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Board Industry Experience, Firm Value, and Investment Behavior*

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Abstract

We analyze the valuation effect of board industry experience and channels through which industry experience of outside directors affects firm value. Our analysis shows that firms with more experienced outside directors are valued at a premium compared to firms with less experienced outside directors. Additional analyses, including a quasi-experimental setting based on director deaths, mitigate endogeneity concerns. Firms with experienced boards limit investment distortions (lower investment-cash flow sensitivities) by building up valuable financial slack. The results further indicate that firms with experienced boards undertake shareholder-value friendly investments, particularly into R&D. Overall, our findings are consistent with board industry experience being a valuable corporate governance mechanism.

JEL Classification: G32; G34

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1. Introduction

A firm's board of directors is expected to perform the pivotal tasks of monitoring and advising top management. The monitoring function – which is to solve the agency problem created by the separation of ownership and control in modern corporations – has traditionally been at the focus of the empirical corporate governance literature. In a nutshell, this extensive strand of literature finds that smaller, outsider-dominated boards are more effective in monitoring management as they make business decisions with less managerial interference as well as reduced free-riding and coordination problems.[1] In contrast, the advising function has received far less attention, although its importance is already emphasized by early survey-based studies such as Mace (1971), who suggests that boards fulfill an advisory role, and Demb and Neubauer (1992, p. 43), who find that "setting the strategic direction of the company" was considered by two thirds of the directors as one of their tasks. Based on an evaluation of minutes of board meetings of Israeli firms in which the government owns a substantial share, Schwartz-Ziv and Weisbach (2013) characterize boards as "active monitors" and find evidence for both advising and monitoring behavior. Fama and Jensen (1983) also argue that outside directors provide support to top management when dealing with specialized decision problems besides their role as managerial monitors, but suggest that internal managers on the board contribute specific knowledge about the organization's activities to the decision making process. Coles et al. (2008) follow the idea that internal managers provide firm-specific information and find that firms for which the knowledge of the inside directors is more important, e.g., R&D intensive firms, benefit from a higher fraction of inside directors on the board. Therefore, the two tasks that a board fulfills result in a trade-off: enhanced organizational knowledge provided by inside directors comes at the cost of reduced monitoring resulting from hiring fewer outside directors.[2]

[1] For early papers on board size see, for example, Yermack (1996) and Eisenberg et al. (1998). Board independence is studied by Weisbach (1988), Byrd and Hickman (1992), Borokhovich et al. (1996), and Brickley et al. (1994), among others. For a comprehensive overview see Hermalin and Weisbach (2003) and Adams et al. (2010).

[2] This trade-off is modelled in Raheja (2005) and Harris and Raviv (2008), who show that both board size and the fraction of insiders and outsiders on the board are a function of director and firm characteristics. In Harris and Raviv (2008), shareholders can even be better off with a board fully comprised of inside directors.

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In this paper, we hypothesize that independent outside directors with specific knowledge of a firm's business combine these desirable characteristics and are thus in a better position to exert both the monitoring and the advising function. Specifically, we propose and empirically test industry experience of outside directors as a measure that captures a board's superior capabilities to provide both monitoring and advice. Most important, we conjecture that board industry experience is one of the most important determinants of a board's ability to perform its role in a manner that enhances shareholder value.

Anecdotal evidence supports our claim. For example, the Sarbanes-Oxley Act of 2002 requires firms' audit committees to consist entirely of independent outside directors. The listing rules of the New York Stock Exchange and Nasdaq require (most) listed firms to have a majority of independent outside directors on their boards. Furthermore, large institutional investors, such as the California Public Employees' Retirement System (CalPERS), recommend the CEO to be the only insider on the board. This regulatory trend, combined with pressure from institutional investors to reduce inside directors on the board, arguably limits the availability of firm-specific knowledge to the board of directors as the firm's main decision making body. Coincidentally, the main focus of shareholder activists, the press, and various corporate governance experts recently shifted from board independence to board industry experience. In particular, in the aftermath of the recent financial crisis, concerns that the industry experience on corporate boards is insufficient have been raised (Pozen, 2010; Bertsch, 2011). Recent survey evidence among directors suggests that industry experience is seen as the top attribute sought in new directors and one of the most desired skill safeguarding board success in the near future (Deloitte LLC, 2015; Corporate Board Member, 2014).

These developments are consistent with the more general observation that financial crises in the past triggered discussions about the quality of corporate governance, which often resulted in regulatory changes (Holmstrom and Kaplan, 2003; Chhaochharia and Grinstein, 2007). In fact, the amendments to the Securities and Exchange Commission's disclosure rules introduced in December 2009 intend to increase, among

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others, director qualifications, thereby also reflecting an increased interest in director qualifications and experience.[3]

In our empirical analysis, we estimate board industry experience, defined as the percentage fraction of outside directors with prior work experience in the same two-digit standard industry classification (SIC) code industry, for all industrial firms in the S&P 1500 index from 2000 to 2010. Our results show that firms with more board industry experience are valued at a premium compared to firms with less experienced directors on the board. This valuation effect is statistically significant and economically relevant. In particular, an increase in board industry experience by one standard deviation is associated with an increase of approximately 5% to 7% in firm value. When we control for a comprehensive set of corporate governance and board structure variables, board industry experience turns out to be one of the most important value-influencing corporate governance factors. In addition, when breaking down our board industry experience variable into different types of industry experience, we find the results to be mainly driven by industry experience gained as an inside director and, in particular, by industry experience gained as a CEO. Our results also hold when we estimate board industry experience using the Hoberg and Phillips (2010; 2015) industry classification, which reflects product similarity, or when we estimate board industry experience on firm-segment level rather than on firm level. We find that our results are neither driven by active affiliations of directors within the same industry nor by general managerial experience. We provide a number of additional analyses that provide results inconsistent with an endogenous relationship between board industry experience and firm value driving our results. Firm fixed effects regressions suggest that our results are driven by within-firm variation of board industry experience and rule out invariant firm-level omitted variable-based explanations. When we instrument our board industry experience variable to isolate the exogenous component or when we account for the endogenous selection of industry experienced directors to companies' boards in a Heckman selection model, our results remain robust. Additionally, we use an event-

[3] The amendments adopted by the Securities and Exchange Commissions on December 16, 2009 are intended to improve disclosure regarding risk, corporate governance, director qualifications, and compensation to enhance information provided to shareholders (http://www.sec.gov/rules/final/ 2009/33-9089-secg.htm).

study setup and analyze director deaths that occur randomly and represent an exogenous shock to the board structure. The death of an experienced director is associated with a three-day cumulative abnormal return that is 1.3% to 1.5% lower as compared to the death of a director without industry experience. The economic magnitude of this finding becomes even slightly larger when we restrict our sample to a subset of "sudden" deaths, including strokes, heart attacks, and accidents, which were unlikely to be anticipated by the market. We conclude that board industry experience has a positive causal effect on firm value.

To better understand the mechanism behind the industry expertise-firm value relationship, we examine investment policies and cash holdings as two channels through which industry experience of outside directors affects firm value. Existing literature on boards (Güner et al., 2008) and corporate governance (Dittmar and Mahrt-Smith, 2007) suggests that these channels are important in transforming corporate governance into firm value. In our setting, more experienced boards may be able to mitigate the information asymmetry between managers and outside directors within a firm, thereby enhancing investment decisions through better monitoring, and experienced outside directors may also have a comparative advantage in anticipating future conditions in the industry, enabling them to provide active advice to managers about the optimal investment policy. Our results show that experienced boards reduce investment-cash flow sensitivities and help to avoid investment distortions. We further document that industry experienced boards make shareholder value enhancing investment decisions, especially R&D investments, and that board industry experience has a positive and significant impact on the market value of cash. Arguably, firms with industry experienced boards are able to limit potential managerial misuse of precautionary cash holdings. These firms use their cash holdings to become less dependent on operating cash flows and to reduce investment distortions (as indicated by their lower investment-cash flow sensitivities), ultimately implementing value-maximizing investment strategies. We conclude that industry experience among outside directors constitutes a firm-value enhancing corporate governance mechanism.

The question arises why firms do not appoint more industry experts to their board of directors. We provide some evidence that limited supply of industry expert directors resulting from non-competition

agreements as well as corporate governance problems in firms, in particular powerful CEOs and weak board oversight, are at least partly responsible for firms not hiring more industry experts.

Our paper adds to the literature on corporate governance, specifically corporate boards. For example, Yermack (1996) documents that larger boards are associated with lower firm values. Core et al. (1999) find a positive relationship between the fraction of outside directors on the board and firm value. Coles et al. (2014) show that directors appointed after the CEO assumed office are weak monitors and thus seem to have allegiance to the CEO. Cremers et al. (2014) find staggered boards to be associated with higher value, particularly in firms where longer-term commitment by directors is more important. Several studies focus on the skills and the expertise of the directors, reflecting the assumption that directors' backgrounds their behavior. Güner et al. (2008), Dittmann et al. (2010), and Minton et al. (2014) analyze bankers, while Baker and Gompers (2003) turn their attention to venture capitalists, and Agrawal and Knoeber (2001) to politically connected directors. Fich (2005) and Fahlenbrach et al. (2010) investigate the role of CEOs as outside directors. Adams and Ferreira (2009) find that more gender-diverse boards are associated with better attendance records and stronger monitoring, but not higher value. Masulis et al. (2012a) find that foreign independent directors at US corporations show poor board meeting attendance and are associated with lower firm values. We add to the literature on board characteristics by showing evidence of a positive relationship between board industry experience and firm performance. In addition, we identify channels through which directors with industry experience influence firm performance.

Our paper also contributes to the nascent literature on industry experience of corporate executives or directors. Custódio and Metzger (2013) evaluate the industry experience of the CEO in diversifying acquisitions and find that acquirers' abnormal announcement returns are between 1.2 and 2.0 percentage points higher if the acquirer's CEO possesses experience in the target industry. Huang (2014) finds that divestiture decisions of conglomerates are more likely to result in sell-offs of divisions that are active in industries in which the CEO does not have work experience. Thereby, these CEOs achieve a better match between their

experience and their firms' assets. Following such a refocusing, Huang (2014) documents significant performance improvements, supporting the notion that managerial industry experience matters.

Denis et al. (2015) extend the focus to the board of directors. They find industry experience of directors to be a main characteristic when new firms and their boards are set up in the course of a corporate spinoff, especially if the new CEO has neither been CEO of a unit nor on the board of the pre-spinoff firm. Therefore, they conclude that industry experts facilitate the assessment of CEO ability. Wang et al. (2013) show that audit committee industry experience reduces earnings management and the probability of financial fraud, while compensation committee industry experience reduces CEO excess compensation. Other work by Faleye et al. (2014), Masulis et al. (2012b), and Kang et al. (2015) documents a positive valuation effect associated with a higher fraction of experienced outside directors on firms' boards, and shows a relation between board industry experience and innovation activity, acquisition outcomes, and CEO turnover. Moreover, von Meyerinck et al. (2015) find in an event study setting that the appointments of outside directors with industry experience are associated with significantly higher announcement returns than the appointments of outside directors without industry experience. Our study differs from the aforementioned papers by first providing a richer analysis of the relation between board industry experience and firm value, which is supported by exhaustive robustness tests including an extensive set of identification strategies. Second, we establish that board industry experience materializes into firm value via two distinct operating policy channels, namely investment behavior and cash holdings.[4]

[4] Two other studies focus on directors' current industry affiliation rather than their past industry experience, which is the focus of our analysis. Dass et al. (2014) document that a higher fraction of directors from upstream (supplier) or downstream (customer) industries is associated with a higher firm value. Dass et al. (2011) find that firms with a higher fraction of directors from related industries on the board benefit from lower accounts receivable, lower inventories, shorter cash conversion cycles, and higher accounts payable. When splitting our board industry experience variable into contemporaneous and past industry experience, we find positive and significant coefficients on both variables, indicating that both current and past industry experience matters (see Columns 2 to 4 of Table A2).

