and validating a measure of director-specific quality that researchers can use to pursue questions that were previously difficult to conduct. Moreover, while most studies link specific characteristics to a particular outcome, we identify several ways in which high DSQ directors increase firm value, further highlighting that high DSQ directors add value across settings.

# 2 Data and Empirical Methodology

## 2.1 Sample selection

Our base sample starts with all outside/non-executive directors in the BoardEx database between 2000 and 2020. BoardEx contains unique director and firm identifiers that allow us to track directors across firms and over time. It also contains information on director characteristics, such as age and gender, employment backgrounds, and board-related information, such as tenure and committee memberships. We obtain firm financial statement information from Compustat, stock return information from CRSP, and institutional ownership data from Thomson Reuters' 13-F Holdings database. We obtain classified board information from Guernsey, Guo, Liu, and Serfling (2022a) and Guernsey, Sepe, and Serfling (2022b), who combine machine learning techniques, hand collection, and data from the IRRC Corporate Governance database to determine classified board status for the universe of public firms. Poison pill data is from Refinitiv's Securities Data Company (SDC) Platinum database. We also use the SDC database to obtain M&A information and the Voting Analytics database for information on director election vote outcomes. We manually merge Voting Analytics to BoardEx using CUSIPs and director name matches.

After removing observations with missing data and estimating our AKM model described in the following section, our base sample has 436,383 firm-director-year observations, corresponding to 6,463 firms and 52,851 unique directors.

### 2.2 AKM methodology

To quantify an individual director's contribution to firm value, we decompose firm value into the sum of the market value of director-specific effects, a firm-specific effect, time-varying firm, board, and director characteristics, and a systematic component that varies by year. We estimate the following decomposition using the connected group method from AKM (1999), which has been used in other finance research (e.g., Graham et al., 2012; Ewens and Rhodes-Kropf, 2015; Coles and Li, 2020):

$$\text{Ln}(TQ_{ijt}) = \theta_i + \psi_j + \omega_t + X_{jt(t-1)}\beta + Z_{ijt}\gamma + \varepsilon_{ijt}, \tag{1}$$

where $TQ_{ijt}$ is market value of assets scaled by book value of assets (i.e., Tobin's Q) at director $i$'s firm $j$ in year $t$. While we include the subscript $i$ to indicate that each director has a different observation, $TQ$ does not vary across directors at firm $j$ within the same firm-year. In this regression, we include director fixed effects ($\theta_i$), firm fixed effects ($\psi_j$), year fixed effects ($\omega_t$), several time-varying firm and board characteristics ($X_{jt(t-1)}$), and time-varying director characteristics ($Z_{ijt}$). The estimated director fixed effects ($\theta_i$) are our variables of interest and capture DSQ.

Our decomposition includes an extensive set of time-varying firm-, board-, and director-level characteristics. The goal of conditioning on these controls is to isolate the director-specific effect from other factors that could be correlated with director quality and firm value. Firm-level controls include size, leverage, profitability, institutional ownership, R&D expenditures, stock return volatility, and beta. We measure point-in-time variables like size at the beginning of the fiscal year and flow variables like profitability over the contemporaneous fiscal year. We also control for whether the firm has a classified board and an explicit poison pill. Board-level controls include the proportion of independent directors, the proportion of female directors, indicator variables for whether the CEO is the chairman of the board and if the firm has a lead-independent director, and board size. Director-level controls include the total number of boards the director has sat on, whether she sits on more than two other boards at the same time, board tenure, whether the director is independent, whether the director is at least 65 years old, whether the director has prior experience in the industry, and variables indicating committee memberships and leadership positions (chairman or lead director and member or chair of the audit, nominating, or compensation committees). The Appendix provides detailed definitions of the variables, and Table 1 presents summary statistics for the variables used in the decomposition regression. We winsorize firm characteristics, i.e., financial statement and stock return variables, and director tenure at their 1st and 99th percentiles and express dollar values in 2017 dollars.

Ultimately, we want to separately identify the director- and firm-specific effects, which require within-firm variation in director appointments or a director to sit on at least one different board. Fortunately, there are abundant sources of variation in director appointments. Director turnover is common, creating within-firm variation in appointments. Many directors also sit on multiple boards throughout their careers and can sit on more than one board simultaneously, creating time-series and cross-sectional variation within directors. One way to exploit this variation would be to use the mover dummy variable approach and restrict the sample to firms with director turnover and directors that at some point sit on multiple boards, similar to the approach used in Bertrand and Schoar (2003) to separate the manager from the firm fixed effects. However, while this approach is feasible, it reduces the number of firms and directors that can be studied. It also raises concerns about the findings' generalizability. Nevertheless, Section 5.4 shows that our results are robust to using this alternative approach and others.

In contrast, the AKM approach uses connected groups to separately identify the director- and firm-specific effects. These connected groups are formed by arbitrarily selecting a director who sits on at least two different boards over the sample period. For this director, the connected group comprises all firms that she has been a board member at, all the other directors that sit on the boards of these firms, and all other directors and firms that these "other directors" are connected to. This process is then repeated for the remaining directors until no unconnected directors are left. Then, within each connected group sample, the firm fixed effects are estimated by the least-squares dummy variables method after first demeaning all variables by director to remove the director-specific effects. Once the firm fixed effects are estimated, the director-specific effects for all directors within a connected group can be recovered through algebraic manipulation.[4] By construction, firms and directors can appear in only one group, and there is no overlap between groups. Because the excluded reference director and firm are different within each group, the fixed effects are not directly comparable across groups. We address this concern by normalizing the fixed effects by group following Cornelissen (2008). However, comparability between groups is not a large concern in our setting, as 98.7% of observations belong to the first group. Our results do not change if we conduct our analyses using only this first group.

Panel A of Table A1 in the online Appendix tabulates the number of directors sitting on more than one other public board in our sample as a non-executive director (i.e., "movers" in the AKM terminology). Out of the 57,505 unique directors in the full sample before applying post-estimation filters (52,851 unique directors after the filters), 26.3% of them sit on at least two different boards as a non-executive employee during our sample period. Of these directors, 57.1%, 21.9%, and 11.1% sit on two, three, and four boards, respectively. The remaining 9.9% sit on five or more boards. One of the main advantages of the AKM methodology is that we can distinguish between director- and firm-specific effects for "non-movers" as long as they are in a connected group. We can therefore distinguish between director- and firm-specific effects for nearly all of the directors in our sample instead of restricting our analysis to the 26.3% of directors that sit on at least two different boards.

Panel B of Table A1 shows the number of firms with directors that sit on more than one board and that can be connected to a group following the AKM method. In our sample, only 594 of the 7,057 firms cannot be connected to a group. For these firms, it is impossible to distinguish between the firm- and director-specific effects, and we therefore exclude them from our subsequent analyses. While these firms account for 8.4% of all firms in our sample, they only account for 5.0% of all director-firm-year observations.

[4] We implement the AKM (1999) estimation methodology using the Stata command felsvdvreg.

## 2.3 Estimating DSQ

Table 2 presents results examining the determinants of firm value using the AKM estimation approach and the model presented in Eq. (1). While our estimation of the Tobin's Q regression is less standard in the sense that our models include both director- and firm-specific fixed effects, which makes comparing our results to the existing literature difficult, many of the firm, board, and director traits are correlated with Tobin's Q in a way that is consistent with prior research. For example, firm value is positively related to profitability, R&D investment, and institutional ownership, while it is negatively correlated with firm size and having a poison pill provision.

Table 3 tabulates the decomposition of the variation in Tobin's Q into five components using the following variance decomposition formula:

$$R^2 = \frac{\text{cov}\left(\text{Ln}\,TQ_{ijt}, \text{Ln}\,\widehat{TQ}_{ijt}\right)}{\text{var}\left(\text{Ln}\,TQ_{ijt}\right)} = \frac{\text{cov}\left(\text{Ln}\,TQ_{ijt}, \hat{\theta}_i + \widehat{\psi}_j + \widehat{\omega}_t + X_{jt(t-1)}\widehat{\beta} + Z_{ijt}\widehat{\gamma}\right)}{\text{var}\left(\text{Ln}\,TQ_{ijt}\right)}$$

$$= \frac{\text{cov}\left(\text{Ln}\,TQ_{ijt}, \widehat{\theta}_i\right)}{\text{var}\left(\text{Ln}\,TQ_{ijt}\right)} + \frac{\text{cov}\left(\text{Ln}\,TQ_{ijt}, \hat{\psi}_j\right)}{\text{var}\left(\text{Ln}\,TQ_{ijt}\right)} + \frac{\text{cov}\left(\text{Ln}\,TQ_{ijt}, \widehat{\omega}_t\right)}{\text{var}\left(\text{Ln}\,TQ_{ijt}\right)} \quad (2)$$

$$+ \frac{\text{cov}\left(\text{Ln}\,TQ_{ijt}, X_{jt(t-1)}\hat{\beta}\right)}{\text{var}\left(\text{Ln}\,TQ_{ijt}\right)} + \frac{\text{cov}\left(\text{Ln}\,TQ_{ijt}, Z_{ijt}\hat{\gamma}\right)}{\text{var}\left(\text{Ln}\,TQ_{ijt}\right)}.$$

The largest driver of Tobin's Q is the firm-specific component ($\widehat{\psi}_j$), explaining 52.2% of the total variation and accounting for 63.9% of all explainable variation (=0.522/0.818 as 18.2% of the variation is unexplained). Time-varying firm- and board-level traits ($X_{jt(t-1)}\widehat{\beta}$) explain the next largest component of Tobin's Q, accounting for 17.4% of the total variation. Year fixed effects ($\widehat{\omega}_t$) only account for 2.5% of the total variation in Tobin's Q, while the effect of time-varying director-level traits ($Z_{ijt}\widehat{\gamma}$) is negligible, accounting for only 0.06% of the total variation. Relevant for our study is the non-trivial explanatory power of director-specific fixed effects, accounting for 9.7% of the total variation in Tobin's Q and 11.8% of all explainable variation. We use these director-specific fixed effects to capture value-relevant unique director attributes, which we can therefore interpret as a measure of transferable, including difficult to quantify, individual director quality (i.e., DSQ).

In our later tests, we use these estimated director-specific effects in two ways. For director-level tests, we define a continuous variable labeled *DSQ* equal to the estimated director fixed effects. We also allow for a nonlinear relation between our outcomes of interest and director-specific effects by grouping *DSQ* into quartiles labeled *DSQq1*-*DSQq4*. For our firm-level analyses, we average DSQ estimates across all directors on a firm's board in a given year to obtain a firm-level measure of DSQ labeled *AvgDSQ*. We also group these average director-specific effects into quartiles labeled *AvgDSQq1*-*AvgDSQq4*. We define *FSQ* equal to the estimated firm fixed effects and create quartiles for these effects labeled *FSQq1*-*FSQq4*. Importantly, following an approach similar to Coles and Li (2020), we control for Tobin's Q net of these director- and firm-specific components (*ResidTQ*) in all our tests to account for any residual correlation between our DSQ measures, firm value, and our outcomes of interest. The concern is that an outcome, such as innovation, is correlated with DSQ through other components of Tobin's Q other than the director-specific component. This concern arises from not having all possible determinants of Tobin's Q as controls in Eq. (1) or not having these determinants as controls in subsequent analyses. Controlling for *ResidTQ* helps alleviate this concern. Nevertheless, while we believe controlling for *ResidTQ* is econometrically appropriate to isolate the component of firm value attributable to transferable director-specific quality, the results are similar, if not stronger, when we exclude this control from later regressions.

Fig. 1 plots the distribution of *DSQ* and *FSQ* in Figures A and B, respectively. The table below the figure tabulates summary statistics.[5] Overall, both *DSQ* and *FSQ* are mostly normally distributed, and there is substantial variation across directors and firms. Focusing on *DSQ*, the standard deviation of 0.196 implies that directors with one standard deviation higher estimates of quality have about 19.6% higher Tobin's Q given that the estimated effects are from regressions

[5] For these figures, we trim *DSQ* and *FSQ* at their 1st and 99th percentiles for presentation purposes, but in our tests and summary statistics, we winsorize these variables instead.

on the natural logarithm of Tobin's Q. Moving from the 5th to 95th percentiles is associated with higher quality directors having about 65.7% higher firm valuations.

## 2.4 DSQ and observable characteristics

We next examine how distinct our estimates of DSQ are from observable and mostly time-invariant director characteristics that prior studies have found to be correlated with firm value. For example, investors respond favorably when a firm appoints a director with prior experience as a CEO (Fahlenbrach et al., 2010), has advanced degrees (White, Woidtke, Black, and Schweitzer, 2014), is a financial expert (DeFond, Hann, and Hu, 2005), and has political connections (Goldman et al., 2009). There is also abundant evidence that board gender diversity impacts firm performance, but the evidence is mixed on the direction of its effect (e.g., Carter et al., 2003; Adams and Ferreira, 2009; Ahern and Dittmar, 2012). Other factors that can affect or reflect value include network size (Fracassi and Tate, 2012), experience founding organizations (Li and Srinivasan, 2011), receiving recognition awards (Malmendier and Tate, 2009), and cultural origin (Bedendo, Garcia-Appendini, and Siming, 2020).

In Table 4, we examine the correlation between DSQ and several observable traits, including educational attainments, gender, and CEO and financial experience, among others. The Appendix formally defines these traits. Because estimates of DSQ are time-invariant, we restrict the sample to one observation for each of the 52,851 directors in our sample. Some of the traits we consider are completely time-invariant. Other traits, such as Ivy League school attendance and degrees attained, are time-invariant over our sample period, as these background traits were acquired when the director was younger and many years before becoming a director. A few traits, such as entrepreneurial and financial experience, are time-varying to an extent. However, most directors do not experience changes in these traits during our sample, as most of these types of experience were attained earlier in a director's career. We also consider how DSQ relates to other characteristics, such as network size and number of achievements, that vary over time and likely reflect an underlying trait like extroversion and work ethic rather than being determinants of

DSQ themselves. For all these time-varying traits, we use the most recent value for each director to make all traits time-invariant and account for the forward-looking nature of DSQ.

The first columns in Table 4 present univariate correlations between DSQ and director characteristics, and the last four columns tabulate the results from multivariate OLS regressions that include all the traits. We standardize all variables to have a standard deviation of one in the OLS regressions (both X and Y variables) so that their magnitudes are comparable to the univariate correlations. Overall, the results show that while DSQ is correlated with some of these traits in terms of statistical significance, the economic magnitudes of the correlations are very low.

The univariate results show that DSQ is most highly correlated with whether the director is wealthy, has more achievements, has a larger network, has previous management experience, has received professional awards, graduated from an Ivy League university, has a graduate degree, and is female. However, the correlation coefficients range from only 0.013 to 0.037. The results are similar for the multivariate regressions, but multicollinearity among the variables makes interpreting the significance of any single characteristic difficult. However, the main takeaway from the multivariate regressions is that all of these characteristics explain only a small fraction of the variation in DSQ. These characteristics explain 0.27% of the variation in DSQ, and this value increases to only 0.47% when we include fixed effects for a director's nationality. Overall, these results imply that our DSQ measure captures distinct value-relevant director-specific attributes that have not been examined in previous studies.

