Director skill sets*

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I. Introduction

The literature on boards argues that directors may (or may not) add value for different reasons. Some directors may add value because of who they work for, as the literature on industry experience argues.[1] Some have potentially valuable professional or career skills.[2] Others may add value because the titles they hold, e.g. CEO or CFO, suggest they have valuable leadership or financial skills.[3]

But, if outside directors with industry experience comprise only 18.9% of independent directors (Faleye, Hoitash and Hoitash, 2012) or 6.5% of the entire board (Dass et al., 2013) and CEOs comprise only roughly 6.6% of new director appointments (Fahlenbrach, Low and Stulz, 2010), then this begs the question: what skills do the other directors have? For example, J.C. Penney's 2010 proxy statement reports the employment experience of director R. Gerald Turner as follows:

> *President of Southern Methodist University since 1995; Chancellor of the University of Mississippi from 1984 to 1995; Co-Chairman, Knight Commission on Intercollegiate Athletics since 2005; Director of Kronos Worldwide, Inc., American Beacon Funds and the National Association of Independent Colleges and Universities.*

Mr. Turner does not seem to have direct industry experience that is relevant for J.C. Penney, a chain of American mid-range department stores. As his leadership experience lies outside the corporate sector, he also does not hold an organizational position that would normally be classified as indicative of valuable executive or financial skills. Although Mr. Turner's background gives the impression that he can add value, it is not obvious how to classify his skills.

[1] See Kor and Misangyi (2008), Faleye, Hoitash and Hoitash (2012), Masulis, Ruzzier, Xiao and Zhao (2012), Dass, Kini, Nanda, Onal and Wang (2013), Drobetz, Von Meyerinck, Oesch and Schmid (2013).
[2] See Krishnan, Wen and Zhao (2011), Masulis, Wang and Xie (2012).
[3] See Fich (2005), Guner, Malmendier and Tate (2008), Fahlenbrach, Low and Stulz (2010), Bedard, Hoitash and Hoitash (2014).

Even if directors have well-defined skills, the evidence that they add value because of these skills is not always clear. For example, while Drobetz, et al. (2013), Dass, et al. (2013) and Faleye, Hoitash and Hoitash (2012) find that directors' industry experience adds value, Kang, Kim and Lu (2013) find that the effect of industry experience is insignificant in some circumstances. Similarly, Fich (2005) finds that shareholders seem to value CEO experience of directors, while Fahlenbrach, Low and Stulz (2010) find that CEOs do not add value.

Whether or not a particular skill adds value may in part depend on the other skills that are represented on the board. Suppose both boards A and B contain an outside director with CEO experience. Suppose further that the other directors on board A consist of lawyers and consultants, but the other directors on board B have executive experience, as CFOs, presidents or other senior executives in their companies. For board A, the CEO's skill may complement the lawyers' skills. On the other hand, the lawyers may not always understand the CEO's viewpoint and vice versa because they approach problem-solving in different ways. In a theoretical model, the CEO and the lawyers might have different priors (e.g. Garlappi, Giammarino and Lazrak, 2014). There may be no communication problems on board B because the directors share common ground. However, board B may lack diversity in skills.

Rather than examining skills one at a time, in this paper we ask how skills are clustered across boards and whether there are boards with skill *sets* that lead them to systematically outperform other boards. We examine which skills directors have in a sample of 833 firms in 2010 by exploiting the 2009 amendment to Regulation S-K requiring that public U.S. firms must describe their reasons for nominating directors. According to this rule, firms have to disclose the skills they believe each director brings to the table.

We first show that directors are not one-dimensional. On average firms report that outside directors have 2.7 skills and inside director have 2.54 skills. Although one may be

concerned that firms may engage in window dressing of their directors' skills, worse performing firms do not write more about their directors than better performing firms. Firms also do not simply disclose committee assignments of directors as skills. For example, firms report that only 32 percent of the directors on governance committees have governance skills. The average percentage of committee members with a skill matching the committee's purpose is 32.8 percent. Our finding that directors are multi-dimensional suggests that it may be difficult for outsiders to understand which skills of a particular director are the most valuable for a firm.

We characterize all director skills that firms deem important and then examine how skills cluster on boards. Our data show that all firms have at least one director with finance and accounting skills. Other frequently represented skills are outside executive experience (83 percent), outside board experience (74 percent), leadership skills (68 percent), strategic planning skills (63 percent), and management experience (62 percent). Fewer than four percent of firms appoint a director with specific experience in environmental and sustainability issues.

Following Kaplan, Klebanov and Sorenson (2012) and Custodio, Ferreira and Matos's (2013) examination of CEO characteristics, we use factor analysis to extract the main dimensions along which boards vary with respect to the skills of their directors. We find that boards vary primarily along one dimension: the diversity of skills that are available on a board. Some firms assign directors with many different skills to their board, while other firms focus on a few particular skills. As such, we conclude that there is an important distinction between diverse boards and boards with substantial concentration of skills. To provide further evidence that this distinction is important, we examine whether diversity of skills is related to firm performance.

Boards with greater skill diversity do not perform better. Using Blau (1977) measures of concentration of types, we find evidence that this result is driven by a lack of common ground in skill sets that arises with greater diversity. To further examine the effects of having skill-based common ground, we consider the overlap in skills between inside and outside directors. We find that common ground between inside and outside directors, i.e. a relatively high concentration of skills between inside and outside directors, is positively related to firm performance. We also document that boards with more common ground have fewer board meetings. This is suggestive evidence that directors on boards with more common ground may be able to communicate more effectively, in line with arguments in e.g. Murray (1989), Knight et al. (1999), Pelled, Eisenhardt and Xin (1999) and Simons, Pelled, and Smith (1999) that having common ground among group members can facilitate effective decision making.

Our paper makes three main contributions to the literature. First, we move away from a one-dimensional treatment of directors and boards by characterizing their skill sets. A particular strength of the data is that it represents the firm's perspective rather than a perspective chosen by researchers. In this regard, we complement prior studies focusing on particular skills of directors. The second main contribution is that we characterize an important dimension along which boards vary with respect to skill. Just as Kaplan et al. (2012) and Custodio et al. (2013) expand our view on relevant CEO types, our study suggests that there are different board "types".

Finally, our paper complements the literature on board diversity (e.g. Adams and Ferreira, 2009; Anderson et al., 2011; Knyazeva et al., 2011) by showing how different measures of skill heterogeneity relate to the value of the firm. What distinguishes our paper from this literature is that we do not start with the premise that skill diversity may matter. Instead, diversity arises endogenously as an important characteristic from the factor analysis.

Thinking of directors and boards as bundles of characteristics can lead to new and interesting insights concerning board decision-making. Garlappi, Giammarino and Lazrak (2014) examine the role of heterogenous priors and disagreement on board decision-making. The assumption of different priors is difficult to justify if directors are the same in all but one dimension. But, if directors differ in several dimensions, their skill sets are unlikely to overlap and it is plausible that frictions in team decision-making can arise and affect firm outcomes.

The multi-dimensionality of director skill sets may help explain outcomes in the director labor market. Studies relating individual director characteristics to firm value often face the challenge of explaining why firms do not optimize. If industry experience is positively related to firm performance, for example, then firms would do better by having more industry experts. The question is why they do not. If we view directors as one-dimensional, this question is difficult to answer. But if we view directors as multi-dimensional, it becomes easier. When firms appoint directors, they face a multi-dimensional search problem. In the presence of frictions, e.g. search costs, firms may not be able to optimize along every dimension. Similarly, in trying to fulfill governance regulations focusing on one characteristic, e.g. independence, firms may not achieve the best match between new directors and the board. Thus, governance regulations may not always lead to better firm outcomes.

Incorporating a multi-dimensional perspective into governance theory and empirical work is challenging. But future governance research and policy may still benefit from recognizing that the governance problems firms face are more complex than we typically imagine.

II. Data

We describe our sample and then discuss whether the data on director qualifications appears to contain information that is not readily available from other archival sources.

II.A Sample description

We start with the 1,481 firms in the RiskMetrics database in 2010 and eliminate 57 firms that are headquartered overseas and 337 utilities and financial firms (two digit SIC codes 49 and 60-69). We collect the 2010 proxy statements from SEC Edgar, which contain the first descriptions of director skill sets following the 2009 amendment to regulation S-K. We exclude 181 firms that did not disclose director skills for all directors on their boards. Since the 2010 proxy statements describe directors elected to the board for the 2010 fiscal year, we obtain data on the remaining firms' financial characteristics for fiscal year 2010 from Compustat and CRSP. We obtain board and director information from RiskMetrics and data on all board committees and directors' committee memberships from RiskMetrics and BoardEx.

Our main performance measure is a proxy for Tobin's Q which we measure as the book value of assets minus the book value of equity plus the market value of equity, divided by the book value of assets. We use RiskMetrics' classification to define director independence. We consider a firm to have a blockholder on the board if at least one outside director has at least 5% of the firm's shares according to Riskmetrics. The Appendix provides a detailed description of the variables in our study. After eliminating 58 firms with missing financial or governance data and 15 firms with extreme values of Tobin's Q, we end with a sample of 833 firms. Table 1 reports summary statistics of the characteristics of these firms.

[please insert Table 1 here]

The firms in our sample have an average market value of about 8.4 billion dollars. They have an average Tobin's Q of 1.847, and return on assets of 4%. The typical firm has 9 board members and 3 board committees, and 80% of the directors in a typical firm are classified by RiskMetrics as being independent.[4]

II.B Regulation S-K and director skill sets

The December 16, 2009 amendments to Regulation S-K, which lays out reporting requirements for public companies in the United States, require companies to provide insight into their considerations for nominating directors. Item 401(e) of Regulation S-K states:

> *Briefly discuss the specific experience, qualifications, attributes or skills that led to the conclusion that the person should serve as a director for the registrant at the time that the disclosure is made, in light of the registrant's business and structure. If material, this disclosure should cover more than the past five years, including information about the person's particular areas of expertise or other relevant qualifications.*

The new rules became effective as of February 28, 2010 for fiscal years ending on or after December 20, 2009.[5] The rule applies to proxy and information statements, annual reports, and registration statements, but not to foreign private issuers. Guidance from the SEC emphasizes that disclosure should be provided on an individual, director-by-director basis.

In total, our sample includes 6,311 outside (independent or grey) directors and 1,178 inside directors. From the 2010 proxy statements we obtain firms's justifications for hiring these directors. We code skills by matching these texts to a list of 20 skills from a Conference board publication (Conference Board, 2010).[6] Conference Board (2010) analysed Regulation S-K disclosure in 30 Dow Jones companies and identified 20 director skills. We modify their

[4] The company with firm age and director tenure equal to zero is Towers Watson & Co which was created in 2009/2010. Standard Pacific Corp. has had zero capital expenditures since 2008.
[5] Thirty-one of our sample firms had annual meeting dates between January 1, 2010 and February 28, 2010. Although technically the rule did not yet apply to them, all of them followed the disclosure rule.
[6] We hired a company to type firms' justifications for hiring directors from the 2010 proxy statements into Excel. To ensure consistency the same person coded all directors' skills and we verified them at random.

categories as follows. We drop the "Operations" category as we believe most directors have some operational experience. We also drop "Philanthropic or Non-Profit Experience" as it occurs so rarely (fewer than 2% of directors). We then add the categories of "Management" and "Outside Executive Experience" because a substantial number of firms in our sample report these as being important. Table 2 provides an overview of our final set of 20 skills.