The remainder of our study is organized as follows: Section 2 describes the data. Section 3 shows our results on the relationship between board industry experience and firm value. Section 4 examines the question why firms do not add more industry experts to their boards. Section 5 presents evidence how board industry experience affects firm value through its impact on investment behavior and cash holdings. Finally, Section 6 concludes.

2. Data and variables

2.1 Sample selection and measures of director industry experience

We start our sample selection process by identifying all industrial firms in the S&P 1500 index during the 2000-2010 period, i.e., we drop utilities and financial firms from our sample (SIC codes 4900-4949 and 6000-6999, respectively). This selection results in 1,860 distinct firms and 12,271 firm-year observations. We match these firm-year observations with the RiskMetrics database and retrieve for each firm-year's annual meeting the names of all outside directors. This matching procedure delivers 90,002 firm-year-outside director observations. Next, we build an employment history for each outside director using information from BoardEx.[5] Every outside director's employment history, or CV, shows, among others, for most positions both the start and the end date, the company name, and a position description. As a result, we obtain a dataset that contains the CV for each firm-year-outside director observation as of each firm-year's annual meeting date.

As experience at the same firm by definition also constitutes industry experience, we distinguish between prior experience at the firm where the director sits on the board and prior experience in the industry (i.e., at other firms in the focal industry). Arguably, both experience at the firm and in the industry of the firm are beneficial for the tasks and responsibilities of an outside director. To isolate the effect of industry experience, we drop all positions at the firm prior to becoming an outside director at the same firm. We use

[5] We are unable to build a working history for 3,241 firm-year-outside director observations (947 distinct outside directors). These outside directors are kept in our sample, but we define them as having no industry experience. In unreported tests, we drop these directors from the sample and find our results to remain robust.

a firm name-matching algorithm, which identifies and drops firms in the directors' CVs that carry the same name as the firm where the person is active as an outside director. This firm name-matching algorithm matches firm names even if firms changed their name over time.

The directors in our sample worked for 797,168 firms throughout their employment history. To determine whether the directors in our sample have industry experience, we assign SIC codes to the firms in the directors' CVs. In particular, we assign 405,419 SIC codes from the Center of Research in Security Prices (CRSP), 51,318 from COMPUSTAT North America, 5,848 from COMPUSTAT Global, 69,823 from Amadeus, and 2,907 from Datastream.[6] Next, we match the firms from the directors' CVs to their respective two-digit SIC industry by means of the SIC codes. This approach enables us to classify whether a position in a director's CV entails industry experience, namely when the firm he[7] worked for was active in the same two-digit industry where he sits on the board as an outside director.

We introduce different measures of industry experience on the director level. Our standard measure of director industry experience, *Director ind. exp. (dummy)*, uses a dummy variable that equals one if a director possesses industry experience in the same two-digit SIC industry (and zero otherwise). We alternate this measure along two dimensions. First, we construct more granular measures of industry experience that estimate director industry experience gained at different hierarchical levels using the position descriptions. We introduce a dummy variable that equals one if a director has experience as an employee without being a member of the board of directors, denoted as *Director ind. exp. empl. (dummy)*. Additionally, we define a dummy variable which measures industry experience when being a member of the board, while also being employed by the firm (i.e., being an executive director), and a dummy variable which measures experience as an outside director in the same industry (i.e., being a member of the board of directors without being

[6] To check whether industry experience at private firms matters differently than experience at public firms, we assign 149,345 SIC codes of non-listed firms using Factiva and LexisNexis, which we collected by hand. The results remain qualitatively unchanged (see Table A1). However, to reduce the potential noise in measuring director industry experience, we exclude firms whose SIC codes stem from Factiva and LexisNexis from our analysis.

[7] Given that the majority of the directors in our sample are males, we refer to a director as 'he'.

employed by the firm), labeled *Director ind. exp. exec. dir. (dummy)* and *Director ind. exp. outs. dir. (dummy)*, respectively. We further define a dummy variable which equals one if a director has experience as a CEO in the industry (*Director ind. exp. CEO (dummy)*). Second, we estimate the duration of each position as the difference between the provided start and end dates and sum up the duration of all positions that offer industry experience (*Director ind. exp. (years)*). We are thus not only able to estimate whether a director possesses industry experience in certain hierarchical categories, but also the duration of his industry experience.

Descriptive statistics for industry experience on the director level are shown in Panel A of Table 1. 25.21% of all 90,002 outside directors possess industry experience in the same two-digit SIC code industry. With respect to the hierarchical level of industry experience, 6.75% of all outside directors were active as an executive director in the industry, and 5.21% have industry experience as a CEO. Moreover, 18.10% of all outside directors worked as an outside director in the same industry, and 10.33% of all outside directors possess experience as an employee without being a member of the board. The mean (median) duration of industry experience amounts to 2.67 years (0.00 years).

In addition, we use the RiskMetrics database to gather further director characteristics, as shown in Panel B of Table 1. The mean (median) age of a director is 61.12 years (62.00 years), and he holds 0.87 (0.00) other public board memberships. 87.06% of the outside directors are independent, and 12.38% of the outside directors in our sample are women.

2.2 Measures of board industry experience

So far, director industry experience has only been measured at the director level. By aggregating these measures of industry experience on the firm-year level, we compute our board industry experience measures for each firm-year as of the annual meeting date. The main board industry experience variable used in our empirical analysis, *Board ind. exp. (%)*, measures the percentage fraction of outside directors on the board that possess industry experience. Moreover, we introduce a dummy variable that equals one if the majority

of outside directors is experienced, and zero otherwise (*Maj. of board exp. (dummy)*). In addition, we measure board industry experience using the different hierarchical categories at the director level. These measures indicate the percentage fraction of outside directors that possess experience as an employee without a board membership (*Board ind. exp. empl. (%)*), the percentage fraction of outside directors that possess industry experience as an outside director (*Board ind. exp. outs. dir. (%)*), and the percentage fraction of outside directors that possess industry experience as an executive director (*Board ind. exp. exec. dir. (%)*). We decompose the latter variable and determine the percentage fraction of outside directors that have industry experience as a CEO (*Board ind. exp. CEO (%)*), and the percentage fraction of outside directors that have executive director industry experience, but outside the role of being a CEO (*Board ind. exp. exec. dir. non-CEO (%)*). Finally, we estimate the mean and the standard deviation of the length of industry experience among all outside directors (*Mean board ind. exp. (years)* and *σ board ind. exp. (years)*, respectively).

Descriptive statistics for our board industry experience measures are shown in Panel A of Table 2. The mean (median) board industry experience is 26.02% (20.00%). These numbers are very similar to Wang et al. (2013), who document a mean (median) board industry experience of 25.3% (20.0%) for the S&P 500 firm universe from 2000 to 2007 using a similar methodology to determine industry experience. 11.11% (0.00%) of the outside directors in our sample have experience as an employee, 7.16% (0.00%) as an executive director, and 18.37% (12.50%) as an outside director. 5.57% (0.00%) of the outside directors in our sample gathered experience as a CEO in the same industry. The mean duration of industry experience of the board among all firm-years is 2.73 years.

2.3 Additional firm-level financial and corporate governance variables

We collect several additional firm-level financial and corporate governance variables. Following the corporate governance literature, we use Tobin's *Q* as a proxy for firm value as it incorporates managerial ability to utilize corporate assets in the future (Fracassi and Tate, 2012). Testing the association between firm value and some (novel) corporate governance measures, this approach also follows Gompers et al. (2003) and Bebchuk et al. (2009) as well as earlier work by Demsetz and Lehn (1985) and Morck et al.

(1988). Tobin's *Q* is defined as the market value of total assets divided by book value of assets, where the market value of the firm is computed as the book value of total assets plus the market value of common stock minus the book value of common stock minus the book value of deferred taxes (Kaplan and Zingales, 1997; Gompers et al., 2003; Bebchuk, et al., 2009; among others). Our financial control variables include capital expenditures (*CAPEX*), research and development (*R&D*) spending (scaled by property, plant, and equipment and sales, respectively), and return on assets (*ROA*), among others. The construction and sources of all variables are shown in the Appendix. Moreover, we collect a comprehensive set of corporate governance control variables often used in the literature. We use the E-Index proposed by Bebchuk et al. (2009) from RiskMetrics, board size, the percentage of independent outside directors on the board, a dummy variable that equals one if the majority of directors holds three or more additional outside directorships, the fraction of outside directors older than 72 years of age, a dummy variable that equals one if the CEO is a member of the nominating committee, the percentage fraction of outside directors that attend less than 75% of the board meetings, and a dummy variable that equals one if the firm has a combined CEO-Chairman position. Finally, we collect institutional ownership data from Thomson CDA Spectrum and the CEO stock ownership data from COMPUSTAT ExecuComp.

Descriptive statistics for the financial and corporate governance variables are summarized in Panel B of Table 2. The mean (median) firm size measured by total assets is USD 6,745.25 (1,379.56) millions, the mean (median) Tobin's *Q* is 2.04 (1.59), the mean industry adjusted Tobin's *Q* is 0.34, and the mean (median) ROA is 10.01% (9.70%). The mean (median) E-Index over all firm-years in our sample is 2.70 (3.00), and the mean (median) board independence is 87.14% (90.00%). 58.78% of the firm-years in our sample exhibit a combined CEO-Chairman position, and in 62.45% of the firm-years the firm is incorporated in the state of Delaware.

3. Board industry experience and firm value

3.1 Univariate analysis

To test whether industrial firms are valued higher if industry-experienced outside directors sit on their boards, we construct two portfolios. The high (low) board industry experience portfolio is computed on an annual basis and contains for each sample year from 2000 to 2010 the firms in the highest (lowest) 20% board industry experience quintile. As shown in Panel C of Table 2, the mean Tobin's *Q* of the high and low board industry experience portfolio is 2.42 and 1.92, respectively. The difference in mean Tobin's *Q* between the high and the low board industry experience portfolio amounts to 0.50 and is statistically significant (*t*-value of 11.89). A median test for difference between Tobin's *Q* of the two subsamples exhibits a value of 0.27, which is also significant (*z*-value of 11.54). These findings can be interpreted as preliminary evidence that industry experience among a firm's outside directors is related to its market value and thus warrant our following analyses.

3.2 Multivariate analysis

Our univariate results that firms with more experienced boards are valued above their inexperienced peers have to be interpreted with caution. First, firm-level variables might be correlated with both firm performance and board industry experience. Therefore, we estimate multivariate regressions to control for a firm's financial and corporate governance structure. Second, board industry experience might be only beneficial during certain years of our sample period or for certain industries. We include year and two-digit SIC code industry fixed effects in most regression models to control for unobserved year as well as unobserved industry specific effects. Pooling the standard errors on the firm level adjusts for firm-level effects which are not fixed over time (Petersen, 2009; Coles et al., 2012).

The results of ordinary least squares (OLS) regressions with Tobin's *Q* as the dependent variable are shown in Table 3. We find a positive and statistically significant relationship between our board experience measure, *Board ind. exp. (%)*, and Tobin's *Q* in Column 1 when controlling for a firm's financial and corporate governance characteristics as well as industry and year fixed effects. The estimated coefficient on

our board industry experience measure is 0.43, implying that an increase in board industry experience by one standard deviation (0.26; see Panel A of Table 2) is associated with an increase of 11.16 percentage points in Tobin's *Q*. Given the sample mean (median) Tobin's *Q* of 2.04 (1.59), this effect induces an increase of approximately 5.5% (7.0%) in firm value. Overall, the valuation effect of board industry experience is both statistically significant and economically relevant.