# 3 Validating the Value Relevancy of DSQ

To validate whether our DSQ measure captures director quality, we next examine whether our estimates of DSQ correlate with other measures of director performance and quality. We focus on director election voting outcomes and announcement returns around director appointments.

## 3.1 Director election outcomes

Table 5 presents results examining the relation between our estimates of DSQ and election outcomes. We manually match director election outcomes from Voting Analytics to BoardEx by director name and CUSIP between 2004 and 2020, when the Voting Analytics database is more complete. We calculate the fraction of votes in support of a director (*%Vote*) as the number of shares voted for a director scaled by the sum of votes for, against, and abstained. We also create two dummy variables indicating low shareholder support (*%Vote<90* and *%Vote<85*) that equal one if *%Vote* is less than 90% and 85%, respectively. Our regressions include an extensive set of firm-, board-, and director-level controls. Our base specifications also include two-digit SIC industry and year fixed effects, and we cluster standard errors by firm.

Overall, the results show that directors with higher estimates of DSQ have higher shareholder support on average. The positive and statistically significant coefficient on *DSQ* in column 1 of 1.266 ($t$-stat = 2.34) implies that directors with a one standard deviation higher estimate of DSQ receive 16.2 bps (=1.266×0.128)[6] more *for* votes as a fraction of all votes. In column 2, there is a monotonic relation between shareholder support and DSQ quartiles, with directors in the fourth quartile of DSQ receiving 51.7 bps ($t$-stat = 3.37) more shareholder support than those in the first quartile. This result holds after including firm fixed effects in the regression in column 3, with directors in the fourth quartile receiving 41.8 bps ($t$-stat = 3.79) more supporting votes. Even though voter support for directors tends to be high with an average *for* vote percentage of 94.5%, these estimates are economically significant compared to the interquartile range and standard deviation of director *for* votes of 471 and 823 bps, respectively.

Columns 4 and 5 further show that directors in the top quartile of DSQ are less likely to receive below 90% and 85% shareholder approval, respectively. Compared to directors in the lowest quartile of DSQ, those in the top quartile are 150 bps ($t$-stat = 2.63) less likely to receive less than 90% shareholder support, representing a 9.9% decline relative to the average rate of directors receiving low support of 15.1%. Similarly, directors in the top quartile of DSQ are 110

[6] We use the sample-specific standard deviations when calculating economic magnitudes throughout the paper.

bps ($t$-stat = 2.35) less likely to receive below 85% support, an 11.5% decline relative to the average rate of 9.6%.

## 3.2 Director appointment CARs

Table 6 presents results examining the correlation between our estimates of DSQ and abnormal stock returns around the announcement of new director appointments, which reflect shareholders' assessment of a director's contribution to firm value (Shivdasani and Yermack, 1999). We obtain appointment announcement dates from the BoardEx Announcement file by filtering on descriptions that contain "join this board", which has data between 2003 and 2020. Because BoardEx coverage of director appointment announcements decreases substantially after 2012, we supplement this data with director appointments announced in 8-K filings.[7] We obtain a cleaner set of appointment announcements by removing observations accompanied by other major news events in the five-day window around the director appointment. We obtain news events from Ravenpack News Analytics and exclude director appointments with the following types of news events: (i) dividends, (ii) earnings, (iii) conference calls and major-shareholder disclosures, (iv) mergers and acquisitions, and (v) equity actions that involve buybacks, reorganizations, private placements, spin-offs, and stock-splits. We estimate five-day CARs around the announcement of director appointments, $CAR$[-2,+2], using the market model based on CRSP value-weighted returns and parameters estimated over the [-210,-11] trading days before the announcement. Our regressions include an extensive set of firm- and board-level controls. Our base specifications also include two-digit SIC industry and year fixed effects, and we cluster standard errors by firm.

Overall, the results in Table 6 show that appointing higher DSQ directors is associated with higher announcement CARs. The positive coefficient of 1.647 ($t$-stat = 4.31) on $DSQ$ in column 1 implies that directors with a one standard deviation higher estimate of DSQ are met with 28.7 bps (=1.647×0.174) higher announcement CARs. In column 2, there is a monotonic relation

[7]We obtain 8-K filings related to director appointments and match them to BoardEx in three steps. (i) We use WRDS SEC Analytics Suite to obtain all SEC links for 8-K filings of Item 5.02(d), which disclose the name and announcement date of a new director. (ii) We use textual analysis to parse director names and announcement dates. When an announcement date is missing, we use the report date of the filing as the announcement date. (iii) We match the director's name and company to the BoardEx database.

between announcement CARs and DSQ quartiles, with the second through fourth quartiles being statistically different from the first quartile ($t$-stats of 2.02, 3.65, and 4.92, respectively). Compared to the first quartile, directors in the fourth quartile are met with 80.3 bps higher CARs. Compared to the average and standard deviation of announcement CARs of 27.1 bps and 646 bps, respectively, these estimates are economically significant. Column 3 repeats the analysis in column 2 but includes firm fixed effects in the regression. The results remain significant, with the top quartile of DSQ receiving 69.9 ($t$-stat = 3.18) bps higher CARs.

In our sample, 10.3% of firms announce more than one director appointment on the same day, with 8.1%, 1.5%, and 0.6% announcing two, three, and four or more directors on the same day. In columns 1-3, we treat each appointment as separate observations even though each appointment shares the same announcement CAR. In column 4, we collapse the data to one observation per day for each firm by averaging *DSQ* across all directors appointed on the same day. As further robustness column 5 excludes all observations when there are multiple appointments. In these robustness tests, we focus on the model specification from column 2 that uses *DSQ* quartiles and includes year and industry fixed effects. In both columns, we continue to find a monotonic relation between *DSQ* quartiles and announcement CARs.

While the results in Table 6 show a positive relation between appointment CARs and DSQ, how much a director improves or worsens overall board quality may also matter. For example, adding a mid-level quality director who raises the average board-level quality might be more valuable to shareholders than adding a high-quality director to a board that is already composed of very high-quality directors. The same applies to low-quality directors. We test this conjecture by calculating how much a director contributes to average board-level quality by defining $\Delta DSQ$ as the difference between *AvgDSQ* after the director is appointed and *AvgDSQ* before the director is appointed. We also group this variable into quartiles ($\Delta DSQq1$-$\Delta DSQq4$).

Table 7 repeats the Table 6 analyses but uses the contribution of director quality ($\Delta DSQ$) as the variable of interest. The results show that directors who increase average board-level DSQ more receive higher announcement CARs. The results in column 1 show that the coefficient on $\Delta DSQ$ is statistically significant ($t$-stat = 2.92). Column 2, which groups $\Delta DSQ$ into quartiles, also shows that the third and fourth quartiles are significantly different from the first quartile ($t$-stats = 3.23 and 3.88, respectively). The results suggest that moving from the first to fourth quartile of DSQ contribution is associated with 64 bps higher CARs. The results remain significant after adding firm fixed effects in column 3. Columns 4 and 5 show that the results continue to hold after collapsing the data to one observation per day for each firm when there are multiple appointments on the same day and excluding these observations, respectively.

A concern with inferring director value from director appointment announcements is that these appointments are not exogenous. The announcement CARs reflect investors' assessment of the director-specific contribution to value and also the selection/matching of the director to the firm. Therefore, in column 6 in Tables 6 and 7, we examine the relation between estimates of DSQ and CARs around the announcement of director deaths. Because the BoardEx Announcements file appears to have stopped collecting announcements of deaths after 2012, we obtain the dates of director deaths from the BoardEx Profiles file that records a director's date of death. We verify that the director death dates match the announcement dates for the earlier years, and we make sure directors were sitting on their firm's board when they died. Like the previous analysis, we remove observations accompanied by other major news announcements. We continue to cluster standard errors by firm and include the same controls and fixed effects as the announcement return analysis. However, we further include several firm-director position characteristics for this analysis, such as tenure, independence, and committee memberships, among others.

In column 6 of Table 6, we examine the relation between director death announcement CARs and DSQ, while column 6 in Table 7 examines the relation between these CARs and how much average board-level DSQ changes after the director is no longer on the board. Consistent with our director appointment CAR results, Table 6 shows that announcement CARs are more negative when high DSQ directors die. The estimates indicate that compared to the first quartile of DSQ, CARs are 126 bps ($t$-stat = 2.14) lower when directors in the fourth quartile die. This effect is economically significant compared to the average and standard deviation of announcement CARs of -9.38 and 522 bps, respectively. Similarly, Table 7 shows that when directors die and the average board-level DSQ increases (decreases) more, announcement CARs are even more positive (negative). For example, the estimates imply that compared to the first quartile of average board-level DSQ changes, i.e., director contribution, announcement CARs are 128 bps ($t$-stat = 2.17) higher when the change in board-level DSQ is in the top quartile.

# 4 Board-Level DSQ and Firm Outcomes

Next, we examine whether boards with higher average DSQ make better decisions that increase firm value. We focus on the quality of M&A deals, CEO equity-based compensation, innovation, and cash management. In all of these tests, we use the board-level variable, *AvgDSQ*, to capture the average DSQ of the board.

## 4.1 DSQ and M&A quality

M&A decisions are one of the most important corporate decisions involving managers and directors. Directors can play a significant role in M&A outcomes. Reputation, prestige, and compensation tied to firm size give managers ample incentives to use M&A as a tool to rapidly increase the size and scope of their firm, even if the deals destroy shareholder value in the process. Through their monitoring role, directors can act as gatekeepers that prevent managers from engaging in value-destroying M&A (e.g., Masulis and Zhang, 2019). High-quality directors can also improve M&A outcomes by helping managers identify potential targets that will contribute to the firm's strategic mission, assess the risks and opportunities of specific deals, and provide guidance on post-M&A integration (e.g., Cai and Sevilir, 2012; Field and Mkrtchyan, 2017). Like prior work, we use acquirer CARs around the announcement of an M&A deal to measure investors' assessment of the deal's quality.

Table 8 presents results examining the relation between board-level average DSQ and acquirer CARs around M&A announcements. We obtain deal announcements of U.S. targets from the SDC database and apply standard filters to clean the transactions following Masulis, Wang, and Xie (2007). To be included in the sample, deals must satisfy the following criteria: (i) the acquirer owns less than 50% of the target before the deal and owns 100% of the target after the deal, (ii) the deal value is at least $1 million, (iii) the deal amount scaled by the acquirer's market value of equity on the 11th trading day before the deal announcement is at least 1%, (iv) the deal form is "Merger", "Acq. of Assets", or "Acq. Maj. Int.", and (v) the deal is eventually completed. We calculate five-day CARs using the market model based on CRSP value-weighted returns and parameters estimated over the [-210,-11] trading days relative to the deal announcement. Our regressions include an extensive set of firm- and board-level controls. We also include several deal-level controls, including whether the target is private or public, the payment method, and the deal's relative size to the acquirer, among others. Our base specifications also include two-digit SIC industry and year fixed effects, and we cluster standard errors by firm.

Overall, the results in Table 8 indicate that boards with higher average DSQ make better M&A deals. The coefficient of 2.209 on *AvgDSQ* ($t$-stat = 2.16) in column 1 implies that boards with a one standard deviation higher board-level DSQ have 24.1 bps (=2.209×0.109) higher announcement CARs. Column 2 shows a monotonic relation between M&A CARs and board-level DSQ across the quartiles. Compared to boards in the first quartile of average DSQ, boards in the fourth quartile have 74.9 bps ($t$-stat = 2.78) higher announcement CARs. Adding firm fixed effects as controls in column 3 strengthens these findings. With firm fixed effects, moving from the lowest to the top quartile of board-level DSQ results in 184 bps ($t$-stat = 3.45) higher CARs. All these effects are economically significant when compared to the average and standard deviation of M&A announcement CARs of 101 bps and 742 bps, respectively.

Columns 4 and 5 repeat the analyses in columns 2 and 3 but further restrict the deals to those where the deal value is at least 5% of the bidder's market value of equity. We impose this restriction to focus our analysis on more prominent deals in which board members are more likely to be involved. The results continue to show that boards with higher average DSQ have better M&A outcomes. Compared to boards in the first quartile of average DSQ, those in the fourth quartile have 105 bps ($t$-stat = 2.90) higher CARs, and this value increases to 233 bps ($t$-stat = 2.83) when firm fixed effects are included in the regression.

## 4.2 DSQ and equity-based compensation

An effective board of directors is assumed to design a compensation plan that incentivizes the CEO to maximize shareholder value (Bebchuk and Fried, 2003). The compensation scheme that reduces the agency problem and aligns a CEO's incentives with shareholder interests involves providing the CEO with more equity-based compensation that ties the CEO's compensation more closely to firm performance. Consistent with this view, firms with stronger monitoring oversight and better governance structures, such as those with more independent directors and institutional ownership (Hartzell and Starks, 2003; Coles et al., 2014), award more pay-performance sensitive compensation to CEOs. Thus, if higher average board-level DSQ reflects better governance, then high DSQ boards should award CEOs more performance-sensitive compensation.

In Table 9, we examine the relation between board-level DSQ and CEO equity-based compensation. For this analysis, we obtain data on CEO compensation from Execucomp. In columns 1-4, we focus on the *Delta* of CEO wealth, which measures how much a CEO's wealth changes in dollars for a 1% change in stock price. We calculate *Delta* based on the CEO's entire portfolio of stocks and options following Core and Guay (2002) and Coles, Daniel, and Naveen (2006). In columns 5-8, we measure equity-based compensation as the fraction of a CEO's total compensation in the form of option and stock awards (*%Equity*). Our regressions include an extensive set of firm- and board-level controls and also control for CEO age and tenure. Our base specifications also include two-digit SIC industry and year fixed effects, and we cluster standard errors by firm.

Overall, the results in Table 9 show that boards with higher average DSQ tie CEO compensation more closely to firm performance. The coefficients of 1.997 and 0.149 on *AvgDSQ* ($t$-stats = 11.05 and 4.15) in columns 1 and 5 imply that CEOs of firms where the board has a one standard deviation higher average DSQ have wealth that is 19.9% [=exp(1.997×0.091)-1] more sensitive to changes in stock price and receive 136 bps (=0.149×0.091) more total compensation tied to equity. This larger fraction in equity compensation is an increase of 2.57% (=0.0136/0.530) and 4.01% (=0.0136/0.339) relative to the mean and standard deviation, respectively. Columns 2 and 6 show a monotonic relation between both measures of equity-based compensation and board-level DSQ across the quartiles. Compared to boards in the first quartile of average DSQ, CEOs with boards in the fourth quartile have 52.2% ($t$-stat = 9.83) [=exp(0.420)-1] higher delta and 6.23% ($t$-stat = 3.84) (=0.033/0.530) more total compensation tied to equity. Columns 3 and 7 show that these results are robust to controlling for firm fixed effects. Finally, in columns 4 and 8, we separately calculate average DSQ for directors on the compensation committee (*CompDSQ*) and all other directors (*XCompDSQ*). While there is a statistically significant and monotonic effect of average DSQ for both the compensation committee and all other directors, the fraction of pay from equity awards, which is determined by the current compensation committee, is only higher at firms with higher average compensation committee DSQ.