[please insert Table 2 here]

A classification as an "Academic" (for 9.2% of outside directors and 4.5% of inside directors) indicates that the firm stresses that the director's academic position or PhD degree is an important determinant of the director's selection to serve as a board member. The classification "Company business" indicates that the firm chose the director because of his or her experience in the firm's business. We code all insiders as having "Company Business" experience because we view the omission of this category from an insider's skill set as measurement error. We classify a director who was selected as a board member because of experience in compensation and benefits (for 6.3% of outside and 0.9% of inside directors) as having "Compensation" skills. The other categories are: Entrepreneurial, Finance and accounting, Governance, Government and policy, International, Leadership, Legal, Management, Manufacturing, Marketing, Outside board, Outside executive, Risk management, Scientific, Strategic planning, Sustainability, and Technology. Panel A of Table 3 reports the means and standard deviations of the skills at the outside and the inside director level. Figure 1 shows the distribution of director skills. As Figure 1 shows, the skill categories we created, "Outside Executive Experience" and "Management", are the third and seventh most important skills at the director level.

[please insert Table 3 here]

[please insert Figure 1 about here]

Several features of our classification are worth noting. First, directors are not one-dimensional. Instead, they have skill *sets*. For example, J.C. Penney's 2010 proxy statement reports the skills of director R. Gerald Turner as follows:

> *Mr. Turner's extensive career in academia provides the Company with valuable insights and perspectives on communicating with younger customers and Associates. He also brings experience and skills in human resources and management. Mr. Turner's current experience as president of a leading university provides him with perspective into the challenges of managing complex, multi-faceted organizations. In addition, his service on the boards of other publicly-traded companies, including committee service, has given him insights and perspectives on governance and human resources and compensation which benefit the JC Penney Board.*

We code Mr. Turner as possessing skills in the following areas: Academic, Compensation, Governance and Management. With 4 skills, Mr. Turner is above average. The average director in our sample has 2.67 skills. Figure 2A shows the distribution of the number of skills per director type. Most directors have two or three important skills, regardless of whether they are inside or outside directors. While it is obvious that directors will have several skills, we believe it is worth highlighting because most empirical work on boards typically focuses on one skill at a time, e.g. industry, leadership or professional experience.

[please insert Figure 2 here]

Another point worth noting is that firms describe more outside directors as being familiar with the company's business than the recent literature on industry experience does (e.g. Kor and Misangyi, 2008; Faleye, Hoitash and Hoitash, 2012; Masulis, et al., 2012; Dass, et al., 2013; Drobetz, et al., 2013). We find that firms characterize 23.1% of outside directors as having company business related skills. Using Boardex, Faleye, Hoitash and Hoitash

(2012) document for a similar sample (unregulated S&P 1500 firms) that 18.9% of independent directors are "industry experts". This difference suggests that some directors may be misclassified based purely on names of employers.

Of course, the data resulting from Regulation S-K is not without its own problems. The first problem is that the data has so many dimensions. This suggests that characterizing the skills of the board using simple percentages of directors with a certain skill is not sufficient. The second is that firms's stated reasons for hiring directors may not reflect their true motives. We deal with the first problem by examining board-level counts of skill categories, doing a factor analysis and examining aggregate measures of individual directors's skills. We deal with the second problem by conducting various tests in Section II.C to examine if the data appears to be informative.

To characterize a firm's board of directors using board-level counts of skill categories, we examine whether a particular skill is mastered by at least one of the directors on a firm's board. A skill category receives a value of one if at least one director possesses this skill, and is zero otherwise. Table 3 shows summary statistics for the board level skills. Figure 2B shows the distribution of the number of skills at the board level and Figure 1 shows the distribution of skills types across firms.All boards have a Finance and Accounting expert, which is not surprising given the emphasis on the role of financial experts after SOX. About half of the firms in our sample have an expert in strategic planning on their board; the same applies to governance. Fewer than four percent of the boards include a member with experience in environmental and sustainability issues. The five skills that are most likely to be represented on a board are: finance and accounting skills, company business, outside executive experience, outside board experience, and leadership skills.

II.C Are firms' stated reasons for appointing directors informative?

The primary concern one may have about the regulation S-K data is that firms may not reveal the true reasons directors are valuable to them. We conduct five tests to examine whether the reported skills under Regulation S-K are actually informative. First, we examine whether the number of skills correlates with age and outside directorships. If reported skills are informative, one would expect people with more directorships to have more reported skills. Also, directors who are older are likely to have experience in more areas. We calculate correlations between the number of skills of every director and their age and number of outside directorships. When calculating the total number of skills per director, we exclude the "Outside board" experience category as this will be mechanically related to the number of directorships. Panel B of Table 3 shows that both the correlation coefficient between the number of skills and age and the correlation coefficient between the number of skills and outside directorships are positive, which suggests that the reported skills are informative.

Second, we examine whether the skills simply mirror the committee assignments directors have. If, for example, firms assign "governance" skills to everybody on the governance committee, and do not assign skills that are not related to committee membership, then the reported skills do not provide more information than the committee memberships already do. To construct the set of committee memberships for all directors, we start with data on compensation, audit, governance and nominating committee memberships in RiskMetrics and supplement it with additional committee memberships from Boardex.[7] Because firms vary in how they describe committees, we combine committee names that are similar. For example, "Antitrust Compliance" and "Special Litigation" both fall into the "Legal Issue" committee category. We identify 37 types of committees in RiskMetrics and

[7] RiskMetrics only contains information for 3 committees: compensation, audit, governance and nominating. Boardex has data on all committees. We started with RiskMetrics because the names of these three committees were already standardized. Committee names in Boardex vary a lot and need to be classified as belonging to the same category.

Boardex and combine them into 20 different categories. Since one of these categories (Chairman committee) does not occur in our sample, we end with 19 committees. We then calculate the percentage of directors on a committee that firms describe as having the skill associated with the committee, for example, the percentage of directors on the governance committee with "governance" skills.

Panel C of Table 3 shows the number of occurrences of committees of a given type in our sample and the committee skill match ratio. Riskmetrics duplicates committees whenever a committee shares tasks (see Adams, Ragunathan and Tumarkin, 2015). For example, if a firm has one Audit and Compensation committee, Riskmetrics will report that the firm has one Audit committee and one Compensation committee with equal membership. This explains why the occurrence of each committee Riskmetrics covers is so high in our sample. Since "Finance", "Compensation" and "Governance" are important skills in our sample, we keep the Riskmetrics committees separate for the purpose of matching skills to committees.

All match ratios are below 100%, which illustrates that assigned skills do not simply reflect the committees that directors are on. For example, firms assign governance as a skill to only 32.0 percent of the directors on the governance committee and the average match ratio over all committees is only 32.8 percent. If serving on a committee gives directors skills in a particular area, as the description of R. Gerald Turner above suggests, then the low committee skill match ratio suggests firms may be underreporting director skills. We examine the effects of including and excluding skills associated with committee memberships further in Section IV.B.

Third, we examine whether firms use director skills to window dress poor performance. If this is the case, then we expect poorly performing firms to write more about their directors. We split our sample of director descriptions into those belonging to firms with positive ROA (6,195 observations) and those belonging to firms with negative ROA (1, 294

observations) and count the average number of words that profitable and unprofitable firms use in describing the qualities of their directors. Panel D of Table 3 shows the results. On average, profitable firms use 58 words to describe their directors and unprofitable firms use 54 words. Thus, if anything, profitable firms write more about their directors on average. However, the mean difference of four words is not economically significant and the standard deviations in the number of words are also fairly similar: 32.8 and 28.3 for profitable and unprofitable firms, respectively. Thus, these univariate results do not suggest that profitable and unprofitable firms behave any differently in describing their directors' skills. We examine potential window dressing further in Section IV.D.

Fourth, we examine whether firms attribute the same skills to directors with multiple directorships. There are 1,615 directors in our sample with more than one directorship at another sample firm. The average number of within-sample directorships that these directors have is 2.96. We examine how different firms report the skills associated with the same director. If the disclosure is informative, then we do not expect firms to report exactly the same skills for the same individual as this would mean that firms simply copy directors' biographies without considering which skills they deem relevant. On the other hand, if there is no overlap in reported skills then the reported experience is also not very informative, or at least highly subjective.

To compare firms's descriptions, we calculate a "clarity score" for directors on more than one board. In calculating this score, we exclude the "Company business" category, as this category would differ across firms almost automatically. We illustrate the clarity score using an example: If a director is on three boards, and 2/3 of the descriptions report skill A, 1/3 reports skill B, and 2/3 reports skill C, then the clarity score is the average of 2/3, 1/3, and 2/3. Thus, the clarity score will be positive and has a maximum value of one, which would indicate perfect overlap. Panel E of Table 3 shows that the average clarity score is 0.563.

Hence, firms do not simply report directors' biographies, but there is still some overlap in the skills that they assign to directors. We exploit the information on directors with multiple directorships further in Section IV.C and IV.D.

As a final check whether firms' descriptions are informative, we examine whether we can verify at least one reported skill through other sources. For many skills we could not identify another data source that we could use to double-check firms's descriptions, e.g. "Leadership" or "Strategic Planning". Even for skills for which we could identify sources, it proved prohibitively time-consuming to verify each skill. Thus, we focus on a skill that is relatively easy to measure and for which it should be straightforward to characterize measurement error, namely the "International" skill.

To verify "International" skills, we use education, work history and board seat data in Boardex. We match our sample of directors on names and company to Boardex. Due to incomplete coverage of directors in our sample and missing education data, we end with a sample of 5,784 out of 7,489 directors with information in Boardex. According to Boardex, 2,556 of these directors have some international experience in the form of non-US education (421), non-US employment (1,579) or non-US board seat experience (1,496). These categories are not mutually exclusive as some directors fall into more than one category.

Our sample firms report international skills for 681 of the 5,784 directors with Boardex information. Of these 681, 419 (61.53%) have some form of international experience according to Boardex. To examine why firms report international skills for directors who do not have international experience according to our Boardex classification, we did a random check of skill descriptions. In each case, the firm reported that the director had experience with international expansion or international merger and acquisition activity. So firms appear to be reporting skills accurately.

Firms do not appear to be simply copying directors's CVs. For 2,137 out of 2,556 (83.6%) of our directors who have some international experience according to our Boardex classification, firms do not indicate that international experience is important. It is possible that firms underreport skills, which means we underestimate skill diversity on the board. It is also possible that the international experience is simply less important for these directors. More of these directors are American (61.39%) than the directors for whom firms report international skills (51.31%). If the Americans's international experience arose because they were exchange students abroad, for example, then this may be irrelevant for firms.

III. The main dimension along which boards vary with respect to skill

A natural question is whether certain skills appear together on the board. Table 4 shows the correlation matrix for the 20 board-level skill variables. It suggests that some skills do cluster. For example, boards that have risk management skills are more likely to also have at least one director with governance skills, but less likely to have a director with entrepreneurial skills. In such a setting factor analysis can be useful to capture the variability among the observed, correlated board skills in terms of a lower number of unobserved factors which describe characteristics that tend to vary together. For example, Kaplan, Klebanov and Sorenson (2012) use factor analysis to identify two main dimensions of ability (talent and execution skills) from 30 characteristics and abilities of CEOs in private equity transactions. Custodio, Ferreira and Matos (2013) use factor analysis to measure a CEO's general versus specific managerial skills.

[please insert Table 4 here]

We extract the main dimensions of variation in skills on the board using factor analysis. We use both the maximum likelihood method (ML) as well as the iterated principal

factor method (IPF), which, unlike ML, does not require the assumption of multivariate normality. Table 5 reports the results of the factor analysis with factor loadings above 0.1 or below -0.1. In the first four columns we report the results when using ML. The last four columns report the IPF results. The results are very similar using both methods.