Outside directors not only monitor managers, but they additionally represent a source of valuable advice to management if they possess experience in leading positions within an industry. If this is the case, we expect the quality of an outside director's advising to depend on whether his industry experience has been acquired in a leading top management position (as an inside director and, in particular, as a CEO) in comparison to experience gained while working in a position with less responsibility (as an employee without being member of the board of directors). This notion is consistent with the argument that "CEOs have the most relevant experience and expertise to be effective directors" (Lorsch and McIver, 1989, p. 174). The additional specifications in Columns 2, 3, and 4 of Table 3 include the three measures of board industry experience that estimate industry experience gained at different levels of a firm's hierarchy. As expected, all coefficients are significantly positive. The coefficient for the measure of board industry experience as an executive director (*Board ind. exp. exec. dir. (%)*) in Column 3 is higher compared to our overall measure of board industry experience in Column 1 and our other hierarchical measures of board industry experience (*Board ind. exp. empl. (%)* and *Board ind. exp. outs. dir. (%)* in Column 2 and 4, respectively). When including all three measures jointly in Column 5, only the coefficient for board industry experience as an outside director remains significantly positive.[8]

[8] We are cautious in interpreting the coefficients in regressions that include all three variables jointly due to multicollinearity problems. It is plausible that if a director possesses detailed (valuable) industry experience, he has experience in all three categories gained by rising through the ranks during his career: first, as an employee without a board membership, second as an executive director, and finally as an outside director. Therefore, the conclusion that can be drawn from the estimated coefficients is that all three variables contribute to the positive relationship between firm performance and board industry experience.

To evaluate in more detail whether industry experience gained as an executive director matters most, we further decompose our board industry experience variable that measures industry experience as in inside director. In particular, we use the fraction of outside directors with experience as a CEO (*Board ind. exp. CEO (%)*), while at the same time controlling for experience as an executive director outside the role of a CEO (*Board ind. exp. exec. dir non-CEO (%)*). If board industry experience as an executive director matters more than experience gained as an outside director or an employee, we expect the coefficient to be highest for board industry experience of outside directors gained at the CEO level, since serving as CEO allows gaining the most detailed operational experience (Fich, 2005; Fahlenbrach et al., 2010). The results are shown in Column 6 of Table 3. The impact of CEO board industry experience on Tobin's *Q* is highly positive and statistically significant. The magnitude of the CEO board industry experience coefficient is higher compared to the other board industry experience variables used in the regression models shown in the previous columns; thus, it seems that the results of the model in Column 3 are largely driven by CEO board industry experience of the outside directors. This finding is in line with Kang et al. (2015), who argue that industry experience gained while working as a CEO improves firm-value.[9] Overall, our results suggest that industry experience among a firm's outside directors enhances firm value. This effect is mostly driven by industry experience gained while working as an outside director and as a CEO, thus corroborating our conjecture that experienced boards both advise and monitor senior management.

Turning to the other control variables, we observe that most corporate governance variables enter the regression models with their predicted signs. For example, the coefficient on board size is negative and significant in almost all specifications. This result indicates that firms with larger boards of directors exhibit lower firm values (Yermack, 1996). The coefficient on Bebchuk et al.'s (2009) entrenchment index, or E-

[9] We investigate whether this finding reflects the positive valuation effect of having CEOs as outside directors, as documented by Fich (2005) and Fahlenbrach et al. (2010), rather than having outside directors with industry experience gained in a CEO position. To this end, we reestimated the regression and included the percentage fraction of outside directors on the board with a contemporaneous CEO position at another corporation as additional control variable (not tabulated). The coefficients on both industry experience variables remain qualitatively unchanged when compared to the results reported in Column 6 of Table 3, while the coefficient on the percentage fraction of outside directors on the board with a contemporaneous CEO position is close to zero (0.002, *t*-value = 0.009).

Index, is also negative and significant in all specifications. The E-index comprises the six provisions that drive the results of the governance index, or G-Index, of Gompers et al. (2003). In previous studies, both indexes are found to negatively affect Tobin's *Q*, confirming a positive correlation between shareholder rights and firm value (Gompers et al., 2003; Bebchuk et al., 2009; Cremers and Ferrell, 2014). The dummy variable indicating whether the CEO is a member of the nominating committee is also significant throughout all specifications, indicating that more entrenched CEOs exert a negative impact on firm value (Shivdasani and Yermack, 1999). The coefficient on the variable indicating a board's busyness (*Busy board (dummy)*) is positive and significant in all specifications (Field et al., 2013).

3.3 Robustness tests

The results of a number of robustness tests are reported in Tables 4 and 5. In a first step, we check whether our results are robust during different sub-periods. The full sample is split into two subsamples of similar size, one containing the first six sample years (2000-2005) and one the last five sample years (2006-2010). When reestimating the baseline regression model from Column 1 of Table 3 for both subsamples, we find the coefficient on the board industry experience measure for the years 2000 to 2005 (Column 1) to be almost double the size of the estimate for the later years 2006 to 2010 (Column 2). However, the board industry experience coefficients remain positive and statistically significant in both subsamples.

In a second step, we check whether our results are robust when we use a cruder dummy variable classification of board industry experience. In particular, we test whether firms that are governed by a board dominated by experienced outside directors are valued at a premium relative to firms where only a minority of outside directors is experienced. Supporting this conjecture, the coefficient on the dummy variable (*Maj. of board exp. (dummy)*), which indicates whether the board is composed of a majority of outside directors, is positive and statistically significant (Column 3).

In a third step, we check whether our results depend on the industry classification used to estimate board industry experience. We change the industry classification scheme from the two-digit SIC code to the one-digit SIC code (Column 4) as well as to the three-digit SIC code (Column 5) and recompute the fraction

of experienced outside directors on the board (*Board ind. exp. (%; one-digit)* and *Board ind. exp. (%; three-digit)*, respectively). We include one-digit SIC code industry fixed effects in the regression shown in Column 4, and two-digit SIC code fixed effects in Column 5. In addition, we use a combined board industry experience measure that assigns more weight to an outside director with working experience in a more closely related industry (*Combined ind. exp. measure (one – four digit)*) similar to Custódio and Metzger (2013) and two-digit SIC code fixed effects in Column 6 of Table 4. Specifically, it assigns a value of four to an outside director with experience in the same four-digit SIC code industry, a value of three for experience in the same three-digit SIC code industry, a value of two for experience in the same two-digit SIC code industry, a value of one for experience in the same one-digit SIC code industry, and zero otherwise. On the board level, the measure is computed as the mean score of the weighted industry experience measure. When substituted into our main regression specification, coefficients on all three variables are positive and statistically significant.

In a fourth step, we measure industry experience on the outside director level in years of work experience in the same two-digit SIC code industry. In Column 7 of Table 4, the mean years of industry experience among all outside directors on the board (*Mean board ind. exp. (years)*) is used as the industry experience measure. As expected, the corresponding coefficient is positive and significant. In Column 8, we add the standard deviation of the director industry experience among all outside directors in years for each firm-year (*σ board ind. exp. (years)*) to the model. This specification allows us to determine whether stock market participants reward a heterogeneous or a homogeneous structure of industry experience among a firm's outside directors (i.e., only one industry experience expert with many years of experience compared to a group of directors with relatively little experience). The coefficient on the mean years of industry experience remains positive and significant. Interestingly, the coefficient on the standard deviation of board industry experience is significantly negative, thus investors seem to prefer a homogeneous structure of industry experience among the outside directors.

In a fifth step, we rerun the baseline regression and check whether our results are driven by active affiliations of directors within the same industry, as suggested by Dass et al. (2011) and Dass et al. (2014). This test requires splitting our overall board industry experience measure. While only active industry affiliations at the annual meeting date in a director's CV are considered in one measure, only past industry affiliations are included in the other one. In results not shown, we find that the coefficients are positive and statistically significant for both measures, thus director industry experience drives our results rather than active affiliations within an industry.

So far, we have shown that the positive association between our measure of board industry experience and Tobin's *Q* is robust along a number of dimensions. However, there may still be concerns whether the industry classification applied effectively captures the true relatedness of the business model of two companies. We address these concerns with two additional tests. First, we apply the Hoberg and Phillips (2010; 2015) industry classification both to the firms in the outside directors' working histories and to the firms where the directors currently sit on the board in order to measure a board's industry experience.[10] The industry measures developed and tested in Hoberg and Phillips (2010; 2015) are based on a pair-wise textual comparison of the product descriptions in the annual reports available via the SEC's EDGAR database.[11] For each sample year, this comparison yields a matrix of product similarity scores for all firms, which Hoberg and Phillips (2010; 2015) use to classify firm-years into time-varying industries of different granularity. We replicate the baseline regression from Column 1 of Table 3 and substitute our standard board industry experience variable with a board industry experience measure based on the Hoberg and Phillipps (2010; 2015) industry classification. We use their coarsest industry classification, which assigns all firms to

[10] The data stems from the Hoberg and Phillips Data library at http://alex2.umd.edu/industrydata/.

[11] Applying the text-based industry classification introduced by Hoberg and Phillips (2010; 2015) in our setup comes with certain drawbacks. First, the universe of firms for which their industry classifications are provided is limited to firms filing their annual report with EDGAR. Second, the Hoberg and Phillips database starts in 1997 since electronic filing with EDGAR was not required before 1997. Therefore, we are unable to determine whether entries in the directors' work histories offer industry experience for engagements at firms that do not file their annual report with EDGAR or engagements prior to 1997. Therefore, we use the SIC classification in the remainder of the paper.

50 industries (*Board ind. exp. (%; Hoberg-Phillips 50)*) in Column 1 of Table 5. We still find that board industry experience has a significantly positive effect on Tobin's *Q*.[12]

As a second test to check whether our measure of board industry experience captures the true relatedness of firms, we merge our firm-year sample with the COMPUSTAT segment file and reestimate the board industry experience measure using segment industry classification data.[13] This alternative approach allows us to check whether we misclassify directors as industry experienced and some as not industry experienced by relying on the broader firm-level industry classification. We are able to retrieve segment data from COMPUSTAT for 10,526 of the 12,271 firm-years. Out of these 10,526 firm-years, we classify 3,631 firm-years as diversified, i.e., firm-year observations where the firm has at least two business segments operating in different two-digit SIC code industries. Similar to our standard measure of director industry experience, we then classify an outside director as industry experienced if he possesses working experience in at least one of the two-digit SIC code industries a firm's business segments operate in. The measure *Board ind. exp. (%; Segment)* is calculated as the mean number of segment industry experts among all outside directors. Column 2 of Table 5 shows the result of the baseline regression using this segment board industry experience measure. As expected, we find the coefficient on the segment board industry experience measure to be positive and statistically significant. In Column 3 of Table 5 we reestimate the regression using a modified segment board industry experience measure (*Board ind. exp. (%; Segment/Main)*), where we replace the firm-years without coverage in the segment file with our standard measure of firm-level board industry experience (*Board ind. exp. (%)*) and find similar results. This approach effectively assumes that firms not covered in the COMPUSTAT segment database are not diversified. Finally, we use a measure of

[12] We also apply finer industry measures, where firms are assigned to 100 or 200 industries. The results remain qualitatively the same (Columns 5 and 6 of Table A2).

[13] As discussed in prior studies, segment data comes with a number of additional problems (see, for example, Berger and Ofek, 1995). Most noteworthy in our context is the fact that firms have some leeway in reporting segments (Berger and Hann, 2003). In some cases, none of the segments reported in a given firm-year is active in the two- or even the one-digit SIC code industry of the company. Furthermore, the sum of the segment sales do not equal the sales reported by the company in many cases. Due to these data deficiencies, we report the results only as a robustness test.

director industry experience which reflects the idea that the benefit of an outsider's working experience in a segment industry depends on the relative importance of the segment for the firm. For each outside director sitting on the board of a firm in a given year, we add up the fractions of segment sales to total segment sales of all segments that operate in two-digit SIC code industries where he has past working experience.[14] We estimate this measure on the board level as the mean outside director segment sales measure among all outside directors (*Board ind. exp. (%, Segment-Sales weighted)*). When we replace the standard board industry experience measure with the mean segment sales-weighted industry experience score and reestimate our standard regression, we find that this alternative measure is again positively associated with Tobin's *Q*, as shown in Column 4 of Table 5. Taken together, we conclude from this set of additional tests that using alternative industry experience measures based on Hoberg and Phillips (2010; 2015) industries or on segment industries does not change our main result that industry experience of the outside directors is positively related to firm value.