## 4.3 DSQ and innovation

Innovation is critical to a firm's ability to compete and succeed in the long run. While directors are not involved in the day-to-day operational decisions of the firm, they can still have a substantial impact on innovation. Directors can affect innovation through their monitoring function or contributing to a culture that is conducive to open dialogue, creativity, and long-term vision. Innovation, such as that resulting in patentable products or processes, often results from substantial investments in R&D. Due to the option-like payoff structure of R&D, namely highly uncertain outcomes characterized by enormous returns or complete failure, it is considered a risky form of investment. As such, risk-averse managers have incentives to underinvest in innovation than what risk-neutral shareholders would find optimal. By designing appropriate incentive schemes and offering a reasonable tolerance for failure, boards can better align the interests of shareholders and managers (e.g., Manso, 2011; Balsmeier et al., 2017). Directors can also shape a firm's innovation strategy by setting the firm's long-run strategic direction; helping identify, evaluate, and exploit R&D opportunities; providing better oversight of management's R&D spending; facilitating knowledge diffusion; and being a conduit to outside markets (e.g., Engelberg, Gao, and Parsons, 2012; Faleye, Hoitash, and Hoitash, 2018; Chang and Wu, 2021). To the extent that high DSQ directors are better advisors, monitors, or have value-relevant attributes that are conducive to innovation, firms with higher average board-level DSQ should produce more and higher quality innovations.

In Table 10, we examine the relation between average board-level DSQ and innovation. Our analyses focus on innovation output, measured by patenting activity. In addition to patent and citation count measures of innovation used in prior studies, we use a measure of the private, economic value of patenting activity developed in Kogan, Papanikolaou, Seru, and Stoffman (2017). This measure combines patent and stock market data to estimate the value of patents. In general, this measure captures the value of patents using cumulative abnormal returns around the announcement that a patent has been granted. We calculate the total value of patenting activity for a firm by summing up the market value of each patent granted during a firm's fiscal year and thus capture the quantity and quality of innovation output.[8] Because a substantial fraction of firms never engage in patenting activity, we restrict our sample to firms with at least one patent granted during our sample period. We also end our sample in 2017 to address concerns of a truncation bias in later years due to patents taking an average of about two years to be granted. Our regressions include an extensive set of firm- and board-level controls. Our base specifications also include two-digit SIC industry and year fixed effects, and we cluster standard errors by firm.

Overall, the results in Table 10 show innovation output is highly correlated with average board-level DSQ. In columns 1-3, the dependent variable is one plus the natural logarithm of the value of patents filed in a year. The coefficient of 1.829 on *AvgDSQ* ($t$-stat = 8.09) in column 1 implies that boards with a one standard deviation higher average DSQ produce 25.2% more market value from innovation.[9] Column 2 shows that compared to boards in the first quartile of average DSQ, those in the fourth quartile produce 39.1% ($t$-stat = 4.46) more value in innovation. The results continue to hold in column 3 after including firm fixed effects, with firms in the top quartile producing 43.8% ($t$-stat = 6.21) more value in innovation than those in the first quartile.

[8] While announcement returns are calculated around the date when a patent is granted, the value of these patents is assigned to the patent's filing date.

[9] To calculate the economic magnitudes of the effect of DSQ on innovation, we take the anti-log of the coefficient estimates after multiplying them by the appropriate unit, such as a one standard deviation change in *AvgDSQ* [e.g., 0.252 = exp(1.829×0.123)-1].

Column 4 shows similar results when we replace the dependent variable with the natural logarithm of one plus the number of patents, with boards in the top quartile producing 16.5% ($t$-stat = 2.94) more patents than those in the bottom quartile. As an alternative measure of patent quality, column 5 focuses on the intensive margin of innovation and replaces the dependent variable with the number of citations per patent in a year. The results show that boards in the top quartile of average DSQ produce patents that each generate an additional 1.111 citations ($t$-stat = 2.66), representing an increase of 15.7% compared to the average number of citations per patent of 7.06. Lastly, column 6 uses the original dependent variable of one plus the market value of patents in a year, but we do not restrict the sample to firms that eventually patent during our sample period. The results continue to hold for this expanded sample, with boards in the top quartile producing 17.7% ($t$-stat = 3.73) more in innovation based on market values.

## 4.4 DSQ and value of cash

Managers tend to build up cash reserves so that they can take advantage of M&A, investment, and other growth opportunities when they arise. However, agency problems involving cash holdings are large, as liquid assets provide managers with the most discretion with how they can be used. Consequently, managers have incentives to use cash reserves to grow their firm beyond its optimal size or invest in projects that provide personal benefits at the expense of shareholders (e.g., Jensen, 1986). To evaluate whether directors are able to discipline managers and ensure that cash reserves are used to benefit shareholders, we focus on how board-level average DSQ affects the firm's marginal value of cash. The marginal value of cash represents investors' assessment of how much an additional dollar of cash holdings will increase shareholder value. Higher estimates indicate that investors believe that managers will use the cash to pursue investments that benefit shareholders, and prior work has shown that well-governed firms have higher marginal values of cash (e.g., Dittmar and Mahrt-Smith, 2007; Masulis, Wang, and Xie, 2009).

Table 11 examines the relation between average board-level DSQ and the marginal value of cash following Faulkender and Wang (2006) by estimating variations of the following regression:

$$r_{jt} - R^B_{jt} = \gamma + \gamma_1 \frac{\Delta C_{jt}}{M_{jt-1}} + \gamma_2 \frac{\Delta E_{jt}}{M_{jt-1}} + \gamma_3 \frac{\Delta NA_{jt}}{M_{jt-1}} + \gamma_4 \frac{\Delta RD_{jt}}{M_{jt-1}} + \gamma_5 \frac{\Delta I_{jt}}{M_{jt-1}}$$
$$+ \gamma_6 \frac{\Delta D_{jt}}{M_{jt-1}} + \gamma_7 \frac{C_{jt-1}}{M_{jt-1}} + \gamma_8 L_{jt} + \gamma_9 \frac{NF_{jt}}{M_{jt-1}} + \gamma_{10} \frac{\Delta C_{jt}}{M_{jt-1}} \times \frac{C_{jt-1}}{M_{jt-1}} \tag{3}$$
$$+ \gamma_{11} \frac{\Delta C_{jt}}{M_{jt-1}} \times L_{jt} + \gamma_{12} AvgDSQ_{jt} + \gamma_{13} \frac{\Delta C_{jt}}{M_{jt-1}} \times AvgDSQ_{jt} + \varepsilon_{jt},$$

where $r_{jt} - R^B_{jt}$ is firm $j$'s excess stock return over its fiscal year $t$, $r_{jt}$ is the raw buy-and-hold return of the stock, and $R^B_{jt}$ is the buy-and-hold return on a value-weighted size and book-to-market matched portfolio. $\Delta X_{it}$ indicates that the variable $X$ is measured in changes from fiscal year $t$-1 to $t$. The other variables included from Faulkender and Wang (2006) include: cash holdings ($C$), earnings ($E$), book assets minus cash ($NA$), R&D expenditures ($RD$), interest expense ($I$), total dividends ($D$), net financing activity ($NF$), and market leverage ($L$). The Appendix provides formal definitions of these variables. We also include several other firm- and board-level variables from previous tests as additional controls. Our base specifications also include two-digit SIC industry and year fixed effects, and we cluster standard errors by firm. We are interested in the variable $\frac{\Delta C_{jt}}{M_{jt-1}} \times AvgDSQ_{jt}$, where $AvgDSQ$ is the average board-level measure of DSQ. Thus, the coefficient $\gamma_{13}$ represents the incremental increase in the marginal value of cash if $AvgDSQ$ changes by one unit.

For this analysis, we exclude financial firms (SIC codes 6000-6999) in columns 1-3 and further exclude utilities firms (SIC codes 4900-4999) in columns 4 and 5. Due to the nature of financial firms' balance sheets and the difficulty in assessing liquidity for these firms, the marginal value of cash is unlikely comparable nor has the same interpretation for these firms as it does for firms in other industries. We further exclude utilities firms because both financial and utilities firms are heavily regulated, and these regulations might influence cash holding policies.

Overall, the results in Table 11 show that boards with higher average DSQ are better stewards of shareholder capital. The coefficient of 1.262 on $\Delta C \times AvgDSQ$ in column 1 implies that an additional dollar of cash is worth \$0.154 ($t$-stat = 5.73) (=1.262×0.122) more to outside investors at firms with a one standard deviation higher board-level DSQ. Column 2 shows a monotonic increase in the marginal value of cash across average DSQ quartiles. Compared to boards in the first quartile of average DSQ, the marginal value of cash is \$0.123, \$0.189, and \$0.338 ($t$-stats = 1.69, 2.61, and 4.04) higher for boards in the second, third, and fourth quartiles, respectively. Column 3 shows that controlling for firm fixed effects has little impact on this finding. The results are also similar after excluding financial and utilities firms, as columns 4 and 5 continue to show that boards in the top quartile of average DSQ have a \$0.346 and \$0.365 higher marginal of cash compared to boards in the first quartile, respectively.

In sum, Tables 8-11 suggest that boards with higher average DSQ increase firm value by making higher quality M&A deals, aligning CEO incentives more closely with performance, generating more and higher quality innovation, and being better stewards of corporate cash.

# 5 Additional Analyses

We next address potential endogeneity concerns by examining how outcomes change around director deaths and whether boards with higher average DSQ perform better during the COVID-19 pandemic. We also conduct analyses to further investigate the validity of *DSQ* as a measure of transferable director quality by examining the robustness of our results to estimating *DSQ* in different ways. We tabulate all the results from these robustness tests in the Online Appendix.

## 5.1 DiD analysis around director deaths

While our prior analyses show that DSQ is correlated with several outcomes that imply higher director- and board-level DSQ increase firm value, the tests only show associations. Although we include several relevant controls to help alleviate various econometric concerns, the possibility remains that high value firms and those having better outcomes recruit directors with high DSQ. Thus, our prior analyses could suffer from endogeneity concerns related to selection biases as well as possible omitted variables. Prior work uses instrumental variables based on geographic variation in the supply of directors to address this and other endogeneity concerns (e.g., Knyazeva et al., 2013; Bernile et al., 2018), but these instruments produce a weak first-stage correlation in our setting because they tend to vary little over time and we orthogonalize DSQ to time-invariant firm-specific factors. To address lingering endogeneity concerns, we conduct two tests.

First, similar to Fracassi and Tate (2012), we estimate the results in Tables 8-11 using a difference-in-differences approach for the +/- 3 years around director deaths. We use a stacked difference-in-differences design in which each director death represents an event. We create two continuous treatment intensity variables. $DSQ$ is the director-specific effect of the director who died, and $\Delta DSQ$ captures how much the board-level average DSQ changes after the director dies (defined the same as in Table 6). We interact these variables with an indicator variable labeled $After$ that equals one if the firm's fiscal period is after the date when the director died, and zero otherwise. For $DSQ$, we expect a negative coefficient on the interaction term, as outcomes should worsen when high-quality directors die and vice versa. For $\Delta DSQ$, we expect a positive coefficient on the interaction term, as outcomes should improve when average board quality increases after a director dies and vice versa. In these tests, Panel A presents results without controls, and Panel B presents results with the same firm- and board-level controls as in their respective tables. Given the stacked event approach in which events can overlap, we include separate firm and year fixed effects for each director death year (i.e., firm×death year and year×death year fixed effects).

Overall, the results in Table 12 are consistent with our previous findings and suggest that DSQ has a causal effect on firm outcomes. In the years after a high DSQ director dies or after the death of a director that causes board-level DSQ to decrease more, M&A announcement returns are lower, CEO compensation is tied less to performance, innovation declines, and the marginal value of cash decreases. While the results are weaker than our previous results, the estimates are significant at the 10% level in all regressions and significant at the 5% level or better in most regressions.

## 5.2 DSQ during the COVID-19 pandemic

Our second test addresses remaining endogeneity concerns by holding a board's composition and average DSQ fixed and examining how firms performed during the COVID-19 pandemic – a large and unexpected shock – conditional on board-level DSQ prior to the shock. The idea is that in the year before the shock in 2019, firms have optimized their board composition for normal operating conditions. However, when COVID-19 became a pandemic, it shocked firms out of this equilibrium, allowing us to examine how pre-pandemic board-level DSQ affected the impact of COVID-19 on firm performance. To the extent that high DSQ directors are better advisors, monitors, or have value-relevant attributes that are conducive to managing turbulent times, firms with higher average board-level DSQ should perform better during the pandemic.

Table 13 examines whether firms with higher average board-level DSQ perform better during the COVID-19 pandemic by estimating OLS regressions similar to Ding et al. (2021). Specifically, we regress a firm's weekly stock return (*Return*) on the weekly growth rate in positive COVID-19 cases in the U.S. (*COVID*) interacted with board-level DSQ and other firm- and board-level control variables, firm fixed effects, and in some specifications, week fixed effects. For this analysis, we estimate director- and firm-specific quality using the AKM method using only data through 2019 (i.e., only pre-pandemic data). We cluster standard errors by firm, but the results are robust to clustering by firm and week. The sample period for this analysis starts the first week of March 2020 when the documented spread of COVID-19 cases begins in the U.S. and ends a year later in the first week of March 2021, which also corresponds to when The COVID Tracking Project stops collecting data. We fix a firm's level of average DSQ to its pre-pandemic 2019 value.

Column 1 estimates a baseline regression of weekly returns on only the growth rate in COVID-19 cases and firm fixed effects, and consistent with Ding et al. (2021) shows stock returns are 1.84% lower during weeks when cases increase by one standard deviation (=$3.109 \times 0.593$). Further, the coefficient of 1.415 ($t$-stat = 4.80) on $COVID \times AvgDSQ$ in column 2 implies that the negative effect of an increase in cases on stock returns is offset by 5.7% [=$(1.415 \times 0.148)/3.700$] for a one standard deviation higher average board-level DSQ. Column 3 shows a monotonic increase in the extent that DSQ offsets the negative effect of an increase in cases on returns across average DSQ quartiles. Compared to boards in the first quartile of average DSQ, the negative effect of increases in cases is offset by 4.2%, 7.2%, and 12.9% ($t$-stats = 1.54, 2.76, and 4.98) for firms with boards in the second, third, and fourth quartiles, respectively. Controlling for week fixed effects in column 4 has little impact on this finding. The results are also robust to allowing the effect of increases in cases on returns to vary with firm- and board-level characteristics, which we accomplish by adding these controls interacted with the growth rate in cases in column 5. Last, column 6 shows that the results also hold after including industry×week fixed effects, which account for COVID-19 having differential effects on returns across industries. Overall, the results in Table 13 showing that DSQ matters in an out-of-sample test during a large negative unexpected shock provide additional support that high DSQ directors increase value.