[please insert Table 5 here]

The first factor has positive loadings on virtually all classifications. This shows that some boards possess many classifications, while others do not. So the main dimension along which boards vary is in their skill diversity. This finding is understandable given the large fraction of positive correlations reported in Table 4. The second factor shows positive loadings for classifications like Academic, Manufacturing, Scientific, and Technology, and shows negative loadings for classifications like Compensation and Governance. As such, the dimension seems to capture an advising role of the board versus a monitoring role.

Similar to the factor analysis of managerial skills in Custodio et al. (2013), the eigenvalues are not very high, with only the eigenvalue of the first factor being above one. As the eigenvalue of the first factor is more than double the eigenvalue of the second factor, we focus on the first factor, indicating the diversity of skills that are available on the board, which captures about 47% of the variation in skills.[8]

IV. Skill diversity and firm performance

Our factor analysis indicates that the diversity of skills on a board is the primary dimension among which boards of directors vary. Organizational research emphasizes that

[8] Due to the binary nature of our skill variables, we obtain factors based on a tetrachoric correlation matrix in a robustness test following the recommendations of Panter et al. (1997). We obtain similar factors and have confirmed that our results in the remainder of the paper are robust to using factors based on the tetrachoric correlation matrix.

diversity of skills might be beneficial in decision making as it brings greater resources to problem solving and could lead to a more complete analysis of an issue (Milliken and Martins, 1996; Williams and O'Reilly, 1998). However, different personal and professional backgrounds may lead to different ways in which team members interpret information and to multiple representations of a problem (Beers et al., 2006; Hambrick, 2007). Misunderstandings and disagreement can then threaten effective decision-making processes within multidisciplinary teams. For example, Garlappi, Giammarino and Lazrak (2014) show that when directors have heterogenous priors, boards may underinvest in multi-stage projects because they anticipate future disagreement. In their model, security issuance can help alleviate the underinvestment problem. Changing board composition may also work. Murray (1989), Knight et al. (1999), Pelled, Eisenhardt and Xin (1999) and Simons, Pelled, and Smith (1999) argue that having common ground among group members can overcome some of the problems of heterogeneous teams.

Since there may be advantages and disadvantages to having more diversity of skills on a team, it is an empirical question how director skill diversity relates to performance on average. In Section IV.A, we examine the relationship between our factors and firm performance. In Section IV.B, we construct an intuitive counterpart to our factors and examine the role of committee skills. We address endogeneity problems using instrumental variable analysis in Section IV.C and perform robustness checks in Section IV.D.

IV.A The relationship between the factors and firm performance

We examine the relation between firm performance and the first factor from both our ML and IPF factor analysis in Table 6. We regress our proxy for Tobin's Q on our factors and a set of controls that are common to governance performance regressions (e.g. Yermack, 1996; Adams and Ferreira, 2009; Faleye, Hoitash and Hoitash, 2012). As governance controls

we include variables that plausibly relate to both performance and skills. For example, we expect the number of skills to be positively related to board size, board independence, the average number of outside directorships and average director tenure. As the number of committees increases, firms might also add more directors with relevant skills to their board.[9] As the diversity literature argues (e.g. Milliken and Martins, 1996), skill diversity may affect communication, so we include the logarithm of the number of board meetings. We also include a CEO duality measure, an indicator for the CEO being older than 60 and a blockholder indicator. We include the CEO duality because CEOs often hold the chair position prior to succession and they may require different skills from the board during this period. Similarly older CEOs or boards with blockholders may require different board skills.

As firm-level controls, we include the logarithm of assets as a proxy for firm size, the number of segments as a proxy for diversification, capital expenditures, ROA, volatility and an S&P 500 indicator. We provide the exact definitions of the control variables in the appendix. We lag ROA by one year. All models include 2-digit SIC code industry effects and the standard errors are corrected for potential heteroskedasticity.

[please insert Table 6 here]

Column 1 of Table 6 shows that the ML diversity of skills factor is negatively related to the firm's Tobin's Q. This relation is robust to controlling for other firm characteristics, as can be seen in column 2, and to the use of the IPF factor method, as can be seen in the last two columns. The coefficients on the firm-level controls are generally consistent with previous literature. The negative coefficient on board meetings is consistent with Vafeas

[9] We use the number of committees in RiskMetrics plus any additional committees from Boardex as our measure of the number of committees. As we discuss in Section II.C this measure can more naturally be interpreted as a measure of the number of key committee tasks. Results are robust to excluding the number of committees.

(1999). However, some of the other governance controls are not statistically significant, possibly because there are so many of them.

IV.B Measuring the diversity of skills

Factor analysis is sometimes unappealing because it is difficult to assess the economic magnitudes of coefficients on factors. Thus, we examine whether the skill diversity factor has a more intuitive counterpart in the data. An obvious choice is to simply count the number of skills that are represented on a board. In Panel A of Table 7 we report the descriptive statistics of the number of board-level skills. The typical firm has ten different skills. In Panel B we report the correlations between the number of skills and the ML and IPF factors. We find that the number of skills does a good job in capturing the factor, with correlation coefficients of 0.924 and 0.938.

[please insert Table 7 here]

Table 8 shows the relation between the number of skills on the board and Tobin's Q. In the first model we confirm our finding from the factor analysis that the number of skills and Tobin's Q are negatively related.

With a more intuitive measure of skill diversity in hand, it is straightforward to address the possibility that firms may be simply disclosing committee memberships as skills. We examine two variations on the number of skills. For the first measure, we assign a director any of the 20 skills belonging to committees on which he sits and that are missing from his skill description. For example, the director may sit on the finance committee, but the firm did not mention that he has finance skills. For the second measure, we exclude from a director's skill descriptions any skill that matches to a committee on which he sits. This

accounts for the fact that some firms may simply be reporting committee memberships as skills. We then reconstruct our board-level measures of the number of skills represented on the board. Table 7 reports the summary statistics for these measures. Columns 2 and 3 of Table 8 show our performance regressions using these measures. The results are qualitatively similar for both measures.

[please insert Table 8 here]

IV.C Potential Reverse Causality

While the results from Tables 6 and 8 suggest that there is a negative correlation between skill diversity and firm performance, we cannot give this relationship a causal interpretation because of potential endogeneity problems due to reverse causality. It is plausible, for example, that underperforming firms look for more skill diversity on their boards to get different advice. Another potential concern is that underperforming firms engage in window dressing by making their directors appear more talented than they really are. These arguments would predict a negative relationship between performance and skills. On the other hand, it is also possible that poorly performing firms have other concerns and pay less attention to the new regulation as a result. This argument would predict a positive relationship between performance and skills. Without a better understanding of how directors match to firms, it is difficult to sign the bias in the OLS results. We attempt to formally address this concern in our set-up using an instrumental variable analysis.

[please insert Figure 3 here]

We use three instruments whose summary statistics are provided in the Appendix. The first is the number of days between the filing of the firm's proxy statement and the day Regulation S-K was announced. We believe this instrument should be correlated with the number of skills as firms with more time to incorporate Regulation S-K's requirements will

have more time to enhance their diversity by appointing a new director to the board. Figure 3 provides some evidence consistent with this hypothesis: the proportion of firms appointing new directors in a given proxy month is higher the later the month occurs. On the other hand, we believe it is unlikely that the number of days between Regulation S-K and the proxy filing should be correlated with firm performance, as long as the proxy filing date does not change in response to poor performance. We examine whether firms changed their filing dates from the previous year in Section IV.D and conduct an IV analysis in both the full sample and the sample of firms whose filing dates did not change significantly.

The second instrument is the natural logarithm of the average Great Circle distance between the company's headquarters and an airport.[10] The rationale for this instrument is that firms are less constrained in choosing directors when it is easy for them to attend board meetings and this may lead to an increase in skills on the board. Of course, distance to the airport may be directly correlated with firm performance because it may affect firms' transportation networks. But we believe that to a large extent this effect should be controlled for by other variables in our regression, for example, firm size, diversification and industry.

We adopt a similar approach to Ashenfelter and Krueger (1994) to construct our third instrument. Ashenfelter and Krueger (1994) estimate the return to reported schooling in survey data by regressing wages on education. To address measurement error in reported education, they use sibling's reports of the other sibling's education as instruments. Since we have at least two sets of reported skills for directors with multiple directorships in our sample, we can use a similar approach. Our instrument is the average number of skills for common directors reported by other firms. To use this instrument, we have to restrict ourselves to firms with shared directors. Thus, we do not use it in all IV specifications.

[10] The great circle distance is the shortest distance between two points on the surface of a sphere. The average (median) distance to an airport in our sample is 1,330 (1,321) miles.

Columns 4-6 of Table 8 show the results of the second stage of the IV regressions using the measures of skills from columns 1-3 and our first two instruments. Column 7 uses reported skills and all three instruments. We report the coefficient on the instruments from the first-stage regression at the bottom of the Table, along with the Kleibergen Paap F-statistic, the Stock Yogo critical values for i.i.d. standard errors and the results of the Durbin-Wu-Hausman endogeneity test. The first stage coefficients on our instruments have the expected signs and are statistically significant. However, the Kleibergen-Paap Wald statistics are not very large which suggests the magnitudes of our second stage coefficients may still retain some bias.

In the second stage IV regressions, the coefficients on the skill measures are always negative and smaller than in the OLS regressions. This suggests that the correlation between performance and the number of skills is positive, i.e. poorly performing firms appear to focus skills rather than seek out greater skill diversity for their directors. Because the coefficients on the skill measures are consistently negative in both OLS and IV specifications, we can interpret our results as suggestive of a negative causal effect of skill diversity on performance if our instruments satisfy the exclusion restriction. We try to rule out potential violations of the exclusion restriction in Section IV.D.

From column 4, a one standard deviation increase in the number of skills (2.725) is associated with a 26.56% reduction in Tobin's Q at the mean. This is clearly too large and confirms our suspicion that the IV results may be consistent but not unbiased. The economic magnitude of skills in column 1 is -2.95%. Since the IV results are always lower than the OLS results, one way to interpret the economic magnitudes is to take -2.95% as an upper bound for the effect of the number of skills on performance. Since this effect is already economically significant, our results suggest that skill diversity is economically important.

IV.D Robustness checks

In Table 9 we report some additional robustness tests. Since these tests already involve restricted samples, we only use our first two instruments in the IV specifications. First, we examine the possibility that firms may alter their meeting dates in response to poor performance, which would invalidate our first instrument. We collect proxy filing dates for 2009 and 2010 from Edgar and examine whether there were any changes in the dates. Figure 4 shows the distribution of changes between the two years. As is evident from the figure, most changes occur in the -1, 0, +1, day range, which is reasonable if annual meetings are held close to or on the weekend and firms send their proxy statements out a fixed number of days before the meeting.

[please insert Figure 4 here]

In columns 1 and 3, we replicate the OLS and IV regressions for reported skills after dropping firms with more than 14 days difference in the proxy filing date between 2009 and 2010 (16.33% of the sample). The results are consistent with our previous results.

We also examine whether we can easily reject that our third instrument violates the exclusion restriction. As long as other firms's reporting of skills is not related to the firm's performance, this instrument will satisfy the exclusion restriction. But it is possible that firms that file proxies later copy skill descriptions of common directors when the other firms on whose boards they sit perform well. In this case, the instrument would not satisfy the exclusion restriction. To examine this, we take the first reporting company and the last reporting company for each director. We then regress the number of skills that overlap on the ROA of the first reporting company. The coefficient is insignificant (p-value of 0.753), which suggests that firms do not simply copy descriptions of better performing firms.

Next, we restrict our sample to firms with positive ROA in 2010 to control more explicitly for the fact that poorly performing firms might report skills differently. In columns 2 and 4, we replicate the OLS and IV results for reported skills in this sample and find that our results continue to hold although the skill coefficient is not significant in the OLS specification.