Finally, we test whether our board industry experience measure captures general managerial experience rather than industry experience. In Column 5 of Table 5, we extend our baseline regression from Column 1 of Table 3 by including the mean age of the outside directors, the mean number of firms the directors worked for in their work history, and the mean number of two-digit SIC code industries the outside directors worked in anytime in the past as additional control variables.[15] The results show that the coefficient on the board industry experience variable remains positive and significant. In addition, the coefficient on the mean number of firms the outside directors worked for is positive and significant, while both the coefficient on the mean number of industries in which the outside directors were active in and the coefficient on the mean age of the outside directors are negative and insignificant. In Column 6, we transform the three general board experience measures using the natural logarithm of one plus the experience measure to account for

[14] We estimate the relative importance of a segment using segment sales rather that segment assets, because segment assets is missing in the COMPUSTAT segment database for a substantial number of firm-year-segment observations.

[15] In contrast to the baseline regression, we drop the variable *% of directors older 72* due to collinearity with the variable that proxies for the mean age among the outside directors.

the skewness of these variables. The results remain virtually unchanged. Overall, results in Table 5 suggest that board industry experience remains value-relevant when we account for other measures of (general) managerial experience. However, general experience, as measured by the number of firms the outside directors worked for in the past, also seems value-relevant.

3.4 Endogeneity concerns

Our results so far establish a robust positive relationship between board industry experience and firm value. It is possible, however, that endogeneity concerns plague our empirical analysis of this relationship. It could be the case, for example, that our results arise due to reverse causality, reflecting the fact that more highly valued companies attract directors with industry experience. Our findings could also be driven by unobservable (omitted) variables, which affect both firm value and industry experience on boards. We provide seven pieces of evidence inconsistent with a pure endogeneity explanation of our results, suggesting that at least part of the experience-firm value relationship is causal. While the first six tests are variants of our main regression specification, our final test exploits director deaths as an exogenous shock to the board structure in an event study setup.

Potentially, our results might be driven by industry shocks that lead investors to value industry experience during certain time periods in certain industries. We test this hypothesis by replacing industry and year fixed effects with industry × year fixed effects in our main regression specification. Results of such a regression are shown in Column 1 of Table 6. The coefficient on our board industry experience variable remains positive and significant, indicating that industry shocks do not drive our results.

Our second test uses the methodology applied in Cremers and Ferrell (2014) and addresses the possibility that reverse causality could be a driver of our results. The alternative hypothesis under reverse causality is that the industry experience of the board serves as a quality signal to investors. As a result, firms with a low Tobin's *Q* fail to attract experienced directors, rather than experienced directors enhancing a firm's valuation. We test this alternative hypothesis by analyzing whether a firm's past valuation (i.e., lagged

Tobin's *Q*) explains the change in board industry experience, while at the same time controlling for all other lagged explanatory variables. Results of such an OLS regression with robust standard errors clustered at the firm level and industry and year fixed effects are shown in Column 2 of Table 6. Most important, the coefficient on lagged Tobin's *Q* is statistically insignificant and economically negligible, mitigating concerns that reverse causality drives our results. The coefficient on lagged board industry experience is negative and strongly significant, indicating that firms with high board industry experience are less likely to further increase board industry experience in the following year.[16]

Our third test uses an alternative model specification also following Cremers and Ferrell (2014). It includes firm fixed effects rather than industry fixed effects and, to adjust for industry effects, industry-adjusted Tobin's *Q* as the dependent variable. This specification controls for a potential correlation between the error term and the independent variable (board industry experience) due to unobserved firm-level variables. A caveat with this specification is that corporate governance variables often do not show sufficient within-firm variation, potentially creating collinearity problems with the firm fixed effect. We specify a firm fixed effects regression model and add our board industry experience variable, replacing most corporate governance controls with firm fixed effects.[17] The results of a regression with industry-adjusted Tobin's *Q* as the dependent variable together with firm and year fixed effects and firm clusters are shown in Column 3 of Table 6. The estimated coefficient on the board industry experience variable remains positive and statistically significant.[18] We conclude that board industry experience is positively associated with Tobin's *Q*,

[16] A potential concern is that the lagged board industry experience variable is already correlated with Tobin's *Q*, thus we are unable to observe a significant relationship between the change in board industry experience and lagged Tobin's *Q*. To overcome this concern, we reestimate the model in Column 2 of Table 6 without the lagged board industry experience variable. Our results remain unchanged (Column 7 of Table A2).

[17] Most corporate governance variables are largely time-invariant, rendering fixed effects techniques ineffective (e.g., Zhou, 2001; Fahlenbrach, 2009; Coles et al., 2012). For example, the G-Index (and E-Index) is updated every two or three years only, and at each update, the median change is zero (see Fahlenbrach, 2009). A fixed effects regression would thus attempt to identify the coefficient for the G-Index/E-Index from very few observations. Our board industry experience measure also shows little time-series variation with both the 25th and 75th percentile annual changes being equal to zero. Nevertheless, our results hold when we include firm fixed effects.

[18] The coefficient becomes statistically stronger when we use a mean adjustment rather than a median adjustment for the dependent variable (not shown).

and this relationship is at least in part driven by within-firm variation of board industry experience rather than by unobservable firm characteristics that are constant over time.

We tackle endogeneity concerns in our fourth test by using a two-stage least squares (2SLS) regression approach. In their study on audit committee industry experience, Wang et al. (2013) introduce an instrument for director industry experience that exploits the stylized facts that directors are more likely to be appointed to boards of firms located in close proximity (Knyazeva et al., 2013), that industry experience is a regularly observed background for outside directors (Denis et al., 2015), and that firms avoid or are prohibited to appoint directors from direct competitors (see also Section 4). The specific instrument used is the natural logarithm of one plus the number of firms that share the same three digits of the zip code and the same two-digit SIC code, but not the same four-digit SIC code. The exclusion restriction requires that an instrument affects the dependent variable only indirectly through its effect on the endogenous board experience variable. We follow Wang et al.'s (2009) implicit assumption that the location of a firm, and thus the supply of experienced directors, does not affect firm value. The results of the first stage of the regression, shown in Column 4 of Table 6, indicate that the instrument is economically relevant since firms located closely to a larger number of non-competing industry peers exhibit a significantly higher fraction of industry-experienced directors among their outside directors. Moreover, the instrument passes the Stock and Yogo (2005) weak instrument test.[19] When controlling for endogeneity of board industry experience in the second stage of the 2SLS regression in Column 5 of Table 6, we still find that more experienced directors on the board are associated with higher firm value.

In our fifth test, we use a Heckman selection model to control for the endogeneity of the decision to appoint industry experienced directors. In the first step, we estimate a probit regression with a dummy as

[19] We directly test for the endogeneity of the board industry experience variable in our standard regression (Column 1 of Table 3) using Wooldridge's (1995) robust score test. The test statistic is significant, thereby confirming the endogenous nature of this variable.

the dependent variable that equals one if the number of experienced directors on the board increased compared to the previous year (and zero otherwise). The set of explanatory variables includes the standard firm-level controls used in Table 3, the instrument from the IV regression in Column 4 (i.e., the number of non-competing nearby peer firms), the fraction of other firms in the same two-digit SIC industry that increased the number of experienced directors compared to the previous year, the fraction of industry experienced directors on the board of other firms in the same two-digit SIC industry, the mean ROA of the other firms in the same two-digit SIC industry, and the firm's mean ROA over the past three years. In the second step, we regress Tobin's *Q* on the board industry experience variable, the full set of control variables, and the self-selection parameter (or inverse Mills ratio). The results from the first step are reported in Column 6, and the results from the second step in Column 7 of Table 6. The first step results show that the decision to increase board industry experience is positively related to the fraction of industry experienced directors on the board of peer firms and negatively to the percentage of other firms in the industry, which increase the number of industry experienced directors in this year. This latter finding may indicate a potential shortage in the supply of industry expert directors. The second step results show that, while there is evidence of self-selection, the coefficient on the board industry experience variable remains positive (significant at the 1% level) and of similar magnitude as in Column 1 of Table 3.[20]

In another test to mitigate endogeneity concerns, we use the methodology from Dittmar and Mahrt-Smith (2007) and Bebchuk et al. (2009). We replace the potentially endogenous board industry experience variable with its initial value, thereby forcing the board industry experience to remain constant. The intuition is that governance changes only slowly and future firm value is exogenous. We reestimate all regressions of Table 3 and find the coefficients on the board industry experience to remain similar (see Table A3).

Finally, we implement an altogether different (quasi-experimental) empirical framework to deal with possible endogeneity concerns and analyze stock market reactions to marginal changes in the board structure

[20] The coefficient on the inverse Mills ratio is positive and significant, indicating that there is a positive correlation between a firm's choice to increase industry experience on its board and firm value.

using event study methodology. The most intuitive and most frequently occurring board structure change is the addition of a new director to the board. However, as Hermalin and Weisbach (1988; 1998; 2003) point out, board structure and firm characteristics are simultaneously determined. A positive stock market reaction around the election of a director with industry experience could therefore also be caused by the need for change in the appointing firm rather than by the industry experience possessed by the elected director. In addition, director appointments arguably depend on career concerns as well as the availability and preferences of the newly appointed directors. We thus focus on director deaths in our event study setup, which occur randomly and represent an exogenous shock to the board structure. A small but growing strand of literature uses executive or director deaths as an identification strategy to mitigate endogeneity concerns.[21] Extending the analysis in von Meyerinck et al. (2015), we construct a sample of director death events and search for directors dying in office in our 11-year S&P 1500 sample. To increase sample size, we include additional board seats which our sample directors hold at other listed US non-financial and non-utilities companies. We identify 215 deaths of directors holding 300 directorships in 272 listed US firms. The approach explained in Section 2.1 is again used to determine the industry experience of deceased directors. The independent variable in our event study regressions that indicates director industry experience, denoted *Director ind. exp. (dummy)*, is a dummy variable that equals one if the deceased director possesses industry experience (and zero otherwise). In 93 of the 300 events (30.6%), the deceased director has industry experience in the same two-digit SIC code industry. Daily abnormal returns are estimated as the daily realized return minus the expected daily return under the market model. The market model is estimated over a 200-day period from t = -220 to t = -21, where t = 0 represents the announcement date. If director industry experience is valuation-relevant, we expect to observe significantly more negative cumulative abnormal returns (CARs) around the deaths of experienced directors as compared to the deaths of inexperienced directors. The results from regressions of three-day CARs (from t = 0 to t = 2), which are winsorized at the 1

[21] Johnson et al. (1985), Worrell et al. (1986), Bennedsen et al. (2010), and Fracassi and Tate (2012) analyze CEO and executive deaths, Slovin and Sushka (1993) the death of inside blockholders, and Nguyen and Nielsen (2010) and von Meyerinck et al. (2015) the deaths of outside directors.

and 99 percentile, on a number of director and firm-level control variables are shown in Table 7.[22] As hypothesized, we find a significantly negative coefficient on the industry experience indicator variable even if we control for director (Column 2) and both director and firm-level characteristics (Column 3). In particular, the death of an experienced director is associated with a three-day CAR that is 1.3 to 1.5 percentage points smaller compared to the death of a director without experience.

As a robustness test, we narrow our death sample by attempting to capture sudden deaths only. Arguably, these events are not anticipated by the market. As there is no unambiguously accepted definition of a sudden death, we follow previous literature in the classification of sudden deaths (Nguyen and Nielsen, 2010; Falato et al., 2014). Specifically, we classify a death as sudden when the cause of death is indicated to be a heart attack, a stroke, or an accident. Moreover, we classify a death as sudden when the specific cause is unreported, but the death is described as either unexpected, unanticipated, or sudden. In Column 4 of Table 7, we reestimate Column 3 for the subset of 83 sudden deaths. While the coefficient increases in magnitude to a 1.9% difference in announcement returns between deaths of industry experienced and unexperienced directors, the coefficient is close to statistical significance at conventional levels. However, the inclusion of 2-digit SIC code level industry fixed effects results in very few degrees of freedom in this regression. Therefore, in Column 5, we replicate the regression in Column 4 but omit the industry fixed effects. The results suggest that the death of an industry experienced director is associated with a three-day CAR that is 1.7 percentage points smaller compared to the death of a director without experience, and this result is significant at the 10% level.