## 5.3 Persistence in DSQ

Table A2 examines the persistence of DSQ. If DSQ captures time-invariant quality, high DSQ directors should remain high DSQ directors from one period to the next and vice versa for low DSQ directors. However, we derive estimates of DSQ using the full sample. While this approach allows us to isolate the component of quality that is director-specific and does not change over time, it cannot address the extent to which DSQ is persistent over time. To provide some insight into this question, we reestimate Eq. (1) by three-year non-overlapping windows (except the first period from 2000 to 2003 and the last from 2019 to 2020 to adjust for the fewer observations in the early years and more observations in the later years), collapse the data to one observation per director-period, and examine the persistence of DSQ from one period to the next. A limitation of this analysis is that it is restricted to directors that appear in our data in adjacent periods, reducing the number of director-period observations from 130,739 to 79,817.

The first two columns present results from regressing our measure of DSQ in period $t$+1 on the continuous and quartile indicator variables of DSQ in period $t$. The results show a strong positive relation between measures of DSQ in periods $t$ and $t$+1. The pure autocorrelation between the two continuous measures is 0.26. Thus, although the sample is restricted, the results indicate persistence in DSQ. While this analysis focuses on directors with data available in both periods, the second two columns examine whether low DSQ directors are less likely to be directors in the following period. The hypothesis is that low DSQ directors are less likely to be board members in the following years. Consistent with this hypothesis, both columns show that directors with higher estimates of quality in period $t$ are less likely to exit the sample in period $t$+1.

## 5.4 Alternative DSQ estimation methods

First, using the AKM connected group method to estimate DSQ allows us to expand our sample to directors that only have a single board appointment. Another approach called the mover dummy variables (MDV) method (Bertrand and Schoar, 2003) only uses directors appointed to more than one board. In addition to the MDV method producing a smaller sample, a concern is that these directors with multiple appointments are different from those with only one, potentially limiting the generalizability of the findings. Nevertheless, in Table A3, we reexamine whether our previous results are robust to using estimates of DSQ from the MDV method and continue to find that higher DSQ is associated with greater director election shareholder support, higher appointment announcement CARs, higher quality M&A deals, more equity-based compensation, more innovation, and a higher marginal value of cash. Except for the M&A announcement CARs, the effect of DSQ on these outcomes is monotonic across DSQ quartiles.

Second, we explicitly ensure that our results are not sensitive to differences between directors with directorships at multiple firms (i.e., movers) and those with directorships at only one firm (i.e., non-movers) by splitting our sample into movers and non-movers and recalculating *AvgDSQ* for each subsample. The results in Tables A7 and A8 show that nearly all of our results continue to hold for each subsample. One exception is that while non-mover directors with DSQ in the fourth quartile have 24.5 bps higher shareholder support in elections than those in the first quartile, this effect is not statistically significant at conventional levels ($p$-val = 0.231)

Third, while our method isolates the director-specific contribution to firm value from the firm-specific component, this component may be better represented as a CEO-firm-specific component, as theoretical assignment models often emphasize the importance of CEO-firm match quality (Eisfeldt and Kuhnen, 2013). To allow the firm-specific component to vary by CEO, we reestimate Eq. (1) after replacing the firm fixed effects ($\psi_j$) with CEO-firm pair fixed effects ($\nu_{jm}$). Table A4 shows that nearly all of our results continue to hold after using this approach. The one exception is that while firms with boards in the top quartile of average DSQ have a

$0.10 higher marginal value of cash than those in the bottom quartile, this difference is not statistically significant at conventional levels ($p$-val = 0.216).

Fourth, because we estimate DSQ using the full sample, a potential concern is that this approach creates a look-ahead bias. To address this concern, we reestimate Eq. (1) using data only up to $t$-1 each year, excluding observations before 2005 so that we have at least five years of data to estimate the fixed effects. Table A5 shows that most of our results are robust to using only historical information to estimate DSQ. We continue to find that higher DSQ is associated with greater director election shareholder support, higher appointment announcement CARs, more equity-based compensation, more innovation, and a higher marginal value of cash. However, while firms in the top quartile of board-level DSQ have higher M&A announcement CARs than those in the bottom quartile, this effect is not statistically significant. A few caveats of this approach are worth pointing out. For the announcement return tests, the sample size shrinks by about 63% because this approach requires a director to have had a board position and be in our data for this analysis. In addition, using only data up to $t$-1 implicitly assumes that investors cannot assess director quality until they have served on a board for a period of time. Because markets are supposed to be forward-looking and our main approach captures the time-invariant component of director quality, not using the full sample to estimate DSQ is likely overly restrictive.

Last, to ensure our estimates of DSQ are robust to using alternative measures of firm value, we reestimate DSQ from stock returns. Specifically, we estimate DSQ from Eq. (1) with the following modifications: (i) replace the dependent variable with a firm's characteristic-adjusted buy-and-hold stock return over its fiscal year (Daniel, Grinblatt, Titman, and Wermers, 1997), (ii) control for market value of equity instead of book value of assets, and (iii) control for a firm's book-to-market ratio at the beginning of the fiscal year. We match firms in June each year to 125 portfolios based on size, book-to-market, and momentum. With this approach, director-specific, firm-specific, and time-varying effects explain 6.9%, 12.5%, and 11.9% of the total variation in abnormal returns, respectively. Overall, Table A6 shows that nearly all of our results, including a near monotonic relation between the outcomes and DSQ quartiles, continue to hold.

# 6 Conclusion

In this study, we adopt a regression framework that allows us to quantify director-specific quality (DSQ) that is unique to each director and transferable across firms and over time. This method allows us to measure director quality that is distinct from traditional measures that are easily quantifiable or context-specific, and it represents the transferable component of director quality that is independent of which board a director sits on and when. While DSQ captures any value-relevant attributes that include the usual easy to quantify traits, such as gender and early life and work experiences, we find that these previously studied traits explain very little of the variation in our measure of DSQ. Thus, DSQ appears to primarily proxy for more difficult to quantify characteristics of director quality, such as innate ability, critical thinking skills, creativity, interpersonal skills, work ethic, and willingness to challenge management. Importantly, we find that DSQ accounts for a significant amount of the variation in firm value, explaining about 10% of the total variation in Tobin's Q.

Higher DSQ directors receive more shareholder support in the form of a higher percentage of *for* votes during director elections, and DSQ is positively correlated with director appointment announcement returns. Similarly, returns are lower around the announcement that a high DSQ director died. Numerous robustness checks provide additional support that DSQ is significantly related to director effectiveness and performance and is a reasonable measure of director quality. At the firm level, boards with higher average DSQ make higher quality M&A deals, tie CEO compensation more closely to stock returns, produce more and higher quality innovation, and manage cash better. Difference-in-differences analyses exploiting director deaths confirm these effects. During the COVID-19 pandemic, boards with higher DSQ also experienced relatively higher stock returns. These results suggest that boards comprised of directors with higher director-specific transferable skills tend to make decisions that generate greater value for shareholders.

Overall, our results suggest that directors have unique value-relevant attributes that are distinct from easily quantifiable traits, and who firms hire matters. Our study highlights the importance of DSQ in creating firm value, and hence the importance of considering DSQ in the director selection process. While our study focuses on the role that DSQ plays in creating value, the methodological approach we use can be extended to settings outside of firm value and even beyond the context of directors. In addition, because we show that our estimates of DSQ are not correlated with previously studied director traits that are easily quantifiable, our analyses indicate that a fruitful area for future research could be to incorporate research from other fields to help econometricians and firms identify the underlying attributes captured by DSQ and to examine how DSQ impacts other corporate outcomes.

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## Appendix A. Variable Definitions

This table provides the definitions for the main variables used in this study. Variables not included here are defined in the corresponding table captions. Compustat and CRSP variables are in italics when appropriate.

| **Variable** | **Definition** |
|---|---|
| **Director-Level Variables** | |
| ΔDSQ | Changes in board-level average director-specific quality after a director joins or leaves a board. |
| ΔDSQq2-ΔDSQq4 | Indicator variables that equal one if $\Delta DSQ$ is in the second through fourth quartiles, respectively, and zero otherwise. |
| #Seats | Total number of boards of publicly listed companies that a director has served on at the annual report date. |
| %Vote | Total number of "for" votes divided by the total number of votes cast ("for" + "against" + "abstain"). |
| Academics | Indicator variable equal to one if the director has taught at a university or holds a Ph.D. degree, and zero otherwise. |
| Achievements | Total number of director achievements. |
| Age65 | Indicator variable equal to one if a director is at least 65 years old, and zero otherwise. |
| AuditChair | Indicator variable equal to one if a director is the audit committee chair, and zero otherwise. |
| AuditCom | Indicator variable equal to one if a director serves on the audit committee, and zero otherwise. |
| Best of Award | Indicator variable equal to one if a director has received an award for being the best in a category (e.g., person of the year, top 100 women, best director, etc.), and zero otherwise. |
| Busy | Indicator variable equal to one if a director sits on three or more boards during a year, and zero otherwise. |
| Chair-Lead | Indicator variable equal to one if a director is a lead independent director or chairman of the board, and zero otherwise. |
| CompChair | Indicator variable equal to one if a director is the compensation committee chair, and zero otherwise. |
| CompCom | Indicator variable equal to one if a director serves on the compensation committee, and zero otherwise. |
| DSQ | Director-specific quality estimated using the AKM method. |
| DSQq2-DSQq4 | Indicator variables that equal one if director-specific quality ($DSQ$) is in the second through fourth quartiles, respectively, and zero otherwise. |
| Entrepreneur | Indicator variable equal to one if a director has founded a company or organization, and zero otherwise. |
| FinExp | Indicator variable equal to one if a director has worked as an accountant, banker, CFO, treasurer, loan officer, CFP, or in finance, and zero otherwise. |
| Grad | Indicator variable equal to one if a director has a master's degree other than an MBA, and zero otherwise. |
| IndExp | Indicator variable equal to one if a director has worked at another firm in the same two-digit SIC industry, and zero otherwise. |

| | |
|---|---|
| Indep | Indicator variable equal to one if a director is an independent director, and zero otherwise. |
| IVY | Indicator variable equal to one if a director graduated from an IVY League school, and zero otherwise. |
| Legal | Indicator variable equal to one if a director has a Juris Doctor degree or worked as a lawyer, judge, consultant, or attorney, and zero otherwise. |
| Management | Indicator variable equal to one if a director has had the title of president, CEO, COO, manager, or supervisor, and zero otherwise. |
| MBA | Indicator variable equal to one if a director has a master's in business administration degree, and zero otherwise. |
| Military | Indicator variable equal to one if a director has military experience, and zero otherwise. |
| Nationality | Nationality of a director. |
| Network Size | Total number of overlaps through employment, other activities, and education. |
| NomChair | Indicator variable equal to one if a director is the nominating committee chair, and zero otherwise. |
| NomCom | Indicator variable equal to one if a director serves on the nominating committee, and zero otherwise. |
| Politics | Indicator variable equal to one if a director has experience as a senator or member of congress or has worked at the White House or in the House of Representatives, and zero otherwise. |
| Prof Quals | Total number of professional educational qualifications of a director. |
| ResidTQ | Natural logarithm of Tobin's Q minus director- and firm-specific quality [Ln(*TQ*)-*DSQ*-*FSQ*]. When this variable is at the board-level, we average *ResidTQ* across all directors at a firm during a year. |
| Rich | Indicator variable equal to one if a director is a billionaire or has very-high or ultra-high net worth, and zero otherwise. |
| Tenure | The number of years a director has served on a board. |

**Firm- and Board-Level Variables**

| | |
|---|---|
| #Cites | Total number of citations to patents filed in a year that are eventually granted. |
| #Pats | Total number of patents filed in a year that are eventually granted. |
| $Pats | Market value of patents filed in a year that are eventually granted Kogan et al. (2017). |
| %Equity | Fraction of a CEO's total compensation (*tdc1*) coming from stock and option awards (*rstkgrnt*, *stock_awards*, *option_awards_blk_value*, *option_awards*). |
| %Female | Percentage of female directors on a board. |
| %Indep | Percentage of independent directors on a board. |
| AvgDSQ | Average of director-specific quality (*DSQ*) across all directors at a firm during a year. |
| AvgDSQq2-AvgDSQq4 | Indicator variables equal to one if the average director-specific quality is in the second through fourth quartiles, respectively, and zero otherwise. |
| Beta | Firm's sensitivity to market risk calculated using the value-weighted market model over the past three years and requiring at least 24 months of data. |
| BHAR | Firm's buy-and-hold return minus the buy-and-hold return on the CRSP value-weighted index over its fiscal year. |

| | |
|---|---|
| BrdSize | Total number of directors on a board. |
| CEO-Chair | Indicator variable equal to one if the CEO is also the chair of the board, and zero otherwise. |
| ClassBrd | Indicator variable equal to one if a firm has a classified board, and zero otherwise. |
| Delta | The dollar change in CEO stock and option wealth given a 1% change in stock price. |
| FSQ | Firm-specific effect estimated using the AKM method. |
| FSQq2-FSQq4 | Indicator variables equal to one if the firm-specific effect is in the second through fourth quartiles, respectively, and zero otherwise. |
| IO | Percentage of a firm's shares outstanding owned by institutional investors. |
| LEV | Value of debt in current liabilities plus long-term debt scaled by book value of assets $[(dlc{+}dltt)/at]$. |
| Lead-Indep | Indicator variable equal to one if a firm has a lead independent director, and zero otherwise. |
| OROA | Operating income before depreciation scaled by book assets $(oibdp/at)$. |
| Pill | Indicator variable equal to one if a board has a poison pill provision, and zero otherwise. |
| R&D | Annual R&D expenses scaled by sales $(xrd/sale)$. *xrd* is set to zero when missing. |
| Size | Book value of assets $(at)$ (in millions and 2017 dollars). |
| TQ | Market value of assets scaled by book value of assets $[(at\text{-}ceq{+}prcc\_f{\times}csho)/(at)]$. |
| VOL | Annualized standard deviation of monthly returns over a firm's fiscal year. |