[please insert Table 9 here]

In unreported results (available upon request), we conduct several more robustness checks to ensure that skill diversity is not picking up other measures of diversity. First, we examine whether skill diversity is simply a measure of "word diversity". In some firms, the person writing the skill sections may embellish descriptions more than in other firms. For firms with at least one director with multiple directorships, we calculate a "verbosity score" which is the ratio of the number of skills that this firm assigns to this director divided by the average number of skills other firms assign to this director. If a firm has multiple directors with multiple directorships, we take the averages of the individual scores. A higher score indicates that a firm assigns more skills to a particular director than other firms. The magnitude of the coefficient on the number of reported skills is similar when we control for this score.

We also examine whether our results are robust to controlling for measures of diversity in other director characteristics. Item 407(c) of Regulation S-K requires firms to disclose whether and how they consider diversity to be important in the nomination of directors. We code a dummy variable that is one if the company indicates diversity is important, a variable that is one if gender is mentioned as an important diversity characteristic and a variable indicating that race is mentioned as an important diversity characteristic. The summary statistics for these variables are in Appendix Table A3. The

correlations between the number of skills and these three measures are not very high: 0.088, 0.127 and 0.138, respectively. Moreover, adding these variables separately to our regressions does not change our conclusions. The sign on the number of skills is still negative and significant at greater than the 10 or 5% level in both OLS and IV specifications. Since 91% of companies say diversity is important, it is possible that our measures do not pick up actual diversity in board characteristics. But our results are also similar when we control for the proportion of women on the board, a measure of diversity that Adams and Ferreira (2009) show is associated with different board behavior.

V. Common ground in director skills

We document that diversity is the main dimension along which boards vary with respect to skill. An important question is what drives the negative relationship between skill diversity and performance. A potential explanation for this finding is the importance of having common ground in the boardroom, i.e. the need for directors to share skills in order to be able to communicate effectively. We examine this potential mechanism in two ways. First, we construct a better measure of skill overlap between directors and examine how it relates to performance. Although the number of skills is likely to be negatively related to common ground in the boardroom, it is not a perfect measure because the number of skills can be high even when all board members share skills. Second, we provide some evidence that suggests that communication problems may exist when there is less common ground in the boardroom.

To measure the concentration of skills among directors, we use the Blau index. We compute the Blau index (Blau, 1977) as $1 - \Sigma p_i^2$, where p is the proportion of directors in the kth skill category. By construction, the Blau index is between zero and (K – 1)/K, where K is the maximum number of skills, which in our case provides a theoretical maximum of 19/20. A high Blau score indicates a low concentration of skills among directors and low levels of

common ground. Communication problems between insiders and outsider may be particularly important for decision-making. So we calculate a Blau index for the board as a whole, as well as an inside-outside Blau index that measures the concentration of skills between insiders and outsiders. To calculate the insider-outsider index, we combine all inside skills into one category and all outside skills into another category and use the Blau formula. Panel A of Table 10 shows descriptive statistics for the Blau indices.

[please insert Table 10 here]

The Blau score is on average 0.850, with a minimum of 0.320. The average inside-outside Blau score is slightly higher (0.879). Panel B of Table 10 shows the correlation between the Blau scores and the number of skills. The correlations are quite high, with correlation coefficients of 0.815 and 0.881. Panel C shows the results of replicating our OLS and IV performance regressions using the Blau scores instead of the number of skills. Consistent with our previous results, the coefficients on the Blau scores are negative and significant. The difference between these results and our previous ones, however, is that we can interpret the coefficients in terms of common ground. These results suggest that skill diversity leads to less effective decision-making because directors have less common ground (as measured by skill overlap).

To gain further insight into the channel through which skill diversity may affect performance, we ask whether common ground is related to boardroom communication, as proxied by the number of board meetings. For this analysis, we exploit information on committee membership, as an important part of board meetings consists of the reports by the committees, and Adams, Ragunathan and Tumarkin (2015) show that committee structure may play a role in how much directors interact with each other. We construct a Blau index for

the common ground between the members of the three main committees (the audit, nominating, and compensation committee) and the remainder of the board, with the purpose of examining whether having such common ground increases the effectiveness of boardroom communication. More specifically, our committee Blau score is the average of the Blau scores between the members of the audit committee and the remainder of the board, the members of the governance committee and the remainder of the board, and members of the compensation committee and the remainder of the board. The average committee Blau score in our sample is 0.878.

[please insert Table 11 here]

In Table 11, we regress the number of board meetings on the committee Blau score, the original Blau score, and the inside-outside Blau score. We control for similar firm level controls as in Table 8 but also add the proportion of directors who attended fewer than 75% of meetings they were supposed to (meeting attendance) and the proportion of female directors to the regression.[11] We include meeting attendance because directors with poor attendance records may be less likely to sit on committees and firms may adjust their meetings to compensate for absences. We include the proportion of female directors because Adams and Ferreira (2009) find that women are more likely to sit on key committees and the number of meetings may be different when boards are more diverse.

The coefficients on all Blau scores are positive and significant at the 10% level for the committee and inside-outside Blau scores. This suggests that the more common ground there is between directors on key committees and the rest of the board and the more common ground there is between insiders and outsiders, the fewer board meetings there are. This

[11] As in Section IV.D, we added the dummy variables that are one if the company indicates diversity, gender or race are important to the regressions. The results were similar.

evidence is in line with the idea that boards with more common ground can communicate more effectively. We interpret the evidence in Table 11 as suggestive that commonality of skills can play an important role in executing the board's tasks.

VI. Conclusion

Directors are not one-dimensional. We believe that recognizing this fact has important implications for corporate governance. Because director characteristics are bundled, firms may not be able to optimize over individual director characteristics. Instead, firms may face multi-dimensional constrained optimization problems that may be difficult to solve. As such, it may not be surprising that the main dimension along which boards of directors vary is in the diversity of skills on their board. When examining the relation between this dimension and firm performance, we find that boards whose directors have more commonality in skill sets have better firm performance. However, increasing commonality may be difficult because of a limited supply of directors with particular skills or because directors with particular skills have other skills that are not shared by incumbent directors. Understanding how directors and firms sort to each other is an interesting topic for future research.

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Appendix A1. Variable definitions

We provide definitions of the variables we use in the study in this table.

Variable	Definition
Airport distance	The average Great Circle distance of the firm's headquarters to an airport in miles calculated using the code provided by SAS Institute (http://support.sas.com/kb/5/325.html).
Blau score	The concentration of skills among directors following Blau (1977). We calculate the Blau score as $1 - \Sigma p_i^2$. The Blau index is between zero and (K – 1)/K where K is the maximum number of skills, which in our case provides a theoretical maximum of 19/20. Higher Blau scores indicate lower concentration of skills and lower common ground among directors.
Blockholder	A dummy variable set to one if there is an outside director on the board with at least a 5% ownership.
Board committees	The number of combined board committees that the firm has as reported in BoardEx and RiskMetrics.
Board meetings	The annual number of board meetings in the prior fiscal year.
Board size	The number of directors on the board.
Capital expenditures	Capital expenditures over sales (#capx / #sale).
CEO – chair	A dummy that equals one if the CEO is also the chairman of the board.
CEO retirement	A dummy that equals one if the CEO is over 60.
Committee Blau score	The concentration of skills between directors in the key committees and directors not in these committees. The measure is the average of the Blau score between the members of the audit committee and the remainder of the board, the members of the nominating committee and the remainder of the board, and members of the compensation committee and the remainder of the board.
Director tenure	The average director tenure on the board. Director tenure is the number of years that a director has served on the board.
Female directors	The ratio of female directors on the board.
Firm age	The number of years since each firm's CRSP listing date.
Firm size	Total assets (#at) in millions of dollars.
Generosity score	The average ratio of the number of skills assigned to outside directors with multiple directorships by the firm over the average number of skills assigned to the same directors by other firms.
Independent director ratio	The ratio of independent directors on the board to board size
Inside-outside Blau score	The concentration of skills between inside and outside directors. This measure is calculated similar to the outsider Blau score by treating inside and outside directors as separate groups and combining skills within each group
Meeting attendance	The ratio of directors on the board with a less than 75% attendance record.
Number of skills	The number of skills that are represented on a board (out of 20)
Outside directorships	The average number of outside directorships held by the firm's

	directors.
ROA	Net income (#ni) less extraordinary items (#xido) divided by total assets.
S&P500	A dummy that equals one if the firm is included in the S&P500 index.
Segment number	The number of business segments that the firm has.
Skills for common directors	The average number of skills for common directors reported by other firms.
Time since rule announcement	The difference in days between the date of proxy filing and the rule announcement by the SEC divided by 30.
Tobin's Q	The sum of total assets (#at) and market value of equity less book equity (#ceq), divided by total assets
Volatility	Standard deviation of the firm's daily stock return in the prior fiscal year.

Appendix A2. Summary statistics for the instruments

We provide summary statistics for our instrumental variables in this table. There are 833 observations for the first two instruments and 694 observations for the third variable. StDev stands for standard deviation.

Variable	N	Mean	Median	StDev	Min.	Max.
Time since announcement (in months)	833	4.949	3.9	2.642	0.833	12.633
Mean airport distance (in miles)	833	1,330	1,321	198	1,038	2,629
Skills for common directors	694	2.63	2.5	0.947	0.25	9

Appendix A3. Summary statistics for diversity variables

We provide summary statistics for the diversity measures. We code a dummy variable (consider diversity) that is one if the firm notes that diversity is important, a variable (gender) that is one if gender is mentioned as an important diversity characteristic, and a variable (race) indicating race is mentioned as an important diversity characteristic. StDev stands for standard deviation.

Variable	N	Mean	Median	StDev
Consider diversity	833	0.913	1	0.282
Gender	833	0.313	0	0.464
Race	833	0.313	0	0.464

Figure 1. Director skills

This figure shows the percentage of directors (firms) with specific skills. For example, the most common skill among directors (firms) is finance and accounting. About 40% of all directors (grey bars) have finance and accounting skills and all firms (black bars) have at least one director on the board with the finance and accounting skill.