In summary, the results from our event study confirm previous findings that directors with industry experience enhance firm performance. By and large, our event study analysis further mitigates endogeneity concerns and indicates that board industry experience causes higher firm values.

[22] White (1980) heteroskedasticity-robust standard errors are used in Table 7. Clustering of the standard errors on the firm or director level yields similar results.

4. Why do firms not hire more industry expert directors?

Our results so far suggest that board industry experience is a valuable board characteristic. Therefore, the question arises why firms do not attempt to profit from higher valuation levels and lower costs of capital by appointing more industry experts to their board of directors. One explanation could be based on industry expert directors' role as strong monitors: If industry experts are in fact better monitors than other directors, poorly governed firms with powerful and entrenched CEOs may prefer not to hire industry experts to their boards. Director supply side frictions offer another explanation, for example, as a result of non-competition agreements, which prevent industry-experienced individuals from serving on the board of a competitor. We examine whether the propensity to hire industry expert directors depends on the firms' corporate governance by running regressions of our board experience measure, *Board ind. exp. (%)*, on various financial and corporate governance variables. The results are reported in Table 8. We are mostly interested in the corporate governance variables and, in particular, those related to CEO power. Consistent with the hypothesis that powerful CEOs prevent the appointment of industry expert directors, our results in Column 1 show that a larger board, a combined CEO-chairman position, larger shareholdings by the CEO, and a larger fraction of old directors on the board are all associated with a lower percentage of industry experts on the board. All these variables have been shown to be associated with higher CEO power. In contrast, larger institutional ownership and incorporation in the state of Delaware is associated with a larger percentage of industry experts on the board, supporting the hypothesis that better-governed firms are more likely to appoint industry experts as outside directors. The percentage of female directors on the board is negatively related to the percentage of industry expert directors. A reason for this finding may be that female directors are less likely to be industry experts than male directors (mean female director industry experience is 20.09% vs. 25.99% mean male director industry experience; the *t*-value of difference is 13.41).

In the second column, we add variables that proxy for the local supply of directors with relevant industry experience. Specifically, we use the variable that captures local director supply and served as the

instrument in the IV regression in Column 6 of Table 6. In addition, we include the non-competition enforcement index of Garmaise (2009) for the state where a firm is headquartered. Garmaise (2009) introduces a score-based index, measuring non-competition agreement enforcement in 50 states and the DC covering the years 1992-2004. Based on a questionnaire, each jurisdiction receives a score from 0 to 12, with 0 being the lowest level of enforcement and 12 being the highest. The measure is then divided by 12 to generate a score from 0 to 1. To use the index for our sample period (2000-2010), we assume it remains constant after 2004 for each state, which seems justified given that only three states (Florida, Louisiana, and Texas) show time-series variation in the index between 1992 and 2004.[23] The results in Column 2 show a positive and significant coefficient on the variable that proxies for local director supply, indicating that board industry experience is higher when the local supply of directors with experience in the same industry is larger. The negative and significant coefficient on the non-competition enforcement index suggests that firms face difficulties in appointing industry-experienced directors in jurisdictions with stronger enforcement of non-competition agreements. Taken together, these results indicate that director supply side effects are at least partly relevant for firms not appointing more industry experts to their boards.

To mitigate potential endogeneity concerns resulting from reverse causality, we rerun the regression from Column 2 and lag all independent variables by one year in Column 3. The results are similar, and the coefficient on board independence turns positive and (weakly) significant, strengthening the conjecture that better-governed firms tend to appoint more industry experts. To account for the censoring of the dependent variable, Column 4 shows replicated results from Column 2 using a Tobit regression. We find that the results from Column 2 hold. In summary, our findings suggest that a limited supply of industry expert directors and corporate governance problems at least partly explain why firms not hire more industry experts.[24]

[23] The results of the IV regression in Table 6 are robust when we add the non-competition enforcement index as an additional instrument in the first stage (not shown).

[24] A general concern with our results is the existence of additional unobservable constraints that prevent certain individuals from serving as an outside director. Specifically, the Clayton Antitrust Act of 1914 prevents individuals from serving as a director or officer in two corporations for which the elimination of competition would trigger a violation

5. How does board industry experience affect firm value?

All tests carried out in the previous sections aimed at analyzing the relationship between industry experience of the outside directors and firm value. What remains an open question, however, is *how* outside directors with industry experience impact corporate policies and thus enhance a firm's market value. In this section, we evaluate differences in investment behavior and cash holding as potential channels through which outside directors with industry experience influence firm value.

5.1 Board industry experience and investment-cash flow sensitivities

In a Modigliani and Miller (1958) framework, a firm can always raise external funds to finance positive net present value projects. If the underlying assumptions are violated, however, firms may be forced to deviate from the optimal investment program. Following Fazzari et al. (1988), the methodology used to determine whether or not firms face constraints in accessing capital markets relies on single-equation estimates of the cash flow sensitivity of investments (capital expenditures). The conventional interpretation of the investment-cash flow sensitivity coefficient is that a relatively large (small) coefficient implies that firms are (not) forced to cut back on their capital expenditures due to their limited (full) ability to raise funds when faced with adverse cash flow realizations.

Since the board of directors advises on and monitors major investment decisions, scholars relate director and board characteristics to corporate investment decisions. For example, Güner et al. (2008) analyze the effect of directors with financial expertise on corporate investment decisions. They find that investment bankers on the board of industrial firms are associated with larger bond issues but worse acquisitions. They also document that external funding increases and investment-cash flow sensitivity decreases following the appointment of a banker director. Since the increase in financing is restricted to firms with good credit

of antitrust law. Arguably, experience gained while working for a competitor firm represents the most valuable industry experience, thereby biasing the true impact of board industry on firm value downward. As we cannot determine the impact of the Clayton Antitrust Act empirically but observe a positive and significant effect of board industry experience and firm value, we conjecture that our estimates are rather on the conservative side.

ratings but poor investment opportunities, they conclude that bankers on the board lower investment distortions. However, they also argue that the facilitated capital market access might be in the interest of the directors' banks rather than in the interest of the firms' shareholders. Custódio and Metzger (2014) find that CEOs with financial expertise are also able to lower investment-cash flow sensitivities, but since these CEOs are no longer associated with a bank, they are not subject to conflicts of interest.

We conjecture that industry experience represents another outside director characteristic that enhances investment decisions made by boards both through their monitoring and advising role. On the one hand, more experienced directors reduce the information asymmetry between managers and board members, and thus enhance investment decisions through better monitoring. On the other hand, experienced directors possess a comparative advantage in anticipating future industry conditions, which puts them in a position to provide active advice to managers about the optimal (and thus value-maximizing) investment policy. To evaluate the impact of adverse cash flow realizations on investment decisions of firms in the presence of board industry experience, we estimate an extended variant of the standard model of investment (Fazzari et al., 1988; Kaplan and Zingales, 1997):

$$\begin{aligned} INV_{i,t} = {} & \alpha + \beta_1 Board\ ind.\ exp.(\%)_{i,t} + \beta_2 CF_{i,t} + \beta_3 Board\ ind.\ exp.(\%)_{i,t} \times CF_{i,t} + \\ & \beta_4 CF_{i,t-1} + \beta_5' X_{i,t} + \beta_6' Y_{i,t} + fe + \varepsilon_{i,t} \end{aligned} \quad (1)$$

where $INV_{i,t}$ is either capital expenditures (*CAPEX*), acquisition spending (*ACQ*), research and development expenses (*R&D*), or the sum of the three (*CAPEX*+*ACQ*+*R&D*) of firm *i* in year *t* scaled by lagged total assets. *Board ind. exp. (%)*$_{i,t}$ is the fraction of experienced outside directors among all outside directors, and $CF_{i,t}$ is cash flow scaled by lagged total assets. Gatchev et al. (2010) argue that capital expenditures exhibit substantial persistence due to adjustment frictions, thus ignoring the intertemporal aspect of financial variables is likely to produce an omitted variables bias. To capture financial market frictions rather than real side effects (i.e., adjustment costs associated with changes in investments), we also include the lagged cash flow term. $X_{i,t}$ and $Y_{i,t}$ represent vectors of firm-level financial and corporate governance control variables, respectively. In addition, we add industry and year fixed effects. The potential insights offered by the model

in Equation (1) are twofold. First, a positive coefficient β_1 would indicate that firms with more experienced boards invest more than firms with non-experienced boards. Second, while the (positive) coefficient β_2 denotes the conventional investment-cash flow sensitivity, a negative coefficient β_3 on the interaction term between cash flow and board industry experience would confirm our hypothesis that firms with more experienced boards benefit from lower investment distortions.

We estimate Equation (1) using pooled OLS regressions with robust standard errors clustered at the firm level. The results are shown in Table 9. The results in Column 1 suggest that firms with more experienced boards do not overinvest in capital expenditures compared to firms with less experienced boards (as indicated by the insignificant β_1 coefficient). In contrast, in Column 2, we find a positive and significant coefficient on board industry experience. Corroborating our main hypothesis, experienced boards exert a negative impact on the investment-cash flow sensitivity, as indicated by the significantly negative β_3 coefficient. Firms with industry-experienced boards are able to mitigate financial market frictions, thus they are less likely to forego valuable investment projects in response to negative cash flow shocks. Acquisition spending scaled by lagged total assets is used as the dependent variable in Columns 3 and 4 of Table 9. The estimated coefficient on board industry experience is only positive and significant in Column 4. Most important, the interaction term between cash flow and board industry experience is again significantly negative. Firms with more experienced boards are not forced to cut back on their acquisition spending in response to adverse cash flow realizations in the same way as firms without experienced boards. Turning to research and development expenditures as another channel of value generation in Columns 5 and 6, we find that firms with more experienced directors on their board invest significantly more in research and development. This result is consistent with the notion in Masulis et al. (2012b) and Faleye et al. (2014) that industry experience allows directors to better evaluate and implement innovative activities and to trigger corporate innovation. Moreover, the coefficient on the interaction term between investment-cash flow sensitivity and board industry experience is again negative and significant in Column 6, suggesting that firms with more experienced boards are not forced to cut back on their research and development spending in response to

adverse cash flow realizations in the same way as firms without experienced boards. Finally, when the sum of *CAPEX*, *ACQ*, and *R&D* is used to proxy for investment expenditures, we find in Columns 7 and 8 that more experienced boards invest more. Most important, the interaction term between cash flow and board industry experience remains significantly negative. Both findings may be attributable to the superior monitoring and advising abilities of industry-experienced outside directors. As a robustness check for our investment-cash flow sensitivity regressions, we add corporate governance controls in Column 9 and firm fixed effects in Column 10, respectively. Magnitude and statistical significance of the observed coefficients remain similar.[25]

So far, we have demonstrated that firms run by boards with more industry experienced shareholder representatives show the tendency to invest more, and that the investments made by these firms seem to be less dependent on operationally generated cash flows. Since we observe that firms run by more industry experienced boards are valued at a premium compared to firms with less experienced boards, we infer that investments undertaken by a board with higher industry experience are associated with a higher firm value. We directly test such a relationship by adapting the regression framework of Cremers et al. (2014), who show that staggered boards have a positive influence on firm value when analyzing the time-series (rather than the cross-section). They document that staggered boards represent a credible long-term commitment made by shareholders, which is more relevant for firms with more R&D expenditures and larger intangible assets, among others. Therefore, we regress Tobin's *Q* on lagged board industry experience, variables that proxy for the three investment channels (R&D, CAPEX, and M&A), and interactions between the investment channel proxies and board industry experience. We add financial control variables from our standard regression (*ROA*, *financial leverage*, and *ln(Total assets)*) as well as firm and year fixed effects to the model.