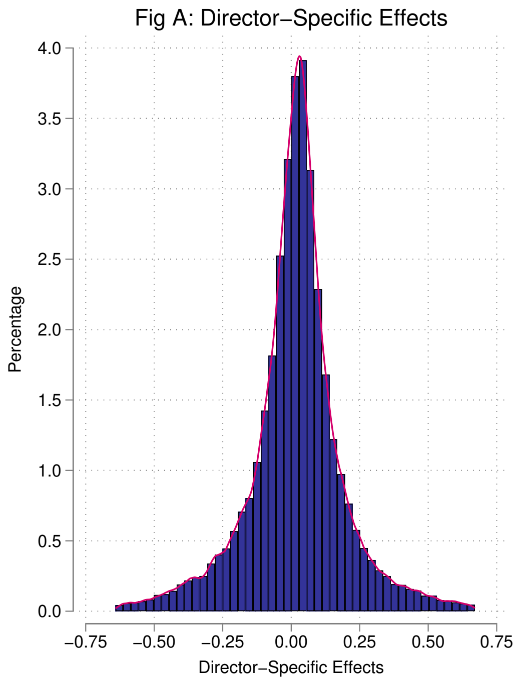
**M&A Variables**

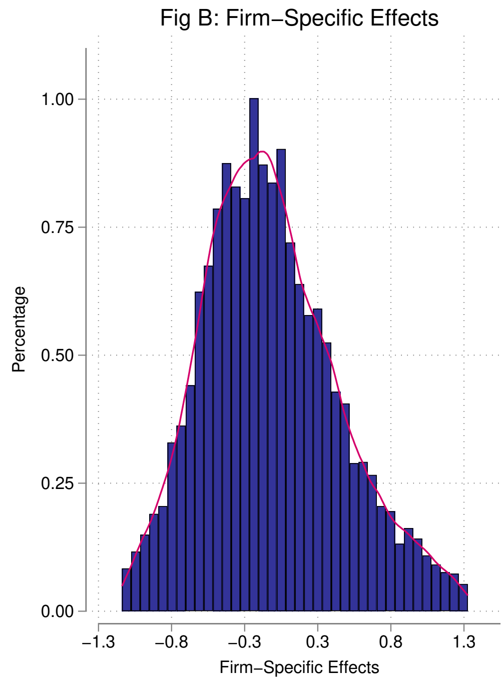
| | |
|---|---|
| AllCash | Indicator variable equal to one if a deal is all cash-financed, and zero otherwise. |
| BHAR | Bidder's buy-and-hold return over the $[-210, -11]$ trading days before a deal announcement minus the buy-and-hold on the CRSP value-weighted index. |
| CAR[-2,+2] | The five-day bidder cumulative abnormal return centered around an M&A announcement date. Parameters are estimated using the market model and CRSP value-weighted index over the [-210,-11] trading days before a deal announcement. |
| DivAcq | Indicator variable equal to one if a bidder and target do not share a two-digit SIC code industry, and zero otherwise. |
| FCF | Operating income before depreciation $(oibdp)$ - interest expenses $(xint)$ - taxes $(txt)$ - capital expenditures $(capx)$, all scaled by book value of total assets $(at)$. |
| Hitech | Indicator variable equal to one if a bidder and target are both from high tech industries defined by Loughran and Ritter (2004), and zero otherwise. |
| MB | Market value of assets scaled by book value of assets $[(at\text{-}ceq{+}prcc\_f{\times}csho)/(at)]$. |
| MLEV | Book value of debt scaled by market value of assets $[(dltt{+}dlc)/(at\text{-}ceq{+}prcc\_f{\times}csho)]$. |
| MVE | Market value of equity on the 11th trading day before the deal announcement (in 2017 dollars). |
| Private | Indicator variable equal to one if a target is a privately held company, and zero otherwise. |

| | |
|---|---|
| RelSize | Deal value scaled by the bidder's market value of equity on the 11th trading day before the deal announcement. |
| StockDeal | Indicator variable equal to one if the deal is at least partially stocked-financed, and zero otherwise. |
| Subsidiary | Indicator variable equal to one if a target is a subsidiary of another firm, and zero otherwise. |
| **Marginal Value of Cash Variables** | |
| $\Delta$C | Change in cash holdings (*che*) scaled by lagged market value of equity (*prcc_f*× *csho*). |
| $\Delta$D | Change in common dividends (*dvc*) scaled by lagged market value of equity (*prcc_f*× *csho*). |
| $\Delta$E | Change in earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits (*ib+xint+txdi+itci*) scaled by lagged market value of equity (*prcc_f*× *csho*). |
| $\Delta$I | Change in interest expense (*xint*) scaled by lagged market value of equity (*prcc_f*× *csho*). |
| $\Delta$NA | Change in total book assets minus cash holdings (*at-che*) scaled by lagged market value of equity (*prcc_f*× *csho*). |
| $\Delta$RD | Change in R&D expenditures (*xrd*, set to zero when missing) scaled by lagged market value of equity (*prcc_f*× *csho*). |
| $C_{t-1}$ | Lagged cash holdings (*che*) scaled by lagged market value of equity (*prcc_f*× *csho*). |
| L | Book value of debt (*dlcc+dlt*) scaled by market value of assets (*dlc+dltt+prcc_f*× *csho*). |
| NF | Total equity issuances minus repurchases plus debt issuances minus debt redemptions (*sstk-prstk+dltis-dltr*) scaled by lagged market value of equity (*prcc_f*× *csho*). |
| $r - R^B$ | A firm's stock return over its fiscal year minus the return on a size and book-to-market matched portfolio. |

## Figure 1: Distribution of Director- and Firm-Specific Quality

This figure reports the distribution of the estimated DSQ (Fig A) and FSQ (Fig B) using the AKM method. The red line is a fitted Kernel density. The table reports summary statistics for these director-specific ($DSQ$) and firm-specific ($FSQ$) effects. We trim the variables at their 1st and 99th percentiles for the figures and winsorize them at their 1st and 99th percentiles for the summary statistics.




| | Mean | Std | P5 | P25 | Median | P75 | P95 |
|---|---|---|---|---|---|---|---|
| DSQ | 0.018 | 0.196 | -0.320 | -0.061 | 0.023 | 0.099 | 0.337 |
| FSQ | -0.068 | 0.487 | -0.805 | -0.407 | -0.1164 | 0.228 | 0.863 |

## Table 1: Summary Statistics

This table reports summary statistics for the variables used in the decomposition of Tobin's Q regression in Table 2. This sample consists of 436,383 firm-director-year observations over the period 2000 to 2020 after excluding observations that are not part of the connected samples. All variables are defined in the Appendix.

| | Mean | Std | P25 | Median | P75 |
|---|---|---|---|---|---|
| TQ | 1.894 | 1.846 | 1.065 | 1.368 | 2.059 |
| Ln(Size) | 7.468 | 2.119 | 6.053 | 7.475 | 8.854 |
| LEV | 0.229 | 0.207 | 0.055 | 0.190 | 0.347 |
| OROA | 0.065 | 0.165 | 0.023 | 0.087 | 0.144 |
| IO | 0.589 | 0.296 | 0.357 | 0.646 | 0.839 |
| R&D | 0.210 | 1.086 | 0.000 | 0.000 | 0.032 |
| VOL | 0.116 | 0.075 | 0.064 | 0.095 | 0.143 |
| Beta | 1.194 | 0.843 | 0.613 | 1.072 | 1.608 |
| Ln(#Seats) | 1.660 | 0.865 | 1.099 | 1.609 | 2.303 |
| Tenure | 7.726 | 6.816 | 2.700 | 5.800 | 10.800 |
| Busy | 0.309 | 0.462 | 0.000 | 0.000 | 1.000 |
| Indep | 0.909 | 0.288 | 1.000 | 1.000 | 1.000 |
| Age65 | 0.400 | 0.490 | 0.000 | 0.000 | 1.000 |
| IndExp | 0.225 | 0.418 | 0.000 | 0.000 | 0.000 |
| Chair-Lead | 0.059 | 0.237 | 0.000 | 0.000 | 0.000 |
| AuditCom | 0.535 | 0.499 | 0.000 | 1.000 | 1.000 |
| CompCom | 0.498 | 0.500 | 0.000 | 0.000 | 1.000 |
| NomCom | 0.488 | 0.500 | 0.000 | 0.000 | 1.000 |
| AuditChair | 0.137 | 0.344 | 0.000 | 0.000 | 0.000 |
| CompChair | 0.129 | 0.335 | 0.000 | 0.000 | 0.000 |
| NomChair | 0.120 | 0.325 | 0.000 | 0.000 | 0.000 |
| %Indep | 0.731 | 0.152 | 0.643 | 0.769 | 0.846 |
| %Female | 0.120 | 0.107 | 0.000 | 0.111 | 0.182 |
| CEO-Chair | 0.438 | 0.496 | 0.000 | 0.000 | 1.000 |
| Lead-Indep | 0.323 | 0.468 | 0.000 | 0.000 | 1.000 |
| Ln(BrdSize) | 2.274 | 0.317 | 2.079 | 2.303 | 2.485 |
| Pill | 0.201 | 0.401 | 0.000 | 0.000 | 0.000 |
| ClassBrd | 0.451 | 0.498 | 0.000 | 0.000 | 1.000 |

## Table 2: Estimating Director-Specific Quality

This table reports results from estimating the following equation using the AKM method:

$$\text{Ln}(TQ_{ijt}) = \boldsymbol{\theta_i} + \psi_j + \omega_t + X_{jt(t-1)}\beta + Z_{ijt}\gamma + \varepsilon_{ijt}.$$

Ln($TQ$) is the natural logarithm of a firm's market value of assets scaled by book value of assets. $\theta_i$, $\psi_j$, and $\omega_t$ are director, firm, and year fixed effects, respectively. $X_{jt(t-1)}$ are time-varying firm and board characteristics, and $Z_{ijt}$ are time-varying director characteristics. The estimated director fixed effects $\theta_i$ capture DSQ. All variables are defined in the Appendix. $t$-statistics are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | Ln(TQ) | $t$-Statistic |
|---|---|---|
| | (1) | |
| Ln(#Seats) | 0.006 | 1.00 |
| Tenure | 0.001*** | 3.06 |
| Busy | -0.001 | -0.51 |
| Age65 | -0.006** | -2.28 |
| Indep | 0.016*** | 4.02 |
| Chair-Lead | -0.012*** | -3.79 |
| AuditCom | -0.003* | -1.68 |
| CompCom | -0.002 | -1.03 |
| NomCom | -0.001 | -0.47 |
| AuditChair | -0.001 | -0.61 |
| CompChair | -0.003* | -1.68 |
| NomChair | -0.004** | -2.12 |
| IndExp | 0.001 | 0.18 |
| Pill | -0.026*** | -3.38 |
| ClassBrd | 0.002 | 0.34 |
| Ln(Size) | -0.163*** | -28.02 |
| LEV | 0.036* | 1.80 |
| OROA | 0.663*** | 16.82 |
| IO | 0.060*** | 5.00 |
| R&D | 0.030*** | 6.13 |
| VOL | 0.063** | 2.10 |
| Beta | -0.002 | -0.82 |
| %Indep | -0.005 | -0.24 |
| %Female | 0.021 | 0.69 |
| CEO-Chair | 0.021*** | 4.16 |
| Lead-Indep | 0.003 | 0.64 |
| Ln(BrdSize) | 0.053*** | 4.10 |
| Director FE | ✓ | |
| Firm FE | ✓ | |
| Year FE | ✓ | |
| Obs | 459,479 | |
| $R^2$ | 0.818 | |

## Table 3: Contribution of Director-Specific Quality

This table reports the variance decomposition of the natural logarithm of Tobin's Q from Table 2.

| Component | $R^2$ attributable to the component (in %) | % of $R^2$ attributable to the component (in %) |
|---|---|---|
| Director-specific effects | 9.65 | 11.80 |
| Firm-specific effects | 52.23 | 63.90 |
| Year effects | 2.49 | 3.04 |
| Time-varying firm- and board-level effects | 17.39 | 21.27 |
| Time-varying director effects | 0.06 | 0.07 |
| Residual | 18.25 | – |

## Table 4: Director-Specific Quality and Observable Traits

This table presents result relating DSQ to observable director traits. There is only one observation per director. The first two columns present results from univariate correlations of *DSQ* with the listed director traits. The last four columns present results from OLS regressions of *DSQ* on all of the listed director traits. *DSQ* is the director-specific effect estimated using the AKM method. All variables are defined in the Appendix. Reported *p*-values are calculated from heteroskedasticity-robust standard errors. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | Univariate correlation with DSQ | | OLS Determinants of DSQ | | OLS Determinants of DSQ | |
|---|---|---|---|---|---|---|
| | Coefficient | p-Value | Coefficient | p-Value | Coefficient | p-Value |
| MBA | 0.012*** | 0.007 | 0.005 | 0.247 | 0.006 | 0.191 |
| Grad | 0.014*** | 0.002 | 0.008* | 0.088 | 0.010** | 0.048 |
| IVY | 0.016*** | 0.000 | 0.009* | 0.055 | 0.008* | 0.088 |
| Academics | 0.012*** | 0.005 | 0.004 | 0.420 | 0.004 | 0.436 |
| Legal | 0.006 | 0.139 | 0.003 | 0.549 | 0.003 | 0.566 |
| FinExp | 0.000 | 0.934 | -0.000 | 0.941 | -0.001 | 0.894 |
| Mangement | 0.020*** | 0.000 | 0.017*** | 0.000 | 0.015*** | 0.001 |
| Female | 0.013*** | 0.003 | 0.010** | 0.033 | 0.011** | 0.014 |
| Rich | 0.037*** | 0.000 | 0.026*** | 0.000 | 0.026*** | 0.000 |
| Entrepreneur | 0.007 | 0.101 | 0.004 | 0.363 | 0.004 | 0.399 |
| Military | -0.001 | 0.849 | -0.003 | 0.544 | -0.003 | 0.495 |
| Politics | -0.001 | 0.848 | -0.006 | 0.169 | -0.007 | 0.103 |
| Ln(Prof Quals) | 0.006 | 0.178 | 0.007 | 0.175 | 0.008 | 0.111 |
| Ln(Achievements) | 0.035*** | 0.000 | 0.016*** | 0.008 | 0.011* | 0.065 |
| Ln(Network Size) | 0.026*** | 0.000 | 0.008* | 0.093 | 0.010** | 0.046 |
| Best of Award | 0.020*** | 0.000 | 0.005 | 0.353 | 0.005 | 0.287 |
| Nationality FE | | | | | ✓ | |
| Obs | 52,851 | | 52,851 | | 52,851 | |
| $R^2$ | | | 0.0027 | | 0.0047 | |

# Table 5: Director-Specific Quality and Election Outcomes

This table reports results from OLS regressions relating director election outcomes to DSQ over the period 2004 to 2020. The dependent variable *%Vote* in columns 1-3 is the fraction of "for" votes scaled by the the number of "for", "against", and "abstain" votes. The dependent variables *%Vote<90* and *%Vote<85* in columns 4 and 5 equal one if *%Vote* is less than 90% and 85%, respectively, and zero otherwise. *DSQ* and *FSQ* are director- and firm-specific effects estimated using the AKM method. *DSQq2*-*DSQq4* (*FSQq2*-*FSQq4*) are indicator variables that equal one if the director- (firm-) specific effect is in the second through fourth quartiles, respectively, and zero otherwise. Control variables include *Ln(Size)*, *BHAR*, *LEV*, *OROA*, *IO*, *R&D*, *VOL*, *Beta*, *%Indep*, *%Female*, *CEO-Chair*, *Lead-Indep*, *Ln(BrdSize)*, *Pill*, *ClassBrd*, *Ln(#Seats)*, *Tenure*, *Busy*, *Indep*, *Age65*, *Chair-Lead*, *AuditCom*, *NomCom*, *CompCom*, *AuditChair*, *NomChair*, and *CompChair*. All variables are defined in the Appendix. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | %Vote | | | %Vote<90 | %Vote<85 |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| DSQ | 1.266** | | | | |
| | (2.34) | | | | |
| DSQq2 | | 0.222* | 0.102 | -0.002 | -0.004 |
| | | (1.77) | (1.27) | (-0.45) | (-1.07) |
| DSQq3 | | 0.396*** | 0.239*** | -0.010** | -0.011** |
| | | (3.18) | (2.68) | (-2.09) | (-2.57) |
| DSQq4 | | 0.517*** | 0.418*** | -0.015*** | -0.011** |
| | | (3.37) | (3.79) | (-2.63) | (-2.35) |
| FSQ | 1.142*** | | | | |
| | (5.55) | | | | |
| FSQq2 | | 1.215*** | | -0.043*** | -0.032*** |
| | | (5.93) | | (-5.41) | (-5.06) |
| FSQq3 | | 1.099*** | | -0.037*** | -0.028*** |
| | | (4.58) | | (-4.07) | (-3.64) |
| FSQq4 | | 1.340*** | | -0.050*** | -0.034*** |
| | | (5.62) | | (-5.47) | (-4.55) |
| ResidTQ | 2.026*** | 2.022*** | 2.099*** | -0.081*** | -0.051*** |
| | (8.88) | (8.86) | (10.29) | (-9.27) | (-6.98) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | | ✓ | ✓ |
| Firm FE | | | ✓ | | |
| Obs | 157,691 | 157,691 | 157,619 | 157,691 | 157,691 |
| Adj $R^2$ | 0.087 | 0.088 | 0.298 | 0.070 | 0.052 |