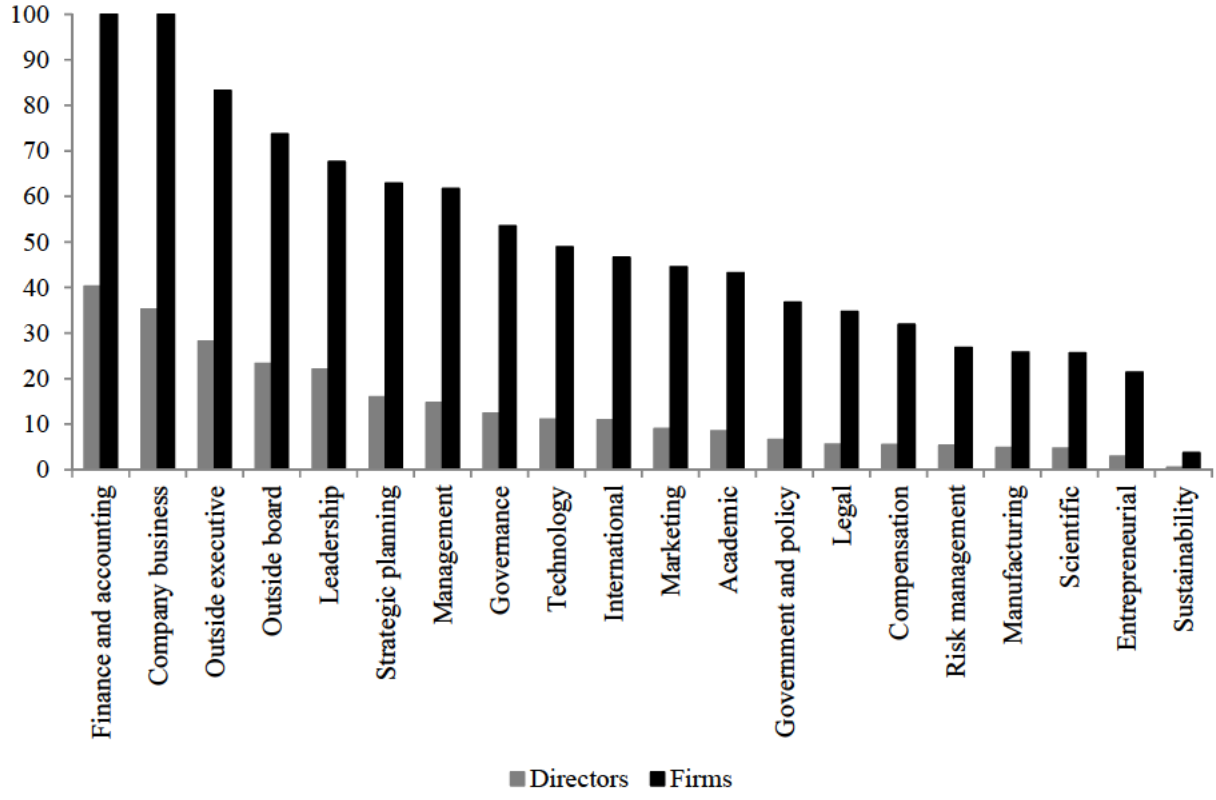
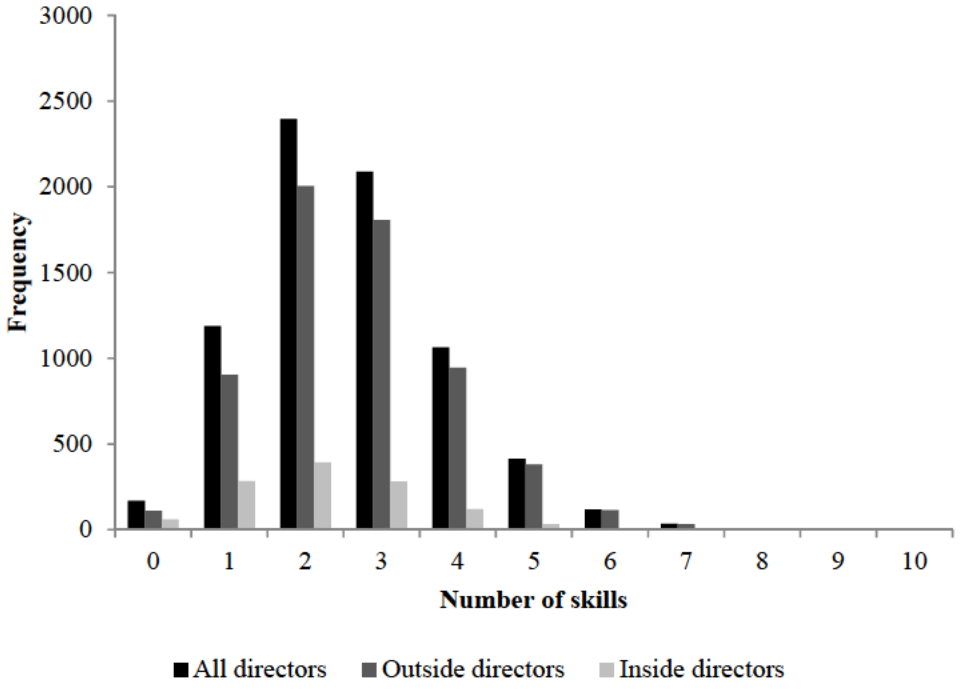


Figure 2. Number of skills

We present the number of skills per director and the number of skills represented at the board level in this figure. Graph A is for the number of skills at the director level and Graph B is for the number of skills represented at the board level. Graph A is based on 6,311 outside and 1,178 inside directors at 833 firms. Graph B is based on 833 firms. The maximum number of skills possessed by an outside (inside) director is 10 (nine). Any director who has a skill that is not in our list of 20 skills is classified as having zero skills. The maximum (minimum) number of skills represented on a board is 19 (2).

Graph A: Director skills



Graph B: Total skills

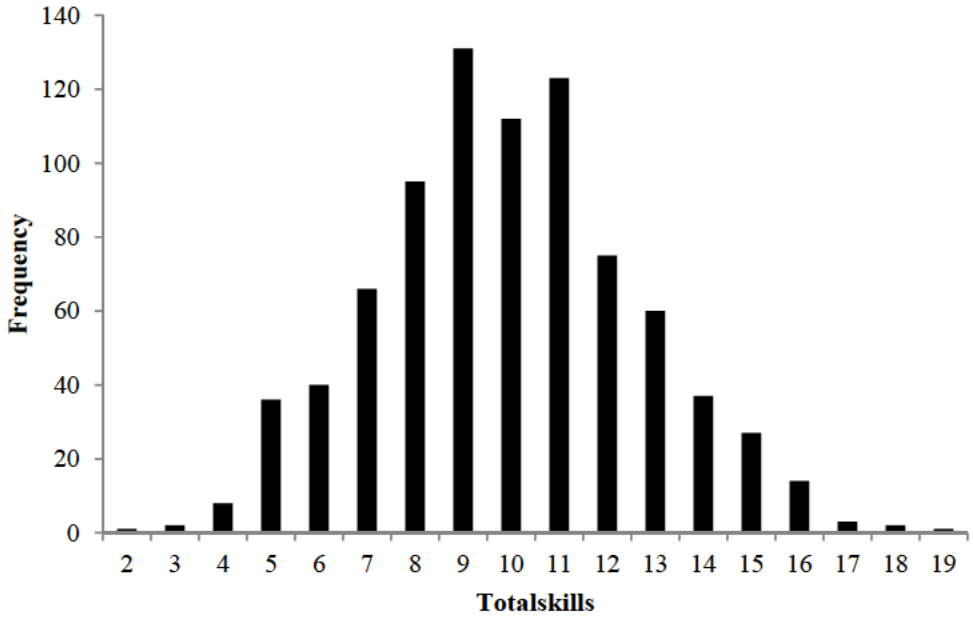


Figure 3. New directors

We examine new director nominations in this figure. There are 225 new director nominations in our sample of 833 firms. The horizontal axis is the number of months between the proxy statement date and the rule announcement date (December 16, 2009). The left vertical axis shows the number of new directors per firm after the rule announcement date. The right vertical axis shows the percentage of firms with proxy statements within a particular month that had new directors. For example, out of 158 firms that had proxy statements five months after the rule announcement date, there were 45 new directors which corresponds to 0.28 new directors per firm (left axis) and 18.35% of firms of those 158 firms had at least one new director (right axis).

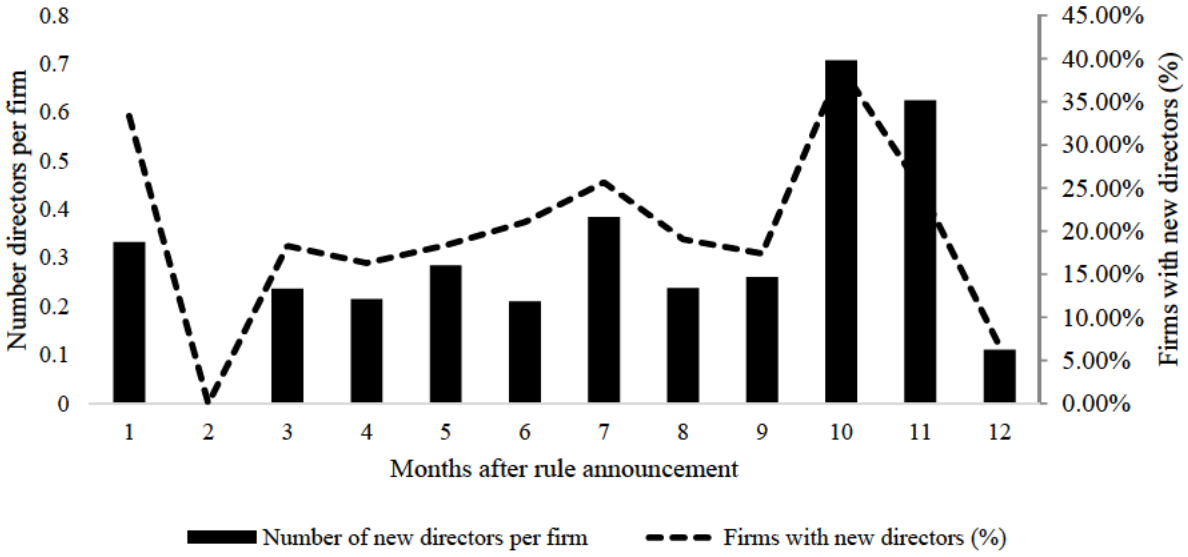


Figure 4. Proxy filing dates

The figure below examines whether firms in our sample (833 firms) filed their proxies the same calendar day and month in 2010 relative to their most recent proxy filing date and shows the frequency distribution of the difference between the day and month of 2010 and the most recent proxy filing dates. The vertical axis is the number of occurrences and the horizontal axis is the difference in days between proxy filing dates. The first (last number) on the horizontal axis is the frequency of 2010 proxy filings that occurred 31 or more days before (after) the calendar day and month of the most recent proxy filing.

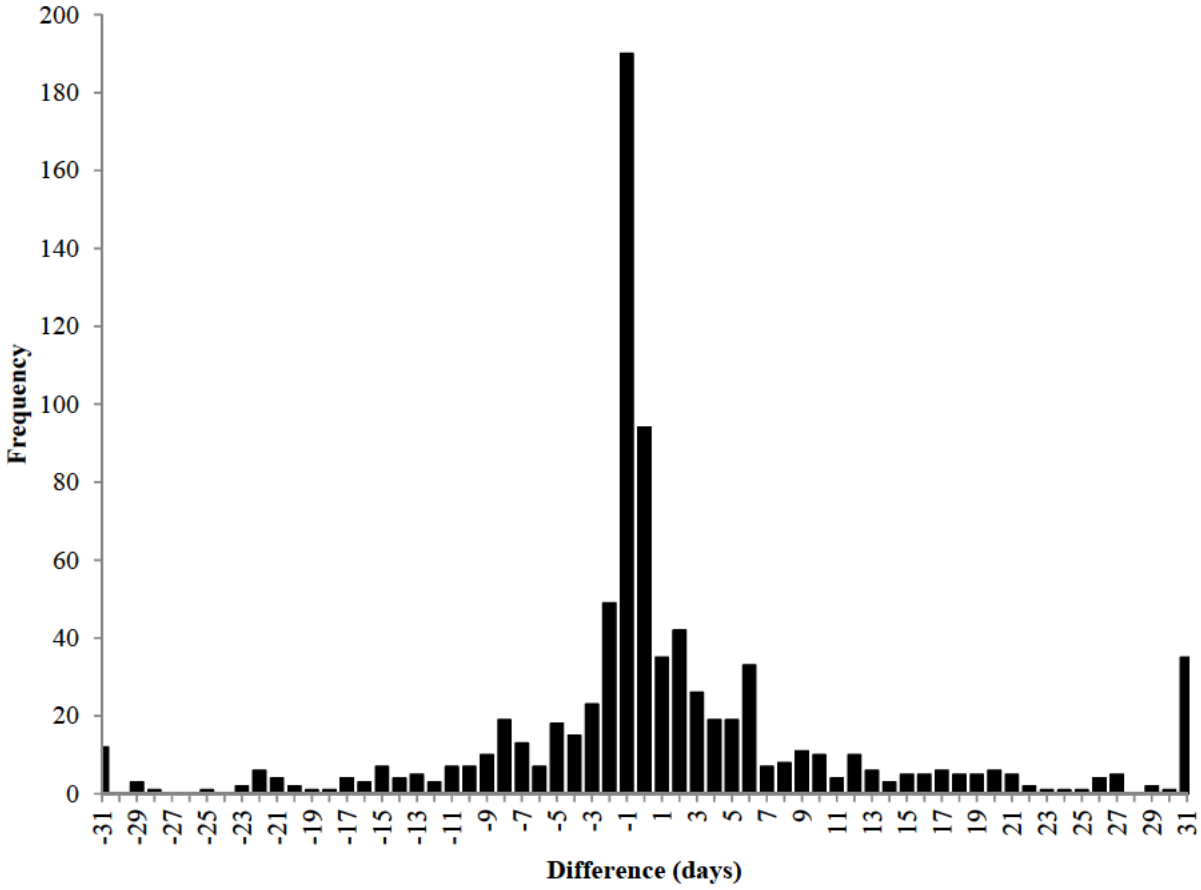


Table 1. Firm characteristics

This table reports descriptive statistics for 833 firms with data available for all variables. We provide the minimum and maximum of all variables except the dummies in the last two columns. See the Appendix for variable definitions.