[25] The corporate governance controls used in Column 9 of Table 9, abbreviated as *CG controls*, include the natural logarithm of board size, the E-Index, a dummy whether the CEO is also the chairman of the board, a dummy whether the CEO is also a member of the nominating committee, the fraction of stock owned by the CEO, the fraction of stock owned by institutional investors, the fraction of directors older than 72 years of age, the fraction of directors attending less than 75% of the meeting dates, a dummy whether the majority of the board holds three or more other directorships, a dummy whether the firm is incorporated in the state of Delaware, and the fraction of female directors on the board.

The results in Column 1 of Table 10 show that when board industry experience is interacted with capital expenditures, capital expenditures undertaken by a board with more industry experienced members does not significantly influence *Q*. In contrast, R&D expenditures made by an experienced board seem to affect Tobin's *Q* positively, as the interaction term between board industry experience and R&D expenditure scaled by sales is positive and highly significant in Column 2 of Table 10. In Column 3 of Table 10, we find that industry experience of the board does not have a positive incremental effect on the value of M&A spending. Finally, interacting the sum of CAPEX, ACQ, and R&D scaled by sales with board industry experience in Column 4 of Table 10, we conclude that boards with a higher fraction of industry experienced members positively affect Tobin's *Q* via their investment decisions. Industry experienced board members effectively exercise their advising role by influencing investment decisions, and they are able to identify investments that enhance shareholder value.

5.2 Board industry experience, cash holdings, and the market value of cash

Güner et al. (2008) study the impact of bankers on the board and attribute their finding of lower investment-cash flow sensitivities to the facilitated access to capital markets provided by bankers' institutions. As facilitated capital market access seems unlikely in the case of industry-experienced outside directors, the question arises how firms with a higher fraction of experienced directors are able to achieve lower investment-cash flow sensitivities.[26] The most immediate answer is that these firms use available liquidity to finance their investments after exogenous cash flow shocks occur, an argument which is referred to as the precautionary motive of cash holding (Opler et al., 1999). Our univariate tests in Panel C of Table 2 indicate that firms with more industry experience on the board hoard more cash and have a lower propensity

[26] We cannot fully rule out the alternative explanation that industry-experienced boards signal a firm's quality to the market and thereby facilitate capital market access.

to pay dividends.[27] In a broader corporate governance context, these findings are in line with Harford et al. (2008), who argue that US firms with good corporate governance hold higher cash levels.[28]

Higher cash holdings can have a positive valuation impact. They allow for more financial flexibility in the sense that firms are not forced to forgo profitable investment opportunities if the adverse selection costs from going to capital markets become excessive. However, generating financial slack by hoarding cash may also come at a price because the most liquid assets of a firm (cash) are those most likely to be misused by management (Myers and Rajan, 1998). High cash holdings are assumed to trigger agency problems of free cash flow between shareholders and managers, as managers may engage in 'pet projects' that serve their own rather than their shareholders' interests and invest inefficiently (Jensen, 1986; Stulz, 1990). Therefore, the agency problem of cash has been related to a firm's corporate governance, arguing that better corporate governance structures help to safeguard shareholder interests by preventing managers from spending cash inefficiently and destroying shareholder value. In fact, Faulkender and Wang (2006) and Dittmar and Mahrt-Smith (2007) show that the value of cash is higher in better-governed firms.

To test whether board industry experience influences firm value through higher valuations of cash holdings, we adapt the regression model introduced by Pinkowitz et al. (2006) and estimate the following regression specification:

$$\begin{aligned} V_{i,t} = {} & \alpha + \beta_1 E_{i,t} + \beta_2 \Delta E_{i,t} + \beta_3 \Delta E_{i,t+1} + \beta_4 \Delta NA_{i,t} + \beta_5 \Delta NA_{i,t+1} + \beta_6 RD_{i,t} + \beta_7 \Delta RD_{i,t} \\ & + \beta_8 \Delta RD_{i,t+1} + \beta_9 I_{i,t} + \beta_{10} \Delta I_{i,t} + \beta_{11} \Delta I_{i,t+1} + \beta_{12} D_{i,t} + \beta_{13} \Delta D_{i,t} + \beta_{14} \Delta D_{i,t+1} + \beta_{15} \Delta V_{i,t} \\ & + \beta_{16} L_{i,t} + \beta_{17} E\text{-}Index_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (2)$$

[27] We also run multivariate regressions with cash holdings as the dependent variable (Column 1 of Table A4). The coefficient on board industry experience is significantly positive, thus we conclude that experienced boards hoard cash to build up financial slack.

[28] Harford et al. (2008) find partial evidence for a "shareholder power hypothesis", which predicts a negative relation between agency problems and cash holdings. Under this hypothesis, shareholders, who have more effective control over managers, allow managers to stockpile cash. Interestingly, they take reference to expertise of directors: "outside (or independent) directors contribute expertise and objectivity that ostensibly mitigates managerial entrenchment and expropriation of a firm's resources" (Harford et al., 2008, p. 540).

where $X_{i,t}$ is the level of a variable of firm i at time t scaled by total assets, while ΔX_t is the corresponding change from t-1 to t, and ΔX_{t+1} the change from year t to t+1 (both scaled by total assets in year t). The dependent variable V is the market value of the firm, estimated as the market value of equity plus the book value of short-term debt and long-term debt. E is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, NA is total assets net of cash and equivalents, RD is research and development expenses (set to zero if missing), I is interest expenses, D is dividends defined as common dividends paid, L is liquid asset holdings, and *E-Index* is the E-Index of Bebchuk et al. (2009).

We estimate Equation (2) as a Fama-MacBeth (1973) regression based on 11 cross-sections. In Columns 1 and 2 of Table 11, we split our sample into a high and a low board industry experience subsample, with subsamples comprising firms above or below the sample median board industry experience. If the industry experience of outside directors matters, we expect the estimated coefficient (β_{16}) on liquid assets ($L_{i,t}$) to be higher for the high board industry experience subsample. Confirming this conjecture, the coefficient on liquid assets is higher for the high board industry subsample than for the low board industry subsample. Using the methodology applied in Pinkowitz et al. (2006), we find the difference between the two coefficients to be statistically significant (Column 3). To overcome concerns that the sample split drives this result rather than board industry experience driving cash valuations, we run an additional test for the full sample and incorporate interaction terms between board industry experience and liquid assets as well as between the E-Index and liquid assets. As indicated by the estimated coefficient on the former interaction term, the value of liquid assets (cash) is significantly higher if overseen by an experienced board of directors (Column 4). We conclude that shareholders prevent managers from wasting firm resources by electing industry-experienced directors to the board, who are in a better position to monitor and advise on the efficient use of cash than are inexperienced directors.[29]

[29] To check whether the results are driven by the recent financial crisis, we split the sample at the year-end 2007 and rerun the regression from Column 4 for both subsamples separately (Table A5). While the coefficient on the interaction term between liquidity and board industry experience is statistically significant in both subsamples, the coefficient is

5.3 Robustness test

One potential drawback of the approach in Section 5.2 to estimate the market value of cash is that observed levels of cash do not account for the fact that managers are less likely to waste cash needed for daily operations. In fact, poorly monitored managers tend to divert *free* cash flows (Jensen, 1986). We extend our analysis and test whether the market value of excess cash holdings, i.e., the cash holdings that exceed the necessary level of cash given a firm's operational structure, is affected by the industry experience of outside directors. In particular, we adapt the approach used in Dittmar and Mahrt-Smith (2007) for testing the value of excess cash in well-governed firms. In a first step, we predict firms' cash holdings as follows:

$$Ln\left(\frac{Cash_{i,t}}{NA_{i,t}}\right) = \alpha + \beta_1 Ln\left(NA_{i,t}\right) + \beta_2 \frac{FCF_{i,t}}{NA_{i,t}} + \beta_3 \frac{NWC_{i,t}}{NA_{i,t}} + \beta_4 IndustrySigma_{i,t} + \beta_5 \left(\frac{MV_{i,t}}{NA_{i,t}}\right) + \beta_6 \frac{RD_{i,t}}{NA_{i,t}} + \beta_7 E\text{-}Index_{i,t} + \beta_8 Inst.Ownership_{i,t} + Year\ Dummies + Firm\ Fixed\ Effects + e_{i,t} \quad (3)$$

where *Cash* is defined as cash and cash equivalents, *NA* is assets less cash and cash equivalents, *FCF* is operating income less interest, taxes, and cash, *IndustrySigma* is the FF48 industry median of prior 10 year standard deviations of *FCF/NA*, *MV* is market value equity plus total debt, and *RD* is R&D expenditures, which are set to zero if missing. In addition, we use the E-Index and the fraction of shares owned by institutional investors (*Inst.Ownership*) as a proxy for corporate governance. As in Dittmar and Mahrt-Smith (2007), the market-to-book ratio is instrumented with past three-year sales growth because the market-to-book ratio is used as both a measure of investment opportunities and as a measure of firm value. Dittmar and Mahrt-Smith argue that past growth is a reasonable instrument as it is exogenous to current cash levels.

The results of this first step are shown in Columns 1 and 2 of Table 12. In Column 1, which reports the results from the instrumental variables regression, we find that lagged three-year sales growth is positively and significantly correlated with the market-to-book ratio, thereby confirming instrument relevance.

larger during the recent financial crisis and its aftermath (2008-2010). As expected, monitoring of cash by industry experienced outside directors was more value-relevant in the years after 2007.

In Column 2, we predict cash levels by estimating regression (3). The error terms of this regression represent the deviation from the predicated cash levels and are used to estimate excess cash. We then run the second-step regression of Dittmar and Mahrt-Smith (2007) to evaluate the market value of excess cash:

$$\begin{aligned} MV_{i,t} &= \alpha + \beta_1 E_{i,t} + \beta_2 \Delta E_{i,t} + \beta_3 \Delta E_{i,t+2} + \beta_4 RD_{i,t} + \beta_5 \Delta RD_{i,t} + \beta_6 \Delta RD_{i,t+2} + \beta_7 D_{i,t} \\ &+ \beta_8 \Delta D_{i,t} + \beta_9 \Delta D_{i,t+2} + \beta_{10} I_{i,t} + \beta_{11} \Delta I_{i,t} + \beta_{12} \Delta I_{i,t+2} + \beta_{13} \Delta NA_{i,t} + \beta_{14} \Delta NA_{i,t+2} + \beta_{15} \Delta MV_{i,t+2} \\ &+ \beta_{16} E\text{-}Index_{i,t} + \beta_{17} Board\ ind.exp.(\%)_{i,t} + \beta_{18} XCash_{i,t} + \beta_{19} E\text{-}Index_{i,t} \times XCash_{i,t} \\ &+ \beta_{20} Board\ ind.exp.(\%)_{i,t} \times XCash_{i,t} + Year\ Dummies + Firm\ Fixed\ Effects + e_{i,t} \end{aligned} \quad (4)$$

where $X_{i,t}$ is the level of a variable of firm *i* at time *t* scaled by net assets of firm *i* at time *t*, while ΔX_t is the corresponding change from *t-2* to *t* scaled by net assets of firm *i* at time *t*. In addition to the variables from the predictive regression (3), *E* is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, *D* is common dividends, *I* is interest expenses and *XCash* is excess cash. As in Dittmar and Mahrt-Smith (2007), we restrict the analysis to observations with positive excess cash only.

The results in Column 3 of Table 12 show that the interaction term between board industry experience and excess cash has a positive and signification loading. In Column 4, we alternatively exclude firms, rather than firm-years, with negative excess cash and find similar results: industry experienced boards enhance firm value by monitoring and advising on the use of the firm's excess cash holdings.[30] Finally, the interaction term between the E-index and excess cash becomes marginally significant at the 10% level only in Column 4, indicating that the influence of the corporate governance on the value of excess cash is less pronounced and partly captured by industry experience.

[30] The results in Column 4 also suggest that firms with poor governance (as proxied by the E-Index) have lower market values of cash, which is in line with the findings of Dittmar and Mahrt-Smith (2007).