# Table 6: Director-Specific Quality and Appointment CARs

This table reports results from OLS regressions relating director appointment announcement CARs to DSQ over the period 2003 to 2020. When more than one director is appointed on the same day at a firm, the sample is collapsed to one observation per firm per day in column 4, and all these observations are excluded in column 5. The dependent variable *CAR[-2,+2]* in columns 1-5 is the five-day cumulative abnormal return centered around the announcement of a director appointment. *DSQ* and *FSQ* are director- and firm-specific effects estimated using the AKM method. *DSQq2-DSQq4* (*FSQq2-FSQq4*) are indicator variables that equal one if the director- (firm-) specific effect is in the second through fourth quartiles, respectively, and zero otherwise. Control variables include *Ln(Size)*, *BHAR*, *LEV*, *OROA*, *IO*, *R&D*, *VOL*, *Beta*, *%Indep*, *%Female*, *CEO-Chair*, *Lead-Indep*, *Ln(BrdSize)*, *Pill*, and *ClassBrd*. In column 6, we examine the relation between director-specific quality and cumulative abnormal returns centered around the announcement of a director death. In this specification, we further include the control variables *Ln(#Seats)*, *Tenure*, *Busy*, *Indep*, *Age65*, *Chair-Lead*, *AuditCom*, *NomCom*,*CompCom*, *AuditChair*, *NomChair*,and *CompChair*. All variables are defined in the Appendix. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | CAR[-2,+2]×100 | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| DSQ | 1.647*** | | | | | |
| | (4.31) | | | | | |
| DSQq2 | | 0.308** | 0.197 | 0.325** | 0.316** | -0.419 |
| | | (2.02) | (1.04) | (2.14) | (1.97) | (-0.82) |
| DSQq3 | | 0.549*** | 0.517*** | 0.480*** | 0.464*** | -1.096** |
| | | (3.65) | (2.63) | (3.17) | (2.89) | (-2.05) |
| DSQq4 | | 0.803*** | 0.699*** | 0.758*** | 0.735*** | -1.255** |
| | | (4.92) | (3.18) | (4.80) | (4.45) | (-2.14) |
| FSQ | 0.359** | | | | | |
| | (2.04) | | | | | |
| FSQq2 | | 0.266 | | 0.143 | 0.028 | -0.465 |
| | | (1.51) | | (0.89) | (0.16) | (-0.83) |
| FSQq3 | | 0.493*** | | 0.417** | 0.349* | -1.964*** |
| | | (2.68) | | (2.43) | (1.92) | (-3.33) |
| FSQq4 | | 0.412** | | 0.274 | 0.109 | -1.452** |
| | | (2.02) | | (1.45) | (0.55) | (-2.09) |
| ResidTQ | 0.149 | 0.149 | 0.232 | 0.170 | 0.402** | 0.039 |
| | (0.85) | (0.85) | (1.17) | (0.92) | (2.07) | (0.03) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Firm FE | | | ✓ | | | |
| Deaths | | | | | | ✓ |
| Obs | 16,140 | 16,140 | 14,943 | 14,293 | 12,880 | 969 |
| Adj $R^2$ | 0.036 | 0.036 | 0.142 | 0.034 | 0.034 | 0.041 |

# Table 7: Appointment CARs: Director-Specific Quality Contribution

This table reports results from OLS regressions relating director appointment announcement CARs to the contribution of new director DSQ over the period 2003 to 2020. When more than one director is appointed on the same day at a firm, the sample is collapsed to one observation per firm per day in column 4, and all these observations are excluded in column 5. The dependent variable *CAR*[-*2,+2*] in columns 1-5 is the five-day cumulative abnormal return centered around the announcement of a director appointment. $\Delta DSQ$ captures how much the board-level average DSQ changes after the director joins the board. *FSQ* is the firm-specific effect estimated using the AKM method. $\Delta DSQq2$-$\Delta DSQq4$ (*FSQq2*-*FSQq4*) are indicator variables that equal one if $\Delta DSQ$ (*FSQ*) is in the second through fourth quartiles, respectively, and zero otherwise. Control variables include *Ln(Size)*, *BHAR*, *LEV*, *OROA*, *IO*, *R&D*, *VOL*, *Beta*, *%Indep*, *%Female*, *CEO-Chair*, *Lead-Indep*, *Ln(BrdSize)*, *Pill*, and *ClassBrd*. In column 6, we examine the relation between director-specific quality and cumulative abnormal returns centered around the announcement of a director death. In this specification, we further include the control variables *Ln(#Seats)*, *Tenure*, *Busy*, *Indep*, *Age65*, *Chair-Lead*, *AuditCom*, *NomCom*,*CompCom*, *AuditChair*, *NomChair*,and *CompChair*. All variables are defined in the Appendix. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | CAR[-2,+2]×100 | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ΔDSQ | 8.429*** | | | | | |
| | (2.92) | | | | | |
| ΔDSQq2 | | 0.224 | 0.100 | 0.130 | 0.142 | 0.565 |
| | | (1.40) | (0.50) | (0.82) | (0.85) | (1.01) |
| ΔDSQq3 | | 0.521*** | 0.282 | 0.491*** | 0.497*** | 0.475 |
| | | (3.23) | (1.37) | (3.10) | (2.94) | (0.84) |
| ΔDSQq4 | | 0.640*** | 0.483** | 0.646*** | 0.690*** | 1.280** |
| | | (3.88) | (2.20) | (4.08) | (4.09) | (2.17) |
| FSQ | 0.239 | | | | | |
| | (1.35) | | | | | |
| FSQq2 | | 0.175 | | 0.048 | -0.070 | -0.272 |
| | | (0.99) | | (0.30) | (-0.41) | (-0.50) |
| FSQq3 | | 0.381** | | 0.303* | 0.234 | -1.667*** |
| | | (2.06) | | (1.75) | (1.29) | (-3.00) |
| FSQq4 | | 0.301 | | 0.156 | -0.016 | -1.116 |
| | | (1.46) | | (0.82) | (-0.08) | (-1.63) |
| ResidTQ | 0.135 | 0.133 | 0.217 | 0.224 | 0.394** | -0.200 |
| | (0.77) | (0.76) | (1.09) | (1.21) | (2.03) | (-0.15) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Firm FE | | | ✓ | | | |
| Deaths | | | | | | ✓ |
| Obs | 16,138 | 16,138 | 14,942 | 14,291 | 12,878 | 969 |
| Adj $R^2$ | 0.035 | 0.036 | 0.141 | 0.034 | 0.034 | 0.039 |

## Table 8: Director-Specific Quality and M&A Announcement Returns

This table reports results from OLS regressions relating M&A announcement CARs to board-level DSQ over the period 2001 to 2020. In columns 4 and 5, the sample is restricted to deals where the deal value is at least 5% of the acquirer's market cap. The dependent variable *CAR*[*-2,+2*] in columns 1-5 is the five-day bidder cumulative abnormal return centered around an M&A announcement. *DSQ* and *FSQ* are director- and firm-specific effects estimated using the AKM method. *AvgDSQ* is the average *DSQ* across all directors during a year. *AvgDSQq2-AvgDSQq4* (*FSQq2-FSQq4*) are indicator variables that equal one if the average director- (firm-) specific effect is in the second through fourth quartiles, respectively, and zero otherwise. Control variables include *Ln(MVE)*, *MB*, *FCF*, *MLEV*, *BHAR*, *Hitech*, *RelSize*, *AllCash*, *StockDeal*, *DivAcq*, *Private*, *Subsidiary*, *%Indep*, *%Female*, *CEO-Chair*, *Lead-Indep*, *Ln(BrdSize)*, *Pill*, and *ClassBrd*. All variables are defined in the Appendix. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | CAR[-2,+2]×100 | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| AvgDSQ | 2.209** | | | | |
| | (2.16) | | | | |
| AvgDSQq2 | | 0.409* | 0.873** | 0.384 | 0.983 |
| | | (1.65) | (2.03) | (1.19) | (1.47) |
| AvgDSQq3 | | 0.653** | 1.528*** | 0.642* | 1.434** |
| | | (2.52) | (3.20) | (1.87) | (1.98) |
| AvgDSQq4 | | 0.749*** | 1.844*** | 1.046*** | 2.327*** |
| | | (2.78) | (3.45) | (2.90) | (2.83) |
| FSQ | 1.350*** | | | | |
| | (3.36) | | | | |
| FSQq2 | | 0.674** | | 1.057*** | |
| | | (2.46) | | (3.17) | |
| FSQq3 | | 0.618** | | 1.063*** | |
| | | (1.96) | | (2.60) | |
| FSQq4 | | 1.263*** | | 1.714*** | |
| | | (3.26) | | (3.38) | |
| ResidTQ | 0.096 | 0.057 | 0.510 | 0.399 | 1.068 |
| | (0.23) | (0.14) | (0.75) | (0.72) | (1.02) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | | ✓ | |
| Firm FE | | | ✓ | | ✓ |
| Obs | 8,543 | 8,543 | 7,367 | 5,525 | 4,243 |
| Adj $R^2$ | 0.056 | 0.056 | 0.126 | 0.078 | 0.142 |

# Table 9: Director-Specific Quality and Pay-Performance Sensitivity

This table reports results from OLS regressions relating CEO compensation to board-level DSQ over the period 2001 to 2020. The dependent variable *Ln(Delta)* in columns 1-4 is the natural logarithm of one plus the sensitivity of changes in CEO wealth to a 1% change in stock price. The dependent variable *%Equity* in columns 5-8 is the fraction of a CEO's total compensation coming from stock and option awards. *DSQ* and *FSQ* are director- and firm-specific effects estimated using the AKM method. *AvgDSQ* is the average *DSQ* across all directors during a year. *AvgDSQq2-AvgDSQq4* (*FSQq2-FSQq4*) are indicator variables that equal one if the average director- (firm-) specific effect is in the second through fourth quartiles, respectively, and zero otherwise. *CompDSQ* (*XCompDSQ*) is the average *DSQ* across all directors during a year that are (are not) members of the compensation committee. Control variables include the natural logarithm of CEO age and tenure, *Ln(Size)*, *BHAR*, *LEV*, *OROA*, *IO*, *R&D*, *VOL*, *Beta*, *%Indep*, *%Female*, *CEO-Chair*, *Lead-Indep*, *Ln(BrdSize)*, *Pill*, and *ClassBrd*. All variables are defined in the Appendix. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | Ln(Delta) | | | | %Equity | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| AvgDSQ | 1.997*** | | | | 0.149*** | | | |
| | (11.05) | | | | (4.15) | | | |
| AvgDSQq2 | | 0.181*** | 0.189*** | | | 0.022*** | 0.012 | |
| | | (5.14) | (6.53) | | | (2.88) | (1.40) | |
| AvgDSQq3 | | 0.250*** | 0.299*** | | | 0.030*** | 0.024*** | |
| | | (6.54) | (8.69) | | | (3.52) | (2.69) | |
| AvgDSQq4 | | 0.420*** | 0.515*** | | | 0.033*** | 0.032*** | |
| | | (9.83) | (13.13) | | | (3.84) | (3.29) | |
| CompDSQq2 | | | | 0.052 | | | | 0.028*** |
| | | | | (1.46) | | | | (3.32) |
| CompDSQq3 | | | | 0.074* | | | | 0.028*** |
| | | | | (1.87) | | | | (2.79) |
| CompDSQq4 | | | | 0.188*** | | | | 0.034*** |
| | | | | (4.15) | | | | (2.93) |
| XCompDSQq2 | | | | 0.164*** | | | | -0.001 |
| | | | | (4.70) | | | | (-0.03) |
| XCompDSQq3 | | | | 0.182*** | | | | 0.008 |
| | | | | (4.69) | | | | (0.87) |
| XCompDSQq4 | | | | 0.305*** | | | | 0.008 |
| | | | | (6.91) | | | | (0.69) |
| FSQ | 1.329*** | | | | 0.125*** | | | |
| | (25.26) | | | | (10.78) | | | |
| FSQq2 | | 0.428*** | | 0.462*** | | 0.052*** | | 0.054*** |
| | | (9.69) | | (10.29) | | (5.51) | | (5.53) |
| FSQq3 | | 0.809*** | | 0.839*** | | 0.085*** | | 0.092*** |
| | | (16.13) | | (17.15) | | (8.14) | | (8.54) |
| FSQq4 | | 1.208*** | | 1.262*** | | 0.133*** | | 0.142*** |
| | | (21.41) | | (22.54) | | (10.72) | | (11.09) |
| ResidTQ | 0.552*** | 0.589*** | 0.587*** | 0.578*** | 0.086*** | 0.089*** | 0.079*** | 0.084*** |
| | (12.25) | (12.72) | (16.13) | (12.01) | (7.32) | (7.66) | (6.99) | (6.75) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Firm FE | | | ✓ | | | | ✓ | |
| Obs | 27,797 | 27,797 | 27,701 | 25,382 | 27,797 | 27,797 | 27,701 | 25,382 |
| Adj $R^2$ | 0.559 | 0.546 | 0.751 | 0.551 | 0.156 | 0.157 | 0.311 | 0.153 |