Variables	Mean	Median	Standard Deviation	Min.	Max.
Firm size (millions of dollars)	8,387	1,822	33,025	57	75,1216
Tobin's Q	1.847	1.595	0.830	0.867	6.140
ROA	0.040	0.047	0.085	-1.217	0.252
Capital expenditures	0.063	0.029	0.146	0	1.600
Business segments	2.029	1	1.343	1	8
Volatility	0.023	0.022	0.009	0.008	0.115
S&P 500	0.315	0	0.465		
Firm age	26.154	19	19.618	0	85
Board size	8.990	9	2.122	4	17
Board meetings	7.707	7	3.618	3	45
Board committees	3.378	3	0.704	2	7
Independent director ratio	0.786	0.800	0.109	0.333	1
Outside directorships	0.835	0.833	0.456	0	2.333
Director tenure	9.060	8.444	3.871	0	27
CEO - chair	0.538	1	0.499		
CEO retirement	0.287	0	0.453		
Blockholder	0.042	0	0.201		

Table 2. Experience categories

This table lists our 20 experience categories. Data are obtained from 2010 proxy statements. From the 2010 proxy statements we code each director's experience, qualifications, attributes or skills that were important in appointing the director. We code all reasons directors were appointed and combine similar reasons. For example, we combine "litigation" or "legal compliance" experience into a single category of "legal" experience.

Variables	Description
Academic	The director is from academia or has a higher degree (such as a Ph.D.).
Company business	The director is experienced in the firm's business or industry (or a closely related industry).
Compensation	The director has compensation and benefits experience.
Entrepreneurial	The director has entrepreneurial experience.
Finance and accounting	The director has experience in banking, finance, accounting, or economics related activities.
Governance	The director has corporate governance experience.
Government and policy	The director has governmental, policy, or regulatory experience.
International	The director has international experience.
Leadership	The director is someone that has leadership skills/experience.
Legal	The director has legal expertise.
Management	The director has management and communications skills/experience.
Manufacturing	The director has manufacturing experience.
Marketing	The director has marketing and sales skills/experience or knowledgeable in marketing activities.
Outside board	The director has outside board experience.
Outside executive	The director is an executive of another company.
Risk management	The director has risk management experience.
Scientific	The director has engineering, scientific, or R&D skills/experience.
Strategic planning	The director is someone that has strategy skills or strategy planning experience
Sustainability	The director has experience on environmental and sustainability issues.
Technology	The director has technology skills/experience.

Table 3. Descriptive statistics

We present various descriptive statistics related to our sample firms. Data in this table are obtained from 2010 proxy statements and are based on 833 firms. In Panel A, we present descriptive statistics related to 20 firm-level skill experience categories for directors at the board level and director level. The first number is the percentage of boards that have the particular skill. The second and the third numbers are the percentages of outside and inside directors that possess the particular skill. Pairwise correlations between director age and the number of skills and outside directorships and the number of skills that excludes outside directorship as an experience category for 7,489 directors (6,311 outside directors and 1,178 inside directors) are reported in Panel B. Panel C reports descriptive statistics for committee skill match ratios for 20 committees. To construct the set of committee memberships for all directors, we start with data on compensation, audit, governance and nominating committee memberships in RiskMetrics and supplement it with additional committee memberships from Boardex. We group committees with similar names in Boardex. Riskmetrics duplicates committees whenever a committee shares tasks. For example, if a firm has one Audit and Compensation committee, Riskmetrics will report that the firm has one Audit committee and one Compensation committee with equal membership. This explains why the occurrence of each committee Riskmetrics covers is so high in our sample. To find the committee skill match ratio, we first find the number of directors on a particular committee that has the required skills (e.g., the number of directors with compensation skills on the compensation committee). We then compute the ratio of directors with those skills to the number of directors on the committee. We repeat this for all the other committees. In Panel D, we split our director-level sample into two based on whether a firm had a positive or negative ROA in the prior fiscal year and examine the difference between the number of words used to describe director experiences by the ROA sub-samples. We report the clarity scores in Panel E. Clarity score is a score variable that ranges between 0 and 1 for directors on more than one board that takes into account skills reported by other boards for the same director. We describe the calculation of the clarity score on page 11. The clarity score (mean) is the mean of the numbers as described on page 11. The clarity score (maximum) takes the maximum of the ratios instead of the mean. There are 1,615 directors with other directorships. Values in parentheses in Panel B (Panel D) are p-values (t-statistics). ***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively.

Panel A: Experience categories

Experience category	**Mean**			**Standard Deviation**		
	Board	*Outside*	*Inside*	*Board*	*Outside*	*Inside*
Academic	0.445	0.092	0.045	0.497	0.290	0.207
Company business	1.000	0.231	1.000	0.000	0.422	0.000
Compensation	0.319	0.063	0.009	0.466	0.243	0.096
Entrepreneurial	0.214	0.031	0.017	0.410	0.174	0.129
Finance and accounting	1.000	0.443	0.188	0.000	0.497	0.391
Governance	0.535	0.139	0.042	0.499	0.346	0.202
Government and policy	0.347	0.074	0.021	0.476	0.262	0.144
International	0.489	0.118	0.060	0.500	0.323	0.238
Leadership	0.676	0.216	0.248	0.468	0.411	0.432
Legal	0.367	0.061	0.028	0.482	0.239	0.165
Management	0.617	0.147	0.143	0.486	0.354	0.350
Manufacturing	0.258	0.051	0.029	0.438	0.221	0.167
Marketing	0.432	0.090	0.086	0.496	0.287	0.280
Outside board	0.737	0.256	0.110	0.440	0.436	0.312
Outside executive	0.832	0.309	0.138	0.374	0.462	0.345
Risk management	0.268	0.058	0.028	0.443	0.234	0.165
Scientific	0.256	0.048	0.042	0.437	0.213	0.202

Strategic planning	0.629	0.151	0.205	0.483	0.358	0.404
Sustainability	0.037	0.006	0.003	0.189	0.074	0.050
Technology	0.466	0.113	0.097	0.499	0.317	0.296

Panel B: Correlations

Variables	**Number of skills**
Director age	0.024**
	(0.041)
Outside directorships	0.098***
	(0.000)

Panel C: Committee skill match ratios

Committee Name	**N**	**Mean**	**Median**	**Standard Deviation**	**Min.**	**Max.**
Academic	1	0.667	0.667		0.667	0.667
Audit	833	0.564	0.600	0.268	0	1
Company business	23	0.364	0.333	0.322	0	1
Compensation	833	0.107	0	0.198	0	1
Finance	133	0.429	0.400	0.255	0	1
Governance	822	0.320	0.250	0.313	0	1
Government	4	0.167	0.167	0.192	0	0.333
International	2	0.500	0.500	0.236	0.333	0.667
Leadership	4	0.479	0.375	0.375	0.167	1
Legal	5	0.267	0	0.435	0	1
Management	2	0	0	0.000	0	0.000
Marketing	1	0.857	0.857		0.857	0.857
Real estate	1	0.333	0.333		0.333	0.333
Risk management	10	0.030	0	0.067	0	0.200
Scientific	17	0.297	0.250	0.307	0	1
Securities	3	0.301	0.154	0.396	0	0.750
Strategic planning	30	0.212	0.208	0.221	0	0.667
Sustainability	47	0.045	0	0.108	0	0.500
Technology	43	0.257	0.200	0.305	0	1
Committee skill match ratio	833	0.328	0.333	0.174	0	1

Panel D: Number of words and firm profitability

ROA sign	**N**	**Mean**	**Standard Deviation**
Positive ROA	6,195	58.457	32.823
Negative ROA	1,294	53.969	28.272
Difference		4.488	
		(4.54)***	

Panel E: Clarity Score

Variable	N	Mean	Median	Standard Deviation	Min.	Max.
Clarity score (mean)	1,615	0.563	0.500	0.125	0.200	1
Clarity score (maximum)	1,615	0.767	0.750	0.237	0.200	1

Table 4. Correlations

We present pairwise correlation coefficients for 18 director skill categories at the board level. Note that all boards have at least one director with company business and finance and accounting experiences. The correlations are based on 833 firms. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Academic (1)	1																	
Compensation (2)	0.013	1																
Entrepreneurial (3)	0.116***	0.014	1															
Governance (4)	0.011	0.297***	0.039	1														
Government and policy (5)	0.098***	0.123***	0.020	0.173***	1													
International (6)	0.076**	0.011	0.024	0.063*	0.150***	1												
Leadership (7)	0.058*	0.034	0.036	0.132***	0.052	0.107***	1											
Legal (8)	-0.001	0.060*	0.022	0.111***	0.198***	0.047	0.001	1										
Management (9)	0.010	0.058*	0.043	0.044	-0.002	0.024	0.035	-0.014	1									
Manufacturing (10)	-0.032	0.031	0.034	0.043	0.077	0.203***	-0.002	-0.006	0.064*	1								
Marketing (11)	-0.002	0.094	0.077**	0.079	0.016	0.146***	0.014	-0.001	0.069	0.150***	1							
Outside board (12)	0.069**	0.122***	0.052	0.160***	0.051	0.060*	0.128***	0.025	0.040	0.028	-0.030	1						
Outside executive (13)	0.060*	0.074**	0.039	0.045	-0.003	0.093***	0.087**	-0.017	0.003	0.060*	0.042	0 213***	1					
Risk management (14)	-0.002	0.133***	-0.104***	0.204***	0.129***	0.109***	0.077**	0.102***	0.047	0.046	0.091***	0.066*	0.062*	1				
Scientific (15)	0.239***	-0.012	0.030	0.027	0.064*	0.055	-0.047	0.044	0.009	0.145***	-0.017	0.044	0.043	0.031	1			
Strategic planning (16)	0.013	0.185***	0.043	0.207***	0.038	0.084**	0.095***	-0.013	0.111***	0.061*	0.173***	0.050	0.020	0.189***	0.023	1		
Sustainability (17)	0.028	0.015	-0.072**	0.018	0.123***	0.112***	0.041	0.021	-0.028	0.058*	0.059*	0.017	0.054	0.125***	0.059*	0.046	1	
Technology (18)	0.059*	-0.005	0.036	0.030	-0.018	0.055	-0.022	-0.013	0.062*	0.027	0.089**	0.038	0.092***	0.012	0.109**	0.040	0.007	1

Table 5. Factor analysis

This table report the results of factor analysis based on 18 experience categories. We present unrotated factor loadings on the first four factors using the maximum likelihood method in the first four columns and the iterated principal factor method in the last four columns. Factor loadings less than ｜0.10｜ are set to blank.