6. Conclusion

In this study, we investigate whether industry experience on corporate boards is related to firm value and investment behavior. Using a dataset that comprises industrial companies listed in the S&P 1500 during the 2000-2010 sample period, we document a robust positive association between the industry experience of corporate directors and firm value. Regressions that use firm fixed effects as well as event-study results from director deaths suggest that our results are driven by within-firm variation of board industry experience, and that board industry experience at least partially causes higher firm values.

We also show evidence that shareholders allow managers overseen by an industry-experienced outside board to hold more cash. Their high cash holdings enable these firms preventing adverse cash flow realizations and financial market frictions to spill over to their investment decisions, as indicated by their lower investment-cash flow sensitivities. Both directors' superior monitoring and advising capabilities materialize into firm value by preventing managers from wasting cash on firm value-destroying investment projects, which is reflected in significantly higher market values of (excess) cash holdings in the presence of experienced boards. We conclude that industry experience among a firm's outside directors constitutes a valuable corporate governance mechanism.

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Table 1: Director industry experience and director characteristics

Panel A reports director industry experience characteristics for the sample of outside directors on the board of all S&P 1500 firms as of the annual meeting dates during the 2000-2010 sample period, excluding utilities (standard industry classification (SIC) codes 4900-4949) and financial firms (SIC codes 6000-6999). The director industry experience dummy variables equal one for a given outside director if he possesses work experience in the two-digit industry of the firm where he sits on the board (and zero otherwise). *Director industry experience (years)* is estimated as the sum of the duration of all positions in a director CV in a given firm-year that offer industry experience. Section 2.1 provides a detailed description of all variables. Panel B reports other director characteristics provided by RiskMetrics.

Panel A: Director industry experience characteristics based on two-digit SIC industry

	Mean	Median	N
Director ind. exp. (dummy)	25.21%	0.00%	90,002
Director ind. exp. empl. (dummy)	10.33%	0.00%	90,002
Director ind. exp. exec. dir. (dummy)	6.75%	0.00%	90,002
Director ind. exp. outs. dir. (dummy)	18.10%	0.00%	90,002
Director ind. exp. CEO (dummy)	5.21%	0.00%	90,002
Director ind. exp. (years)	2.67	0.00	90,002

Panel B: Other director characteristics

	Mean	Median	N
Age (years)	61.12	62.00	89,784
Number of additional directorships held	0.87	0.00	90,002
Gender			89,873
Male	87.62%	100.00%	78,738
Female	12.38%	0.00%	11,135
Independent (as compared to gray)	87.06%	100.00%	90,002

Table 2: Board industry experience, financial, and corporate governance characteristics

This table reports characteristics of all S&P 1500 firms during the 2000-2010 sample period, excluding utilities (standard industry classification (SIC) codes 4900-4949) and financial firms (SIC codes 6000-6999). Panel A exhibits board industry experience characteristics. Panel B contains financial and corporate governance characteristics. Panel C reports selected firm characteristics for the low and the high board industry experience subsample together with test results for inequalities of means and medians, respectively. The high (low) board industry experience subsample consists of all firms that are in the highest (lowest) 20% quintile of industry experience in each sample year from 2000 to 2010. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively. The definitions and data sources of all variables are provided in the Appendix.

Panel A: Board industry experience characteristics based on two-digit SIC industry

	Mean	Median	SD	N
Board ind. exp. (%)	26.02%	20.00%	25.81%	12,271
Maj. of board exp. (dummy)	15.89%	0.00%	36.56%	12,271
Board ind. exp. empl. (%)	11.11%	0.00%	16.18%	12,271
Board ind. exp. exec. dir. (%)	7.16%	0.00%	11.67%	12,271
Board ind. exp. outs. dir. (%)	18.37%	12.50%	22.24%	12,271
Board ind. exp. CEO (%)	5.57%	0.00%	10.17%	12,271
Board ind. exp. exec. dir. non-CEO (%)	3.93%	0.00%	8.31%	12,271
Mean board ind. exp. (years)	2.73	1.15	3.78	12,271
σ board ind. exp. (years)	4.29	2.50	5.00	12,271

Panel B: Financial and corporate governance characteristics

	Mean	Median	SD	N
Total assets	6,745.25	1,379.56	27,271.98	12,266
ACQ / Sales	0.05	0.00	0.29	12.266
CAPEX / PPE	0.24	0.20	0.17	12,179
R&D / Sales	0.09	0.00	2.23	12,266
Tobin's Q	2.04	1.59	1.39	11,690
Median industry adjusted Tobin's Q	0.34	0.00	1.26	11,690
ROA (%)	10.01%	9.70%	8.88%	12,266
Firm age	23.84	17.00	19.28	12,035
Dividend payer (dummy)	49.29%	0.00%	50.00%	12,239
Cash holdings	28.61%	9.33%	61.23%	12,264
Financial leverage	0.19	0.18	0.16	12,266
E-Index	2.70	3.00	1.36	11,379
Board size	8.96	9.00	2.27	12,271
Board independence (%)	87.14%	90.00%	15.65%	12,271
CEO stock own. (%)	2.55%	0.35%	6.70%	11,362
Institutional own. (%)	75.69%	79.14%	19.75%	11,183
Busy board (dummy)	0.95%	0.00%	9.72%	12,271
% directors older 72	7.73%	0.00%	12.87%	12,271
CEO in nom. com. (dummy)	1.51%	0.00%	12.19%	12,271
Director non-attend. (%)	1.55%	0.00%	5.15%	12,271
CEO-chair (dummy)	58.78%	100.00%	49.22%	12,271
Delaware (dummy)	62.45%	100.00%	48.43%	12,267
% female directors	11.40%	12.50%	11.07%	12,271

Panel C: Selected firm characteristics of subsamples with firms in the highest and lowest 20% board industry experience quintiles and tests for difference in means and medians between subsamples

	Low board industry experience		High board industry experience		Difference		Test for difference	
	Mean	Median	Mean	Median	Mean	Median	*t*-value	*z*-value
Tobin's Q	1.92	1.54	2.42	1.81	0.50	0.27	11.89 ***	11.54 ***
Dividend payer (dummy)	60.12%	100.00%	24.56%	0.00%	-35.56%	-100.00%	-26.95 ***	-25.36 ***
Cash holdings	0.19	0.07	0.60	0.27	0.40	0.20	20.80 ***	22.88 ***

Table 3: Pooled ordinary least squares (OLS) regressions of Tobin's *Q* on board industry experience measures

This table reports the results from pooled OLS regressions of Tobin's *Q* on the fraction of experienced outside directors. Column 1 presents regression results where industry experience is estimated as the fraction of experienced outside directors to all outside directors. The remaining columns show regression results where industry experience is defined based on different hierarchical levels: Column 2 considers only industry experience as an employee, Column 3 only industry experience as an executive director, and Column 4 only industry experience as an outside director. Column 5 introduces all three hierarchical measures jointly. Column 6 uses the fraction of outside directors that possess industry experience as a CEO as well as industry experience as an executive director outside the role of the CEO. All regressions include year fixed effects and two-digit standard industry classification (SIC) code industry fixed effects. The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are based on robust standard errors clustered at the firm level and are reported in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively. Definitions and data sources of all variables are provided in the Appendix.

Dependent variable	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	1.937***	1.951***	1.919***	2.041***	1.972***	1.952***
	(7.154)	(6.913)	(6.803)	(7.647)	(7.273)	(7.116)
Board ind. exp. (%)	0.429***					
	(3.934)					
Board ind. exp. empl. (%)		0.439***			0.158	
		(2.792)			(0.851)	
Board ind. exp. exec. dir. (%)			0.668***		0.281	
			(2.579)		(0.981)	
Board ind. exp. outs. dir. (%)				0.561***	0.463***	
				(4.314)	(3.821)	
Board ind. exp. CEO (%)						0.953***
						(3.061)
Board ind. exp. exec. dir. non-CEO (%)						-0.222
						(-0.762)
ln(Total assets)	0.002	0.010	0.006	-0.005	-0.002	0.007
	(0.097)	(0.554)	(0.325)	(-0.266)	(-0.094)	(0.385)
ROA	6.378***	6.316***	6.303***	6.399***	6.423***	6.308***
	(15.835)	(15.430)	(15.588)	(16.050)	(16.202)	(15.623)
R&D / Sales	0.045***	0.045***	0.044***	0.045***	0.045***	0.044***
	(2.852)	(2.805)	(2.768)	(2.858)	(2.872)	(2.768)
CAPEX / PPE	1.580***	1.600***	1.613***	1.582***	1.562***	1.613***
	(8.156)	(8.074)	(8.239)	(8.235)	(8.100)	(8.220)
Financial leverage	-0.823***	-0.850***	-0.853***	-0.816***	-0.816***	-0.849***
	(-4.933)	(-5.108)	(-5.174)	(-4.891)	(-4.936)	(-5.150)
E-Index	-0.078***	-0.076***	-0.078***	-0.078***	-0.079***	-0.079***
	(-5.316)	(-5.133)	(-5.267)	(-5.367)	(-5.344)	(-5.348)
Board independence (%)	0.202	0.215	0.204	0.189	0.188	0.203
	(1.518)	(1.606)	(1.533)	(1.427)	(1.423)	(1.522)
ln(Board size)	-0.295***	-0.309***	-0.306***	-0.302***	-0.287***	-0.306***
	(-3.014)	(-3.085)	(-3.146)	(-3.112)	(-2.939)	(-3.173)
CEO-chair (dummy)	-0.018	-0.025	-0.024	-0.022	-0.017	-0.025
	(-0.537)	(-0.740)	(-0.709)	(-0.654)	(-0.500)	(-0.748)
CEO in nom. com.(dummy)	-0.288***	-0.284***	-0.284***	-0.295***	-0.292***	-0.282***

	(-3.162)	(-3.105)	(-3.084)	(-3.228)	(-3.212)	(-3.035)
CEO stock own. (%)	-0.276	-0.305	-0.302	-0.264	-0.247	-0.284
	(-0.885)	(-0.984)	(-0.967)	(-0.834)	(-0.783)	(-0.908)
Institutional own. (%)	-0.022	-0.011	-0.016	-0.014	-0.030	-0.016
	(-0.227)	(-0.113)	(-0.167)	(-0.138)	(-0.306)	(-0.163)
% directors older 72	0.082	0.061	0.060	0.058	0.089	0.063
	(0.465)	(0.346)	(0.342)	(0.334)	(0.509)	(0.358)
Director non-attend. (%)	0.277	0.267	0.272	0.291	0.267	0.262
	(1.062)	(1.009)	(1.031)	(1.123)	(1.027)	(1.000)
Busy board (dummy)	0.301**	0.324**	0.313**	0.289*	0.294**	0.308**
	(2.044)	(2.263)	(2.173)	(1.939)	(1.979)	(2.128)
Delaware (dummy)	0.021	0.034	0.031	0.016	0.015	0.029
	(0.506)	(0.822)	(0.746)	(0.384)	(0.352)	(0.705)
% female directors	0.172	0.123	0.148	0.168	0.192	0.131
	(0.943)	(0.668)	(0.811)	(0.927)	(1.064)	(0.718)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,033	10,033	10,033	10,033	10,033	10,033
R-squared	0.414	0.411	0.412	0.415	0.416	0.413

Table 4: Robustness tests for different sub-periods and alternative board industry experience measures

This table reports results from pooled ordinary least squares (OLS) regressions of Tobin's *Q* on different board industry experience measures. Columns 1 and 2 show the results of the baseline regression model from Column 1 of Table 3, but for two subsamples of the full sample: Column 1 includes only the years from 2000 to 2005, while Column 2 includes only the years from 2006 to 2010. In Column 3, a dummy variable that indicates whether the majority of outside directors are experienced is used as the independent board industry experience variable. In Column 4, the percentage fraction of experienced outside directors is used as the independent variable, but with the one-digit standard industry classification (SIC) code industry classification scheme to estimate industry experience of the board of directors. In Column 5, the fraction of experienced outside directors is used as the independent variable, but with the three-digit SIC code industry classification scheme to estimate industry experience on the board of directors. In Column 6, a combined industry experience measure similar to Custódio and Metzger (2013) is used. This measure assigns a value of four to an outside director if he has industry experience in the same four-digit SIC code, a value of three if an outside director has experience in the same three-digit SIC code industry, a value of two if an outside director has experience in the same two-digit SIC code industry, a value of one if an outside director has experience in the same one-digit SIC code industry, and zero otherwise. The final measure applied takes the mean industry experience score among all outside directors. In Column 7 and 8, the board industry experience variable is measured in years using the mean years of industry experience among all outside directors. Column 8 additionally includes the standard deviation of the years of director industry experience among all outside board members. The financial and the corporate governance controls are the same as in Table 3 (*ln(Total assets)*, *ROA*, *R&D/Sales*, *CAPEX/PPE*, *Financial leverage*, *E-Index*, *Board independence (%)*, *ln(Board size)*, *CEO-Chair (dummy)*, *CEO in nom. com. (dummy)*, *CEO stock own. (%)*, *Institutional own. (%)*, *% directors older 72*, *Director non-attend. (%)*, *Busy board (dummy)*, *Delaware (dummy)*, *% female directors*). All regressions include year and industry fixed effects. While Columns 1, 2, 3 and 5 to 8 use two-digit SIC code industry fixed effects, Column 4 uses one-digit SIC code industry fixed effects. The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are based on robust standard errors clustered at the firm level and are reported in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively. Definitions and data sources of all variables are provided in the Appendix.