## Table 10: Director-Specific Quality and Innovation

This table reports results from OLS regressions relating innovation to board-level DSQ over the period 2000 to 2017. Columns 1-4 restrict the sample to firms that have at least one patent over the sample period, column 5 requires a firm to have a patent during the year, and column 6 includes the full sample. The dependent variable *Ln(1+$Pats)* in columns 1-3 and 6 is the natural logarithm of the market value of patents filed during a year from Kogan et al. (2017). The dependent variable *Ln(1+#Pats)* in column 4 is the natural logarithm of the number of patents filed during a year. The dependent variable *#Cites/#Pats* in column 5 is the ratio of the total number of citations to patents filed in a year scaled by the number filed during the year. *DSQ* and *FSQ* are director- and firm-specific effects estimated using the AKM method. *AvgDSQ* is the average *DSQ* across all directors during a year. *AvgDSQq2-AvgDSQq4* (*FSQq2-FSQq4*) are indicator variables that equal one if the average director- (firm-) specific effect is in the second through fourth quartiles, respectively, and zero otherwise. Control variables include *Ln(Size)*, *BHAR*, *LEV*, *OROA*, *IO*, *R&D*, *VOL*, *Beta*, *%Indep*, *%Female*, *CEO-Chair*, *Lead-Indep*, *Ln(BrdSize)*, *Pill*, and *ClassBrd*. All variables are defined in the Appendix. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | Ln(1+$Pats) | | | Ln(1+#Pats) | #Cites/#Pats | Ln(1+$Pats) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| AvgDSQ | 1.829*** | | | | | |
| | (8.09) | | | | | |
| AvgDSQq2 | | 0.149** | 0.178*** | 0.095** | 0.672* | 0.078** |
| | | (2.23) | (3.89) | (1.99) | (1.84) | (1.99) |
| AvgDSQq3 | | 0.159** | 0.261*** | 0.093* | 0.746* | 0.064 |
| | | (2.13) | (4.58) | (1.77) | (1.93) | (1.45) |
| AvgDSQq4 | | 0.330*** | 0.363*** | 0.153*** | 1.111*** | 0.163*** |
| | | (4.46) | (6.21) | (2.94) | (2.66) | (3.73) |
| FSQ | 1.989*** | | | | | |
| | (22.29) | | | | | |
| FSQq2 | | 0.184** | | 0.128* | 0.322 | -0.133*** |
| | | (2.08) | | (1.86) | (0.69) | (-3.16) |
| FSQq3 | | 0.585*** | | 0.272*** | 2.092*** | 0.036 |
| | | (6.18) | | (3.81) | (3.84) | (0.65) |
| FSQq4 | | 1.751*** | | 0.842*** | 3.775*** | 1.203*** |
| | | (17.05) | | (10.94) | (6.24) | (16.78) |
| ResidTQ | 0.133** | 0.214*** | 0.248*** | 0.092** | -0.012 | 0.113*** |
| | (2.56) | (4.02) | (6.26) | (2.54) | (-0.03) | (3.30) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Firm FE | | | ✓ | | | |
| Obs | 23,199 | 23,199 | 23,175 | 23,199 | 14,336 | 52,739 |
| Adj $R^2$ | 0.547 | 0.525 | 0.818 | 0.434 | 0.308 | 0.437 |

# Table 11: Director-Specific Quality and Marginal Value of Cash

This table reports results from OLS regressions relating the marginal value of cash to board-level DSQ over the period 2001 to 2020. Columns 1-3 exclude financial firms, and columns 4 and 5 further exclude utilities firms. The dependent variable $r - R^B$ is a firm's stock return over its fiscal year minus the return on a size and book-to-market matched portfolio. *DSQ* and *FSQ* are director- and firm-specific effects estimated using the AKM method. *AvgDSQ* is the average *DSQ* across all directors during a year. *AvgDSQq2*-*AvgDSQq4* (*FSQq2*-*FSQq4*) are indicator variables that equal one if the average director- (firm-) specific effect is in the second through fourth quartiles, respectively, and zero otherwise. $\Delta C$ equals the change in cash scaled by lagged market value of equity. Faulkender and Wang (2006) control variables include $\Delta E$, $\Delta NA$, $\Delta RD$, $\Delta I$, $\Delta D$, *NF*, $\Delta C \times L$, and $\Delta C \times C_{t\text{-}1}$. Other control variables include *%Indep*, *%Female*, *CEO-Chair*, *Lead-Indep*, *Ln(BrdSize)*, *Pill*, *ClassBrd*, *AvgDSQ* and *FSQ* (or quartile variables when appropriate), and *ResidTQ*. All variables are defined in the Appendix. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | $r - R^B$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ΔC | 1.315*** | 0.954*** | 0.946*** | 0.961*** | 0.954*** |
| | (19.19) | (9.28) | (9.54) | (9.25) | (9.52) |
| ΔC×AvgDSQ | 1.262*** | | | | |
| | (5.73) | | | | |
| ΔC×AvgDSQq2 | | 0.123* | 0.133* | 0.128* | 0.140** |
| | | (1.69) | (1.91) | (1.74) | (1.99) |
| ΔC×AvgDSQq3 | | 0.189*** | 0.166** | 0.193*** | 0.176** |
| | | (2.61) | (2.37) | (2.64) | (2.48) |
| ΔC×AvgDSQq4 | | 0.338*** | 0.355*** | 0.346*** | 0.365*** |
| | | (4.04) | (4.31) | (4.10) | (4.40) |
| ΔC×FSQ | 0.582*** | | | | |
| | (7.44) | | | | |
| ΔC×FSQq2 | | 0.101 | 0.116* | 0.111 | 0.117* |
| | | (1.49) | (1.77) | (1.62) | (1.78) |
| ΔC×FSQq3 | | 0.350*** | 0.350*** | 0.357*** | 0.359*** |
| | | (4.40) | (4.37) | (4.42) | (4.41) |
| ΔC×FSQq4 | | 0.555*** | 0.484*** | 0.546*** | 0.473*** |
| | | (5.43) | (4.85) | (5.34) | (4.74) |
| ΔC×ResidTQ | 0.358*** | 0.243*** | 0.145* | 0.229** | 0.126 |
| | (4.07) | (2.74) | (1.70) | (2.56) | (1.47) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | | ✓ | |
| Firm FE | | | ✓ | | ✓ |
| Obs | 42,112 | 42,112 | 41,671 | 39,903 | 39,470 |
| Adj $R^2$ | 0.262 | 0.261 | 0.351 | 0.263 | 0.351 |

# Table 12: DiD Analysis Around Director Deaths

This table reports results from OLS regressions relating DSQ to the director- and firm-level outcomes from Tables 8-11. The sample includes observations in the +/- 3 years around a director death. The dependent variables in columns 1-10 and firm- and board-level control variables are the same as those in their respective tables. All regressions include all the level and interaction terms but are not tabulated for brevity. *DSQ* is the director-specific effect of the director who died. $\Delta DSQ$ captures how much the board-level average DSQ changes after the director dies. *After* equals one if the firm's fiscal period is after the date when the director died, and zero otherwise. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | M&A CAR[-2,+2] | | Ln(Delta) | | %Equity | | Ln(1+$Pats) | | $r - R^B$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Panel A: Regressions do not include firm- and board-level controls* | | | | | | | | | | |
| DSQ×After | -0.112** | | -0.804*** | | -0.211* | | -0.486*** | | -0.201** | |
| | (-2.04) | | (-2.81) | | (-1.94) | | (-2.72) | | (-2.37) | |
| ΔDSQ×After | | 0.737** | | 9.646*** | | 2.123** | | 3.103** | | 2.511*** |
| | | (2.23) | | (4.19) | | (1.97) | | (2.12) | | (3.37) |
| ΔC×DSQ×After | | | | | | | | | -1.894** | |
| | | | | | | | | | (-2.30) | |
| ΔC×ΔDSQ×After | | | | | | | | | | 20.554** |
| | | | | | | | | | | (2.42) |
| Year×Death Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Firm×Death Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Obs | 617 | 617 | 2,677 | 2,677 | 2,677 | 2,677 | 1,956 | 1,956 | 3,503 | 3,503 |
| Adj $R^2$ | 0.172 | 0.169 | 0.780 | 0.781 | 0.335 | 0.335 | 0.877 | 0.877 | 0.060 | 0.066 |
| *Panel B: Regressions include firm- and board-level controls* | | | | | | | | | | |
| DSQ×After | -0.111** | | -0.900*** | | -0.195* | | -0.433** | | -0.242*** | |
| | (-2.07) | | (-3.32) | | (-1.76) | | (-2.26) | | (-3.07) | |
| ΔDSQ×After | | 0.827* | | 9.002*** | | 1.975* | | 2.857* | | 2.586*** |
| | | (1.96) | | (4.79) | | (1.83) | | (1.87) | | (3.56) |
| ΔC×DSQ×After | | | | | | | | | -1.969** | |
| | | | | | | | | | (-2.54) | |
| ΔC×ΔDSQ×After | | | | | | | | | | 18.863*** |
| | | | | | | | | | | (2.67) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year×Death Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Firm×Death Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Obs | 617 | 617 | 2,651 | 2,651 | 2,651 | 2,651 | 1,954 | 1,954 | 3,503 | 3,503 |
| Adj $R^2$ | 0.230 | 0.228 | 0.827 | 0.828 | 0.337 | 0.337 | 0.878 | 0.878 | 0.282 | 0.283 |

## Table 13: Director-Specific Quality during the COVID-19 Pandemic

This table reports results from OLS regressions relating weekly stock returns to COVID-19 intensity and board-level DSQ from the first week of March 2020 through the first week of March 2021. The dependent variable *Return* in columns 1-6 is a firm's weekly stock return. *COVID* is the growth rate in weekly COVID-19 cases, defined as the natural logarithm of one plus the number of positive cases in week $t$ minus the natural logarithm of one plus the number of positive cases in week $t$-1. *DSQ* and *FSQ* are director- and firm-specific effects estimated using the AKM method using data only through 2019. *AvgDSQ* is the average *DSQ* across all directors during 2019. *AvgDSQq2-AvgDSQq4* (*FSQq2-FSQq4*) are indicator variables that equal one if the average director- (firm-) specific effect is in the second through fourth quartiles, respectively, and zero otherwise. Control variables interacted with *COVID* include *Ln(Size)*, *BHAR*, *LEV*, *OROA*, *IO*, *R&D*, *VOL*, *Beta*, *%Indep*, *%Female*, *CEO-Chair*, *Lead-Indep*, *Ln(BrdSize)*, *Pill*, and *ClassBrd*. All variables are defined in the Appendix. $t$-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | Return×100 | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| COVID | -3.109*** | -3.700*** | -4.789*** | | | |
| | (-68.89) | (-48.85) | (-30.58) | | | |
| COVID×AvgDSQ | | 1.415*** | | | | |
| | | (4.80) | | | | |
| COVID×AvgDSQq2 | | | 0.203 | 0.201 | 0.160 | 0.131 |
| | | | (1.54) | (1.52) | (1.19) | (1.05) |
| COVID×AvgDSQq3 | | | 0.343*** | 0.344*** | 0.255* | 0.251** |
| | | | (2.76) | (2.77) | (1.95) | (2.03) |
| COVID×AvgDSQq4 | | | 0.617*** | 0.612*** | 0.445*** | 0.396*** |
| | | | (4.98) | (4.94) | (3.31) | (3.14) |
| COVID×FSQ | | 1.406*** | | | | |
| | | (16.80) | | | | |
| COVID×FSQq2 | | | 0.481*** | 0.484*** | 0.471*** | 0.372*** |
| | | | (3.66) | (3.68) | (3.54) | (2.93) |
| COVID×FSQq3 | | | 1.056*** | 1.050*** | 0.981*** | 0.733*** |
| | | | (8.28) | (8.23) | (7.46) | (5.53) |
| COVID×FSQq4 | | | 1.837*** | 1.830*** | 1.672*** | 1.403*** |
| | | | (15.03) | (14.99) | (12.10) | (9.63) |
| COVID×ResidTQ | | 1.123*** | 1.068*** | 1.060*** | 1.557*** | 1.358*** |
| | | (9.43) | (8.61) | (8.55) | (6.51) | (5.80) |
| Firm FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Week FE | | | | ✓ | ✓ | |
| COVID×Controls | | | | | ✓ | ✓ |
| SIC2×Week FE | | | | | | ✓ |
| Obs | 148,316 | 148,316 | 148,316 | 148,316 | 148,316 | 148,200 |
| Adj $R^2$ | 0.026 | 0.028 | 0.028 | 0.319 | 0.320 | 0.387 |

# Do Individual Directors Matter? Evidence of Director-Specific Quality

## Online Appendix

## Table A1: Director Board Seat Composition

This table reports the number of boards each director sits on over the period 2000 to 2020. Panel A breaks down the number of different boards each director sits on over the sample period, while Panel B shows the number of firms who have directors that sit on more than one board and can be connected to a group following the AKM method.

*Panel A: Number of Directors that Sit on Multiple Boards*

| More than one board | Number of different boards | Number of directors | Percentage |
|---|---|---|---|
| No | 1 | 42,376 | 73.69 |
| Yes | 2 | 8,646 | 15.04 |
| | 3 | 3,315 | 5.76 |
| | 4 | 1,673 | 2.91 |
| | 5 | 757 | 1.32 |
| | 6 | 377 | 0.66 |
| | 7 | 180 | 0.31 |
| | 8 | 88 | 0.15 |
| | 9 | 37 | 0.06 |
| | >9 | 24 | 0.10 |
| | Total | 57,505 | 100 |

*Panel B: Number of Firms with Directors who Sit on Multiple Boards Over the Sample Period*

| Number of "movers" per firm | Number of firms | Percentage | Cumulative percentage |
|---|---|---|---|
| 0 | 594 | 8.42 | 8.42 |
| 1-5 | 3,420 | 48.46 | 56.88 |
| 6-10 | 1,904 | 26.98 | 83.86 |
| 11-20 | 960 | 13.6 | 97.46 |
| 21- 30 | 167 | 2.37 | 99.83 |
| 31- 50 | 12 | 0.17 | 100 |
| Total | 7,057 | 100 | |

## Table A2: Persistence in Director-Specific Quality

This table reports results from OLS regressions showing the persistence in DSQ and the likelihood that a director drops out of the sample over the period 2000 to 2020. The dependent variable *DSQ* in columns 1 and 2 is the director-specific effects estimated using the AKM method. The dependent variable *Not a Director* in columns 3 and 4 is an indicator variable equal to one if a director is not in our sample in the following period, and zero otherwise. The unit of analysis is a director-cohort pair. *DSQ* is estimated over seven three-year cohorts, except the first cohort (2000-2003) and the last cohort (2019-2020). This adjustment is done because there are fewer observations in the early years and more observations in the later years. *DSQq2*-*DSQq4* are indicator variables that equal one if the director-specific effect is in the second through fourth quartiles, respectively, and zero otherwise. Control variables averaged over each cohort include *Ln(#Seats)*, *Tenure*, *Busy*, *Indep*, *Age65*, *Chair-Lead*, *AuditCom*, *NomCom*, *CompCom*, *AuditChair*, *NomChair*, *CompChair*, and *IndExp*. All variables are defined in the Appendix. *t*-statistics in parentheses are calculated from standard errors clustered by director. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | $DSQ_{t+1}$ | | Not a $Director_{t+1}$ | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| DSQ | 0.218*** | | -0.172*** | |
| | (26.23) | | (-16.51) | |
| DSQq2 | | 0.022*** | | -0.117*** |
| | | (14.26) | | (-28.43) |
| DSQq3 | | 0.026*** | | -0.142*** |
| | | (16.35) | | (-34.79) |
| DSQq4 | | 0.026*** | | -0.060*** |
| | | (15.12) | | (-14.00) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Cohort FE | ✓ | ✓ | ✓ | ✓ |
| Obs | 79,817 | 79,817 | 112,573 | 112,573 |
| Adj $R^2$ | 0.110 | 0.064 | 0.063 | 0.073 |