	Maximum Likelihood				Iterated Principal Factor			
Experience Categories	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**
Eigenvalue	1.325	0.591	0.475	0.430	1.327	0.576	0.472	0.434
Percentage explained	0.470	0.210	0.168	0.153	0.472	0.205	0.168	0.155
Academic	0.141	0.364	-0.140	0.250	0.147	0.333	-0.159	0.176
Compensation	0.402	-0.234		0.105	0.382	-0.242		0.102
Entrepreneurial		0.110		0.172		0.120		0.158
Governance	0.531	-0.243		0.103	0.508	-0.262		0.102
Government and policy	0.372	0.118	-0.319	-0.223	0.359		-0.332	-0.233
International	0.303	0.261	0.134	-0.184	0.319	0.235		-0.169
Leadership	0.207				0.209			0.110
Legal	0.187		-0.247	-0.143	0.172		-0.243	-0.140
Management	0.123		0.152		0.130		0.151	
Manufacturing	0.212	0.208	0.213	-0.159	0.226	0.212	0.182	-0.158
Marketing	0.247		0.342	-0.109	0.264		0.350	-0.126
Outside board	0.257			0.248	0.273			0.309
Outside executive	0.178	0.111		0.175	0.201	0.128		0.213
Risk management	0.371			-0.125	0.371	-0.122		-0.132
Scientific	0.142	0.364		0.113	0.152	0.361		
Strategic planning	0.367	-0.128	0.218		0.371	-0.134	0.219	
Sustainability	0.167	0.122		-0.175	0.175			-0.173
Technology		0.146	0.132	0.113	0.105	0.166	0.115	

Table 6. Tobin's Q and factor analysis

We present the results of Tobin's Q regressions on the first factors. The dependent variable is Tobin's Q. Factor 1 in the first two columns is from the maximum likelihood estimation method (ML) and in the last two columns is from the iterated principal factor method (IPF). All other variables are defined in the Appendix. We control for industry effects by including industry dummies based on two-digit SIC codes. T-statistics are reported in parentheses below coefficient estimates and are based on heteroskedasticity corrected standard errors. ***, **, * indicate statistical significance at the 1, 5, and 10% levels, respectively.

Variables	ML method		IPF method	
	(1)	(2)	(3)	(4)
Factor 1	-0.115***	-0.073**	-0.113***	-0.072**
	(-3.18)	(-2.20)	(-3.10)	(-2.18)
Log of firm size		-0.184***		-0.184***
		(-5.36)		(-5.36)
Capital expenditures		0.339		0.338
		(1.29)		(1.29)
ROA		3.115***		3.118***
		(4.22)		(4.23)
Segment number		-0.037**		-0.038**
		(-2.04)		(-2.05)
Volatility		2.866		2.854
		(0.51)		(0.51)
S&P 500		0.654***		0.655***
		(8.19)		(8.19)
Log of firm age		-0.155***		-0.156***
		(-3.27)		(-3.27)
Board size		-0.028*		-0.028*
		(-1.85)		(-1.85)
Log of board meetings		-0.191***		-0.192***
		(-2.74)		(-2.75)
Log of board committees		0.264*		0.265*
		(1.81)		(1.82)
Outside directorships		0.072		0.073
		(1.03)		(1.03)
Director tenure		-0.004		-0.004
		(-0.48)		(-0.49)
Independent director ratio		-0.180		-0.180
		(-0.55)		(-0.55)
CEO - chair		-0.000		0.000
		(-0.00)		(0.00)
CEO retirement		-0.058		-0.058
		(-0.94)		(-0.95)
Blockholder		-0.054		-0.054
		(-0.40)		(-0.39)
Constant	1.847***	3.824***	1.847***	3.824***
	(66.72)	(9.77)	(66.69)	(9.78)
Industry dummies	Yes	Yes	Yes	Yes

Adj. R-squared	0.074	0.281	0.073	0.281
N	833	833	833	833

Table 7. Descriptive statistics for the number of skills

We present descriptive statistics for our number of skills measure that also include and exclude committee skills from committee assignments in this table. We provide summary statistics in Panel A and we show correlations with the two factors in Panel B. We report p-values beneath the correlations. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively.

Panel A: Summary statistics

Variable	Mean	Median	Standard Deviation	Min.	Max.
Number of skills	9.924	10	2.725	2	19
Number of skills including committee skills	11.132	11	2.426	3	19
Number of skills excluding committee skills	8.825	9	2.644	1	17

Panel B: Correlations

Variable	Factor 1 (ML)	Factor 1 (IPF)
Factor 1 (ML)	1	
Factor 1 (IPF)	0.998***	1
	<0.01	
Number of skills	0.924***	0.938***
	<0.01	<0.01
Number of skills including committee skills	0.807***	0.832***
	<0.01	<0.01
Number of skills excluding committee skills	0.842***	0.860***
	<0.01	<0.01

Table 8. Tobin's Q and the number of skills

This table shows how our number of skills variable is related to Tobin's Q. The dependent variable is Tobin's Q in the OLS and second-stage IV models. The dependent variable in the first stage IV models is the number of skills. The first model below is based on the reported skills. We then add to this any unreported committee assignments as skills in the next model. We then remove skills from the reported skills that match to committee assignments in the last model. We repeat this for the IV regressions in models four through six. In the last IV model, we run the fourth model with three instruments. The coefficients from the first-stage on our instruments (time since announcement, log of airport distance and skills for common directors) are provided after the IV regressions along with Kleibergen-Paap rk Wald F statistic and endogeneity test statistic. All other variables are defined in the Appendix. We control for industry effects by including industry dummies based on two-digit SIC codes. T-statistics are reported in parentheses below coefficient estimates and are based on heteroskedasticity corrected standard errors. ***, **, * indicate statistical significance at the 1, 5, 10% levels, respectively.

	OLS			IV			
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
	Reported Skills	**Including Committee Skills**	**Excluding Committee Skills**	**Reported Skills**	**Including Committee Skills**	**Excluding Committee Skills**	**Reported Skills**
Number of skills	-0.020**	-0.022*	-0.022**	-0.180**	-0.246**	-0.191**	-0.214***
	(-2.01)	(-1.93)	(-2.23)	(-2.29)	(-2.25)	(-2.29)	(-2.89)
Log of firm size	-0.185***	-0.185***	-0.185***	-0.199***	-0.204***	-0.200***	-0.208***
	(-5.37)	(-5.37)	(-5.37)	(-5.39)	(-5.26)	(-5.38)	(-5.02)
Capital expenditures	0.346	0.343	0.348	0.332	0.294	0.350	0.358
	(1.31)	(1.29)	(1.32)	(1.26)	(0.98)	(1.31)	(1.32)
ROA	3.117***	3.122***	3.126***	3.381***	3.497***	3.444***	3.083***
	(4.20)	(4.21)	(4.22)	(4.77)	(4.84)	(4.84)	(4.30)
Segment number	-0.037**	-0.037**	-0.036**	-0.032	-0.033	-0.030	-0.027
	(-1.99)	(-2.00)	(-1.97)	(-1.53)	(-1.55)	(-1.44)	(-1.18)
Volatility	2.622	2.547	2.624	0.143	-1.222	0.356	-1.986
	(0.47)	(0.45)	(0.47)	(0.02)	(-0.20)	(0.06)	(-0.28)
S&P 500	0.654***	0.656***	0.654***	0.619***	0.631***	0.618***	0.657***
	(8.19)	(8.18)	(8.17)	(6.68)	(6.59)	(6.58)	(6.27)
Log of firm age	-0.158***	-0.159***	-0.158***	-0.142***	-0.148***	-0.143***	-0.146***
	(-3.30)	(-3.30)	(-3.30)	(-2.86)	(-2.82)	(-2.86)	(-2.60)
Board size	-0.027*	-0.026*	-0.024	0.060	0.085	0.075	0.068

	(-1.78)	(-1.73)	(-1.57)	(1.32)	(1.49)	(1.45)	(1.60)
Log of board meetings	-0.191***	-0.193***	-0.193***	-0.176**	-0.193**	-0.193***	-0.148*
	(-2.74)	(-2.76)	(-2.77)	(-2.46)	(-2.56)	(-2.69)	(-1.73)
Log of board committees	0.272*	0.302**	0.222	0.365**	0.712***	-0.073	0.435**
	(1.86)	(2.02)	(1.52)	(2.12)	(2.70)	(-0.33)	(2.38)
Outside directorships	0.070	0.069	0.073	0.175*	0.194*	0.199**	0.123
	(0.98)	(0.98)	(1.03)	(1.89)	(1.93)	(2.01)	(1.27)
Director tenure	-0.003	-0.003	-0.003	-0.007	-0.005	-0.006	0.001
	(-0.45)	(-0.42)	(-0.44)	(-0.77)	(-0.58)	(-0.72)	(0.11)
Independent director ratio	-0.193	-0.205	-0.194	-0.069	-0.168	-0.085	0.062
	(-0.60)	(-0.63)	(-0.60)	(-0.19)	(-0.45)	(-0.23)	(0.14)
CEO - chair	0.002	0.005	0.006	0.029	0.064	0.064	0.035
	(0.03)	(0.08)	(0.11)	(0.45)	(0.88)	(0.90)	(0.49)
CEO retirement	-0.056	-0.056	-0.059	-0.086	-0.098	-0.109	-0.089
	(-0.90)	(-0.91)	(-0.95)	(-1.20)	(-1.26)	(-1.43)	(-1.10)
Blockholder	-0.050	-0.050	-0.053	-0.132	-0.151	-0.156	-0.125
	(-0.37)	(-0.37)	(-0.39)	(-0.92)	(-1.01)	(-1.09)	(-0.68)
Constant	4.028***	4.058***	4.068***	4.810***	5.241***	5.059***	4.984***
	(10.01)	(9.94)	(10.04)	(7.69)	(7.01)	(7.73)	(6.58)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.280	0.280	0.281				
N	833	833	833	833	833	833	694
1st stage – time since announcement				0.085**	0.062**	0.087***	0.094**
				(2.52)	(2.23)	(2.85)	(2.39)
1st stage – log of airport distance				-2.16***	-1.547***	-1.879***	-2.515***
				(-3.40)	(-2.91)	(-3.16)	(-3.58)
1st stage – skills for common directors							0.232**

				(2.08)
Kleibergen-Paap rk Wald F statistic	9.139	7.039	9.633	7.015
Stock Yogo critical value – 10%	19.93	19.93	19.93	22.30
Stock Yogo critical value – 15%	11.59	11.59	11.59	12.83
Stock Yogo critical value – 20%	8.75	8.75	8.75	9.54
Endogeneity test	5.407**	5.613**	5.260**	12.370***
Chi-square(1) p-value	(0.020)	(0.018)	(0.022)	(0.000)

Table 9. Sub-sample analyses

This table shows how our number of skills variable is related to Tobin's Q for two different sub-samples. The dependent variable is Tobin's Q in the OLS and the second stage IV models and the number of skills in the first stage IV models. The coefficients from the first-stage on our instruments (time since announcement and log of airport distance) are provided after the IV regressions along with Kleibergen-Paap rk Wald F statistic and endogeneity test statistic. In the first OLS model, we restrict the sample to the firms that had their 2010 proxy filing within two weeks of their 2009 proxy filing month and day and regress Tobin's Q on the variables in Table 6. In the second, we consider only profitable firms, defined as firms with positive ROAs in the prior fiscal year. All other variables are defined in the Appendix. We control for industry effects by including industry dummies based on two-digit SIC codes. T-statistics are reported in parentheses below coefficient estimates and are based on heteroskedasticity corrected standard errors. ***, **, * indicate statistical significance at the 1, 5, and 10% levels, respectively.

	OLS		IV	
Variables	**(1)**	**(2)**	**(3)**	**(4)**
	Proxy date	**Profitable firms**	**Proxy date**	**Profitable firms**
Number of skills	-0.023**	-0.007	-0.197**	-0.216***
	(-2.09)	(-0.65)	(-2.53)	(-2.74)
Log of firm size	-0.192***	-0.161***	-0.212***	-0.190***
	(-4.95)	(-4.46)	(-5.02)	(-4.42)
Capital expenditures	0.575*	0.497	0.719***	0.220
	(1.72)	(1.12)	(2.60)	(0.45)
ROA	4.611***	8.800***	4.783***	8.264***
	(7.08)	(9.60)	(7.17)	(8.29)
Segment number	-0.045**	-0.028	-0.035	-0.015
	(-2.19)	(-1.49)	(-1.49)	(-0.63)
Volatility	0.400	1.579	-3.349	-1.713
	(0.07)	(0.32)	(-0.49)	(-0.28)
S&P 500	0.639***	0.556***	0.596***	0.552***
	(7.32)	(6.26)	(5.90)	(5.21)
Log of firm age	-0.143***	-0.122**	-0.132**	-0.089
	(-2.81)	(-2.46)	(-2.45)	(-1.61)
Board size	-0.021	-0.028*	0.074	0.087*
	(-1.18)	(-1.71)	(1.61)	(1.83)
Log of board meetings	-0.240***	-0.222***	-0.197**	-0.143
	(-2.99)	(-2.89)	(-2.34)	(-1.61)
Log of board committees	0.161	0.038	0.235	0.201
	(1.03)	(0.25)	(1.24)	(1.02)
Outside directorships	0.076	0.079	0.189*	0.226**
	(0.93)	(1.00)	(1.86)	(2.10)
Director tenure	0.004	0.002	0.001	-0.004
	(0.49)	(0.21)	(0.10)	(-0.36)
Independent director ratio	0.146	-0.182	0.254	-0.075
	(0.43)	(-0.52)	(0.66)	(-0.18)
CEO - chair	-0.016	0.049	0.014	0.080
	(-0.26)	(0.82)	(0.19)	(1.11)
CEO retirement	-0.063	-0.136**	-0.099	-0.197**
	(-0.90)	(-2.20)	(-1.22)	(-2.44)
Blockholder	0.082	0.001	-0.036	-0.089

	(0.55)	(0.01)	(-0.23)	(-0.52)
Constant	3.914***	3.554***	4.796***	4.487***
	(8.86)	(8.10)	(6.92)	(6.39)
Industry dummies	Yes	Yes	Yes	Yes
Adj. R-squared	0.318	0.379		
N	697	684	697	684
1st stage – time since announcement			0.098***	0.098***
			(2.61)	(2.66)
1st stage – log of airport distance			-2.194***	-2.250***
			(-3.19)	(-3.41)
Kleibergen-Paap rk Wald F statistic			9.243	9.656
Stock Yogo critical value – 10%			19.93	19.93
Stock Yogo critical value – 15%			11.59	11.59
Stock Yogo critical value – 20%			8.75	8.75

Table 10. Tobin's Q and common ground

We report summary statistics for the common ground proxies in Panels A and B, and the results of regression that shows how the proxies are related to Tobin's Q in Panel C. Our first common ground proxy is the Blau score. The Blau score is our measure of concentration of skills among directors and calculated as $1 - \Sigma p_i^2$ (Blau, 1977). By construction, the Blau index is between zero and (K – 1)/K where K is the maximum number of skills, which in our case provides a theoretical maximum of 19/20. A high Blau score indicates a low concentration of skills among directors, and thus low levels of common ground. Our second common ground proxy is the inside-outside Blau score. This measure is calculated similar to the Blau score by treating inside and outside directors as separate groups. The numbers underneath the correlations in Panel B are p-values. The dependent variable in Panel C is Tobin's Q in the OLS and the second-stage IV models and the common ground proxies in the first-stage IV models. In the last IV model, we run the third model with three instruments. The coefficients from the first-stage on our instruments (time since announcement, log of airport distance and skills for common directors) are provided after IV regressions along with Kleibergen-Paap rk Wald F statistic and endogeneity test statistic. All other variables are defined in the Appendix. We control for industry effects by including industry dummies based on two-digit SIC codes. T-statistics are reported in parentheses below coefficient estimates in Panel C and are based on heteroskedasticity corrected standard errors. ***, **, * indicate statistical significance at the 1, 5, and 10% levels, respectively.

Panel A: Summary statistics

Variables	Mean	Median	Standard Deviation	Min.	Max.
Blau score	0.850	0.862	0.053	0.320	0.924
Inside-outside Blau score	0.879	0.889	0.043	0.444	0.941

Panel B: Correlation

Variables	Number of skills
Blau score	0.815***
	<0.01
Inside-outside Blau score	0.881***
	<0.01

Panel C: Regressions

	OLS		IV		
Variables	(1)	(2)	(3)	(4)	(5)
Blau score	-0.823*		-13.190**		-14.883***
	(-1.84)		(-1.98)		(-2.63)
Inside-outside Blau score		-1.420**		-15.626**	
		(-2.32)		(-2.03)	
Log of firm size	-0.185***	-0.186***	-0.211***	-0.211***	-0.219***
	(-5.38)	(-5.40)	(-4.99)	(-5.15)	(-4.82)
Capital expenditures	0.351	0.347	0.393	0.344	0.481
	(1.33)	(1.32)	(1.23)	(1.21)	(1.37)
ROA	3.116***	3.141***	3.588***	3.707***	3.138***
	(4.20)	(4.31)	(4.82)	(5.38)	(4.32)
Segment number	-0.038**	-0.038**	-0.043*	-0.041*	-0.045*
	(-2.05)	(-2.04)	(-1.88)	(-1.82)	(-1.80)
Volatility	2.806	2.647	1.043	-0.123	-2.723
	(0.50)	(0.48)	(0.17)	(-0.02)	(-0.36)
S&P 500	0.655***	0.652***	0.607***	0.593***	0.689***
	(8.19)	(8.19)	(5.62)	(5.63)	(6.10)
Log of firm age	-0.159***	-0.159***	-0.151***	-0.151***	-0.163***
	(-3.32)	(-3.32)	(-2.61)	(-2.70)	(-2.65)
Board size	-0.033**	-0.027*	0.039	0.073	0.028

	(-2.27)	(-1.86)	(0.90)	(1.28)	(0.80)
Log of board meetings	-0.192***	-0.188***	-0.171**	-0.139*	-0.111
	(-2.73)	(-2.69)	(-2.04)	(-1.71)	(-1.08)
Log of board committees	0.274*	0.270*	0.474**	0.361*	0.479**
	(1.86)	(1.84)	(2.02)	(1.78)	(2.34)
Outside directorships	0.070	0.074	0.268**	0.240**	0.163
	(1.00)	(1.04)	(1.96)	(2.03)	(1.46)
Director tenure	-0.004	-0.004	-0.017	-0.016	0.003
	(-0.51)	(-0.55)	(-1.22)	(-1.23)	(0.24)
Independent director ratio	-0.189	-0.171	0.097	0.202	0.360
	(-0.58)	(-0.53)	(0.22)	(0.45)	(0.71)
CEO - chair	-0.001	-0.000	-0.003	0.013	0.013
	(-0.02)	(-0.00)	(-0.04)	(0.19)	(0.16)
CEO retirement	-0.052	-0.054	-0.054	-0.068	-0.055
	(-0.84)	(-0.86)	(-0.72)	(-0.91)	(-0.65)
Blockholder	-0.044	-0.046	-0.101	-0.113	-0.165
	(-0.32)	(-0.34)	(-0.67)	(-0.79)	(-0.83)
Constant	4.588***	5.081***	14.219***	16.453***	15.583***
	(8.71)	(7.94)	(2.73)	(2.68)	(3.41)
Industry dummies	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.279	0.281			
N	833	833	833	833	694
1st stage – time since announcement			0.001*	0.001*	0.001
			(1.76)	(1.87)	(1.31)
1st stage – log of airport distance			-0.027*	-0.023*	-0.038***
			(1.94)	(1.97)	(-2.75)
1st stage – skills for common directors					0.004**
					(2.10)
Kleibergen-Paap rk Wald F statistic			4.449	4.928	4.110
Stock Yogo critical value – 10%			19.93	19.93	22.30
Stock Yogo critical value – 15%			11.59	11.59	12.83
Stock Yogo critical value – 20%			8.75	8.75	9.54
Endogeneity test			5.754**	5.441**	13.495***
Chi-square(1) p-value			(0.017)	(0.020)	(0.000)

Table 11. Blau scores and the number of board meetings

We report the results of regressions that show how the common ground is related to board meetings. We estimate a Poisson model of board meetings on three different Blau scores and other control variables. The Blau score is our measure of concentration of skills among directors and calculated as $1 - \Sigma p_i^2$ (Blau, 1977). By construction, the Blau index is between zero and (K – 1)/K where K is the maximum number of skills, which in our case provides a theoretical maximum of 19/20. A high Blau score indicates a low concentration of skills among directors, and thus low levels of common ground. Our first common ground proxy is the Blau score between committee members and the rest of the board. We use the audit, compensation, and corporate governance and nomination committees to find committee Blau scores. Specifically for each committee, we calculate the Blau score between the committee members and the rest of the board and take an average of the Blau scores for each committee to come a single Blau score for a firm. The second common ground proxy is the Blau score for the board, which considers all board members as in Table 10. Our third common ground proxy is the inside-outside Blau score. This measure is calculated similar to the Blau score for the board by treating inside and outside directors as separate groups. All other variables are defined in the Appendix. We control for industry effects by including industry dummies based on two-digit SIC codes. T-statistics are reported in parentheses below coefficient estimates in Panel C and are based on heteroskedasticity corrected standard errors. ***, **, * indicate statistical significance at the 1, 5, and 10% levels, respectively.

	Board meetings		
Variables	**(1)**	**(2)**	**(3)**
Committee Blau score	0.705*		
	(1.87)		
Blau score		0.244	
		(0.87)	
Inside-outside Blau score			0.654*
			(1.79)
Log of firm size	0.041*	0.040*	0.041*
	(1.74)	(1.68)	(1.72)
Capital expenditures	0.058	0.061	0.061
	(0.36)	(0.38)	(0.38)
ROA	-1.042***	-1.018***	-1.040***
	(-2.66)	(-2.61)	(-2.65)
Segment number	0.001	0.001	0.001
	(0.09)	(0.07)	(0.08)
Volatility	0.305	0.154	0.292
	(0.09)	(0.04)	(0.08)
S&P 500	0.057	0.055	0.057
	(1.14)	(1.09)	(1.14)
Log of firm age	-0.055**	-0.056**	-0.055**
	(-2.05)	(-2.07)	(-2.05)
Board size	-0.024*	-0.020*	-0.023*
	(-1.88)	(-1.65)	(-1.86)
Log of board committees	0.030	0.029	0.029
	(0.34)	(0.33)	(0.34)
Meeting attendance	0.530	0.510	0.525
	(1.18)	(1.13)	(1.16)
Outside directorships	-0.022	-0.017	-0.021
	(-0.46)	(-0.36)	(-0.44)
Female directors	-0.140	-0.118	-0.138
	(-0.79)	(-0.68)	(-0.78)
Independent director ratio	0.599***	0.611***	0.597***
	(3.36)	(3.42)	(3.34)
CEO - chair	-0.116***	-0.116***	-0.116***
	(-3.68)	(-3.67)	(-3.68)

Constant	0.977**	1.360***	1.022**
	(2.40)	(3.63)	(2.58)
Industry dummies	Yes	Yes	Yes
Pseudo R-squared	0.048	0.047	0.048
N	833	833	833