# Table A3: Robustness: Mover Dummy Variables Approach

This table reports results from OLS regressions relating DSQ to the director- and firm-level outcomes from Tables 5-11. The dependent variables in columns 1-7, samples, and control variables are the same as those in their respective tables. However, in this table, *DSQ* and *FSQ* are estimated using the mover dummy approach that is restricted to only directors that have more than one board appointment. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | %Vote | Appt. CAR[-2,2]×100 | M&A CAR[-2,2]×100 | Ln(Delta) | %Equity | Ln(1+$Pats) | $r - R^B$ |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| DSQq2 | 0.336*** | 0.100 | | | | | |
| | (2.62) | (0.53) | | | | | |
| DSQq3 | 0.477*** | 0.381** | | | | | |
| | (3.77) | (2.07) | | | | | |
| DSQq4 | 0.555*** | 0.620*** | | | | | |
| | (4.06) | (3.23) | | | | | |
| AvgDSQq2 | | | 0.294 | 0.082** | 0.013* | 0.094 | 0.006 |
| | | | (1.15) | (2.22) | (1.70) | (1.29) | (0.89) |
| AvgDSQq3 | | | 0.742*** | 0.185*** | 0.023*** | 0.171** | 0.005 |
| | | | (2.88) | (4.95) | (2.80) | (2.17) | (0.77) |
| AvgDSQq4 | | | 0.682** | 0.324*** | 0.023*** | 0.263*** | 0.030*** |
| | | | (2.49) | (7.72) | (2.79) | (3.47) | (4.25) |
| ΔC | | | | | | | 0.945*** |
| | | | | | | | (8.26) |
| ΔC×AvgDSQq2 | | | | | | | 0.029 |
| | | | | | | | (0.39) |
| ΔC×AvgDSQq3 | | | | | | | 0.095 |
| | | | | | | | (1.24) |
| ΔC×AvgDSQq4 | | | | | | | 0.250*** |
| | | | | | | | (3.07) |
| ResidTQ | 1.898*** | 0.010 | 0.149 | 0.690*** | 0.092*** | 0.265*** | -0.398*** |
| | (8.03) | (0.06) | (0.38) | (15.45) | (8.17) | (5.01) | (-40.68) |
| ΔC×ResidTQ | | | | | | | 0.300*** |
| | | | | | | | (3.47) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Obs | 90,623 | 9,268 | 8,065 | 26,999 | 26,999 | 22,229 | 37,675 |
| Adj $R^2$ | 0.084 | 0.036 | 0.057 | 0.546 | 0.150 | 0.525 | 0.263 |

## Table A4: Robustness: Accounting for CEO-Firm Matching

This table reports results from OLS regressions relating DSQ to the director- and firm-level outcomes from Tables 5-11. The dependent variables in columns 1-7, samples, and control variables are the same as those in their respective tables. However, in this table, *DSQ* and *FSQ* are estimated using the AKM method after replacing the firm fixed effects with CEO-firm pair fixed effects. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | %Vote | Appt. CAR[-2,2]×100 | M&A CAR[-2,2]×100 | Ln(Delta) | %Equity | Ln(1+$Pats) | $r - R^B$ |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| DSQq2 | 0.244** | 0.306** | | | | | |
| | (2.08) | (1.99) | | | | | |
| DSQq3 | 0.455*** | 0.467*** | | | | | |
| | (3.64) | (3.08) | | | | | |
| DSQq4 | 0.463*** | 0.904*** | | | | | |
| | (3.04) | (5.58) | | | | | |
| AvgDSQq2 | | | 0.413* | 0.071* | 0.025*** | -0.057 | -0.013* |
| | | | (1.68) | (1.95) | (3.22) | (-0.76) | (-1.88) |
| AvgDSQq3 | | | 0.581** | 0.119*** | 0.022*** | -0.092 | -0.005 |
| | | | (2.34) | (3.21) | (2.68) | (-1.16) | (-0.73) |
| AvgDSQq4 | | | 0.687*** | 0.229*** | 0.016** | 0.148* | 0.007 |
| | | | (2.68) | (5.63) | (2.01) | (1.93) | (0.99) |
| ΔC | | | | | | | 1.068*** |
| | | | | | | | (9.88) |
| ΔC×AvgDSQq2 | | | | | | | -0.005 |
| | | | | | | | (-0.06) |
| ΔC×AvgDSQq3 | | | | | | | -0.075 |
| | | | | | | | (-0.92) |
| ΔC×AvgDSQq4 | | | | | | | 0.103 |
| | | | | | | | (1.24) |
| ResidTQ | 1.906*** | 0.066 | -0.262 | 0.548*** | 0.093*** | 0.215*** | -0.446*** |
| | (7.09) | (0.35) | (-0.57) | (11.78) | (7.41) | (3.97) | (-42.12) |
| ΔC×ResidTQ | | | | | | | 0.241** |
| | | | | | | | (2.54) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Obs | 157,204 | 15,916 | 8,478 | 27,350 | 27,350 | 22,587 | 39,278 |
| Adj $R^2$ | 0.087 | 0.036 | 0.056 | 0.546 | 0.157 | 0.522 | 0.262 |

## Table A5: Robustness: Out-of-Sample Estimation

This table reports results from OLS regressions relating DSQ to the director- and firm-level outcomes from Tables 5-11. The dependent variables in columns 1-7, samples, and control variables are the same as those in their respective tables. However, in this table, *DSQ* and *FSQ* are estimated using the AKM method using data up to *t*-1. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | %Vote | Appt. CAR[-2,2]×100 | M&A CAR[-2,2]×100 | Ln(Delta) | %Equity | Ln(1+$Pats) | $r - R^B$ |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| DSQq2 | 0.484*** | 0.161 | | | | | |
| | (4.48) | (0.69) | | | | | |
| DSQq3 | 0.564*** | 0.282 | | | | | |
| | (4.59) | (1.19) | | | | | |
| DSQq4 | 0.528*** | 0.685*** | | | | | |
| | (3.45) | (2.67) | | | | | |
| AvgDSQq2 | | | -0.028 | 0.166*** | 0.019** | 0.156*** | 0.001 |
| | | | (-0.11) | (4.99) | (2.51) | (2.69) | (0.22) |
| AvgDSQq3 | | | 0.058 | 0.264*** | 0.021** | 0.096 | -0.004 |
| | | | (0.21) | (7.24) | (2.44) | (1.48) | (-0.62) |
| AvgDSQq4 | | | 0.128 | 0.371*** | 0.030*** | 0.209*** | -0.022*** |
| | | | (0.43) | (9.06) | (3.19) | (3.13) | (-3.07) |
| ΔC | | | | | | | 0.943*** |
| | | | | | | | (8.35) |
| ΔC×AvgDSQq2 | | | | | | | 0.105 |
| | | | | | | | (1.41) |
| ΔC×AvgDSQq3 | | | | | | | 0.137* |
| | | | | | | | (1.84) |
| ΔC×AvgDSQq4 | | | | | | | 0.210*** |
| | | | | | | | (2.61) |
| ResidTQ | 2.535*** | -0.266 | 1.356*** | 1.079*** | 0.031* | 0.651*** | -0.157*** |
| | (8.78) | (-1.20) | (2.80) | (16.72) | (1.89) | (7.64) | (-16.57) |
| ΔC×ResidTQ | | | | | | | 0.364*** |
| | | | | | | | (4.06) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Obs | 146,128 | 6,028 | 6,635 | 22,731 | 22,731 | 21,909 | 37,066 |
| Adj $R^2$ | 0.092 | 0.033 | 0.058 | 0.541 | 0.136 | 0.515 | 0.218 |

## Table A6: Robustness: Estimating DSQ from Stock Returns

This table reports results from OLS regressions relating DSQ to the director- and firm-level outcomes from Tables 5-11. The dependent variables in columns 1-7, samples, and control variables are the same as those in their respective tables. However, in this table, *DSQ* and *FSQ* are estimated from Eq. (1) except that the dependent variable is DGTW characteristic-adjusted stock returns over a firm's fiscal year instead of Tobin's Q. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | %Vote | Appt. CAR[-2,2]×100 | M&A CAR[-2,2]×100 | Ln(Delta) | %Equity | Ln(1+$Pats) | $r - R^B$ |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| DSQq2 | 0.312*** | 0.293* | | | | | |
| | (2.74) | (1.74) | | | | | |
| DSQq3 | 0.377*** | 0.355** | | | | | |
| | (2.91) | (2.12) | | | | | |
| DSQq4 | 0.453*** | 0.841*** | | | | | |
| | (3.10) | (4.80) | | | | | |
| AvgDSQq2 | | | 0.432* | 0.250*** | 0.036*** | 0.164** | -0.006 |
| | | | (1.66) | (6.94) | (4.34) | (2.22) | (-0.84) |
| AvgDSQq3 | | | 0.886*** | 0.447*** | 0.037*** | 0.265*** | 0.001 |
| | | | (3.23) | (11.84) | (4.41) | (3.14) | (0.15) |
| AvgDSQq4 | | | 1.191*** | 0.586*** | 0.041*** | 0.227*** | 0.042*** |
| | | | (4.05) | (13.85) | (4.81) | (2.68) | (5.73) |
| ΔC | | | | | | | 1.290*** |
| | | | | | | | (14.05) |
| ΔC×AvgDSQq2 | | | | | | | 0.023 |
| | | | | | | | (0.31) |
| ΔC×AvgDSQq3 | | | | | | | 0.001 |
| | | | | | | | (0.01) |
| ΔC×AvgDSQq4 | | | | | | | 0.236*** |
| | | | | | | | (2.94) |
| ResidTQ | 0.793*** | -0.056 | -0.196 | -0.027 | -0.031*** | -0.427*** | -0.096*** |
| | (6.30) | (-0.31) | (-0.75) | (-1.21) | (-5.09) | (-11.18) | (-17.68) |
| ΔC×ResidTQ | | | | | | | -0.073 |
| | | | | | | | (-1.28) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Obs | 149,299 | 12,749 | 7,293 | 25,830 | 25,830 | 20,508 | 35,163 |
| Adj $R^2$ | 0.089 | 0.034 | 0.053 | 0.554 | 0.157 | 0.542 | 0.219 |

## Table A7: Robustness: Use DSQ Estimates from "Mover" Sample

This table reports results from OLS regressions relating DSQ to the director- and firm-level outcomes from Tables 5-11. The dependent variables in columns 1-7, samples, and control variables are the same as those in their respective tables. However, in this table, we restrict the sample in columns 1 and 2 to directors with directorships at two or more firms, and in columns 3-7, we calculate *AvgDSQ* using directors with directorships at two or more firms. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | %Vote | Appt. CAR[-2,2]×100 | M&A CAR[-2,2]×100 | Ln(Delta) | %Equity | Ln(1+$Pats) | $r - R^B$ |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| DSQq2 | 0.325** | 0.177 | | | | | |
| | (2.59) | (0.91) | | | | | |
| DSQq3 | 0.498*** | 0.371* | | | | | |
| | (3.89) | (1.94) | | | | | |
| DSQq4 | 0.591*** | 0.718*** | | | | | |
| | (4.14) | (3.32) | | | | | |
| AvgDSQq2 | | | 0.166 | 0.086** | 0.015* | 0.078 | 0.003 |
| | | | (0.64) | (2.31) | (1.95) | (1.08) | (0.43) |
| AvgDSQq3 | | | 0.638** | 0.190*** | 0.023*** | 0.185** | 0.006 |
| | | | (2.50) | (5.00) | (2.83) | (2.33) | (0.87) |
| AvgDSQq4 | | | 0.653** | 0.353*** | 0.026*** | 0.268*** | 0.026*** |
| | | | (2.37) | (8.34) | (3.12) | (3.52) | (3.65) |
| ΔC | | | | | | | 0.996*** |
| | | | | | | | (9.32) |
| ΔC×AvgDSQq2 | | | | | | | 0.030 |
| | | | | | | | (0.40) |
| ΔC×AvgDSQq3 | | | | | | | 0.061 |
| | | | | | | | (0.80) |
| ΔC×AvgDSQq4 | | | | | | | 0.249*** |
| | | | | | | | (3.06) |
| ResidTQ | -0.218*** | -0.024 | -0.286 | 0.569*** | 0.082*** | 0.188*** | -0.384*** |
| | (-2.84) | (-0.17) | (-0.73) | (13.85) | (7.67) | (3.81) | (-40.84) |
| ΔC×ResidTQ | | | | | | | 0.282*** |
| | | | | | | | (3.27) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Obs | 98,182 | 9,266 | 7,987 | 26,999 | 26,999 | 22,229 | 37,675 |
| Adj $R^2$ | 0.081 | 0.037 | 0.055 | 0.544 | 0.149 | 0.528 | 0.261 |

## Table A8: Robustness: Use DSQ Estimates from “Non-Mover” Sample

This table reports results from OLS regressions relating DSQ to the director- and firm-level outcomes from Tables 5-11. The dependent variables in columns 1-7, samples, and control variables are the same as those in their respective tables. However, in this table, we restrict the sample in columns 1 and 2 to directors with directorships at only one firm, and in columns 3-7, we calculate *AvgDSQ* using directors with directorships at only one firm. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

| | %Vote | Appt. CAR[-2,2]×100 | M&A CAR[-2,2]×100 | Ln(Delta) | %Equity | Ln(1+$Pats) | $r - R^B$ |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| DSQq2 | -0.083<br>(-0.48) | 0.393<br>(1.63) | | | | | |
| DSQq3 | 0.132<br>(0.75) | 0.699***<br>(2.88) | | | | | |
| DSQq4 | 0.245<br>(1.20) | 0.893***<br>(3.91) | | | | | |
| AvgDSQq2 | | | 0.175<br>(0.68) | 0.180***<br>(4.83) | 0.026***<br>(3.14) | -0.057<br>(-0.75) | 0.010<br>(1.43) |
| AvgDSQq3 | | | 0.324<br>(1.20) | 0.234***<br>(5.61) | 0.029***<br>(3.24) | -0.053<br>(-0.66) | 0.006<br>(0.80) |
| AvgDSQq4 | | | 0.508*<br>(1.76) | 0.421***<br>(9.80) | 0.039***<br>(4.38) | 0.337***<br>(4.32) | 0.023***<br>(3.01) |
| ΔC | | | | | | | 0.987***<br>(9.28) |
| ΔC×AvgDSQq2 | | | | | | | 0.240***<br>(3.21) |
| ΔC×AvgDSQq3 | | | | | | | 0.203***<br>(2.58) |
| ΔC×AvgDSQq4 | | | | | | | 0.315***<br>(3.58) |
| ResidTQ | -0.327**<br>(-2.36) | 0.558<br>(1.38) | -0.234<br>(-0.55) | 0.534***<br>(12.41) | 0.076***<br>(6.68) | 0.113**<br>(2.31) | -0.389***<br>(-39.46) |
| ΔC×ResidTQ | | | | | | | 0.182**<br>(2.08) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC2 FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Obs | 74,681 | 6,872 | 7,721 | 25,286 | 25,286 | 20,762 | 36,562 |
| Adj $R^2$ | 0.094 | 0.038 | 0.054 | 0.541 | 0.157 | 0.504 | 0.260 |

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