Dependent variable	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	1.473***	1.633***	2.184***	2.184***	1.883***	1.806***	1.943***	1.887***
	(4.806)	(5.961)	(8.184)	(7.927)	(7.313)	(6.531)	(7.245)	(6.963)
Board ind. exp. (%)	0.537***	0.316***						
	(3.527)	(3.057)						
Majority of board exp. (dummy)			0.269***					
			(4.166)					
Board ind. exp. (%; one-digit)				0.413***				
				(4.471)				
Board ind. exp. (%; three-digit)					0.718***			
					(5.893)			
Combined ind. exp. measure (one – four digit)						0.121***		
						(4.584)		
Mean board ind. exp. (years)							0.036***	0.074***
							(4.388)	(3.982)
σ board ind. exp. (years)								-0.032***
								(-2.784)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Corporate governance controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,143	4,890	10,033	10,033	10,033	10,033	10,033	10,033
R-squared	0.409	0.497	0.393	0.360	0.421	0.415	0.417	0.420

Table 5: Robustness tests using Hoberg and Phillips (2010; 2015) industry classifications, segment industry experience, and general experience proxies

This table reports results from pooled ordinary least squares (OLS) regressions of Tobin's *Q* on alternative board industry experience measures. Column 1 shows reestimated regression results for the baseline regression but with a board industry experience measure based on the Hoberg and Phillips (2010; 2015) industry classifications with 50 industries (*Board ind. exp. (%; Hoberg-Phillips 50)*). Columns 2-4 show results for board industry experience measures based on segment level. In Column 2, an outside director is classified as industry experienced if he possesses working experience in at least one of the two-digit SIC code industries a firm's segments operate in. The measure takes the mean score among all outside directors (*Board ind. exp. (%; Segment)*). In Column 3, the board segment industry experience measure is replaced with the board firm industry experience measure (*Board ind. exp. (%)*) for all firm-years without coverage in the COMPUSTAT segment database (*Board ind. exp. (%; Segment/Main)*). In Column 4, an outside director receives a segment sales-weighted industry experience score, which equals the sum of the sales of the segments where an outside director possesses working experience in the two-digit SIC code industry of the segment and relates it to the sum of sales of all segments. The measure then takes the mean score among all outside directors (*Board ind. exp. (%, Segment-Sales weighted)*). Besides the standard measure of board industry experience, Column 5 includes outside directors' mean age (*Mean age among outs. dir.)*, the mean number of firms the outside directors worked for (*Mean # of industries among outs. director*), and the mean number of different two-digit SIC code industries the outside directors worked in (*Mean # of firms among outs. directors*). Column 6 replicates these results with transformed general experience proxies (natural logarithm of one plus the variable). Financial and corporate governance controls are as in Table 3 (*ln(Total assets)*, *ROA*, *R&D/Sales*, *CAPEX/PPE*, *Financial leverage*, *E-Index*, *Board independence (%)*, *ln(Board size)*, *CEO-Chair (dummy)*, *CEO in nom. com. (dummy)*, *CEO stock own. (%)*, *Institutional own. (%)*, *% directors older 72*, *Director non-attend. (%)*, *Busy board (dummy)*, *Delaware (dummy)*, *% female directors*) except for Columns 5 and 6, where the *% directors older 72* is dropped. Regressions include year and two-digit SIC code industry fixed effects. The sample contains all firms in the S&P 1500 during 2000-2010, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are based on robust standard errors clustered at the firm level and are reported in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively. Definitions and data sources of all variables are provided in the Appendix.

Dependent variable	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	2.629***	3.082***	2.748***	3.011***	3.317***	4.191***
	(10.766)	(12.137)	(11.497)	(11.800)	(6.711)	(2.502)
Board ind. exp. (%; Hoberg-Phillips 50)	0.374***					
	(4.108)					
Board ind. exp. (%; Segment)		0.388***				
		(3.662)				
Board ind. exp. (%; Segment/Main)			0.350***			
			(3.621)			
Board ind. exp. (%, Segment-Sales weighted)				0.938***		
				(3.573)		
Board ind. exp. (%)					0.220*	0.206*
					(1.876)	(1.727)
Mean age among outs. dir.					-0.004	-0.251
					(-0.576)	(-0.655)
Mean # of firms among outs. directors					0.055**	0.334**
					(2.188)	(2.412)
Mean # of industries among outs. directors					-0.057	-0.222
					(-1.353)	(-1.417)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes
Corporate governance controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,033	8,553	10,033	8,553	10,033	10,033
R-squared	0.413	0.416	0.412	0.419	0.335	0.335

Table 6: Identification analysis

This table reports results from pooled ordinary least squares (OLS) regressions that address endogeneity concerns. In Column, 1 the variables are the same as in the baseline regression (Column 1 of Table 3), but the two-digit standard industry classification (SIC) code and year fixed effects are replaced with two-digit SIC code × year fixed effects. In Column 2, the dependent variable is the change in board industry experience. All independent variables (including Tobin's *Q*) are lagged by one year to mitigate reverse causality problems. Column 3 shows regression results for a specification similar to Cremers and Ferrell (2014), where the dependent variable (median industry adjusted Tobin's *Q*) accounts for industry effects, and the regression includes firm and year fixed effects. Columns 4 and 5 report the results of a two-stage least squares (2SLS) regression using the natural logarithm of one plus the number of firms that share the same three digits of the zip code and the same two-digit SIC code, but not the same four-digit SIC code, as an instrument in the first stage of the regression (Column 4) and the board industry experience variable as the dependent variable. Column 5 shows the second stage of the 2SLS regression with Tobin's *Q* as dependent variable. Columns 6 and 7 report the result from estimating a Heckman selection model. Column 6 reports the results from the first step probit regression with a dummy variable that equals one if the number of experienced directors on the board increased compared to the previous year and zero otherwise (*# of ind. experienced directors increased (dummy)*) as dependent variable. The regression includes the standard set of control variables as well as the number of nearby peer firms (*ln (1+Number of nearby peer firms)*), the fraction of firms in the same two-digit SIC industry that increased the number of experienced directors compared to the previous year (*% firms in industry increased ind. exp. directors*), the fraction of industry experienced directors on the board of other firms in the same two-digit SIC industry (*Industry board ind. exp. (%)*), the mean ROA of the other firms in the same industry (*Industry ROA*), and a firm's mean ROA over the past three years (*Past 3-year ROA*). Column 7 shows results from the second stage of the Heckman selection model with Tobin's *Q* as the dependent variable, including the standard controls from Column 1 of Table 3 as well as the inverse Mills ratio from the first stage probit regression. The regressions in Columns 2 and 4-7 include year fixed effects and two-digit standard industry classification (SIC) code industry fixed effects. The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are reported in parentheses and based on robust standard errors clustered at the firm level with the exception of the probit regression in Column 6. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively. Definitions and sources of all variables are provided in the Appendix.

	OLS	*OLS*	*OLS*	*2SLS*		*Heckman selection model*	
				First Stage (OLS)	*Second Stage (OLS)*	*First Stage (Probit)*	*Second Stage (OLS)*
Dependent variable	*Tobin's Q*	*Δ Board ind. exp. (%)*	*Median industry-adjusted Tobin's Q*	*Board ind. exp. (%)*	*Tobin's Q*	*# of ind. experienced directors increased (dummy)*	*Tobin's Q*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	1.514***	0.000	4.283***	0.085	0.510	-2.270***	-4.090***
	(5.873)	(0.012)	(8.585)	(1.153)	(0.903)	(-6.332)	(-3.362)
Board ind. exp. (%)	0.488***	-0.077***	0.235*		6.094***		0.426***
	(4.344)	(-14.133)	(1.741)		(3.071)		(4.062)
Tobin's Q		0.001					
		(1.270)					
ln (1+Number of nearby peer firms)				0.023***		0.219	
				(3.448)		(0.721)	
% firms in industry increased ind. exp. directors						-1.321*	
						(-1.724)	
Industry board ind. exp. (%)						1.435*	
						(1.859)	
Industry ROA						-0.143	
						(-0.517)	
Past 3-year ROA						0.017	
						(0.897)	
Inverse Mills ratio							1.807***
							(5.078)

ln(Total assets)	0.001	-0.001	-0.534***	0.009**	-0.057	-0.034**	-0.038*
	(0.032)	(-0.984)	(-8.743)	(2.006)	(-1.536)	(-2.005)	(-1.908)
ROA	6.784***	-0.047***	3.797***	-0.304***	8.149***	-0.621**	5.604***
	(15.749)	(-3.568)	(11.266)	(-5.551)	(9.767)	(-2.155)	(14.667)
R&D / Sales	0.041**	-0.000***	0.011**	-0.001	0.048***	-0.027	0.229***
	(2.559)	(-4.335)	(2.465)	(-0.555)	(5.684)	(-0.920)	(3.060)
CAPEX / PPE	1.708***	0.006	0.597***	0.144***	0.687*	0.099	1.450***
	(8.949)	(0.889)	(2.823)	(4.573)	(1.946)	(0.746)	(8.017)
Financial leverage	-0.767***	-0.000	-0.563***	-0.084***	-0.307	-0.090	-0.913***
	(-4.456)	(-0.070)	(-3.796)	(-2.596)	(-1.015)	(-0.707)	(-5.670)
E-Index	-0.070***	-0.000	-0.015	0.005	-0.103***	-0.026*	-0.097***
	(-4.701)	(-0.690)	(-0.844)	(1.324)	(-3.635)	(-1.658)	(-6.480)
Board independence (%)	0.185	0.020**		0.040	0.003	-0.060	0.045
	(1.319)	(2.434)		(1.466)	(0.013)	(-0.447)	(0.341)
ln(Board size)	-0.258***	-0.002		-0.087***	0.224	0.787***	0.879***
	(-2.617)	(-0.329)		(-3.840)	(0.948)	(8.210)	(3.604)
CEO-chair (dummy)	-0.022	-0.001		-0.038***	0.189*	-0.071*	-0.136***
	(-0.630)	(-0.531)		(-4.429)	(1.951)	(-1.925)	(-3.343)
CEO in nom. com. (dummy)	-0.386***	0.008		0.004	-0.316**	-0.174	-0.473***
	(-3.747)	(1.220)		(0.190)	(-2.068)	(-0.922)	(-5.133)
CEO stock own. (%)	-0.202	-0.013		-0.163**	0.610	-0.684**	-1.268***
	(-0.639)	(-0.969)		(-2.428)	(1.093)	(-2.077)	(-3.507)
Institutional own. (%)	-0.083	0.002		0.082***	-0.486**	0.149	0.195*
	(-0.799)	(0.374)		(3.590)	(-2.215)	(1.401)	(1.827)
% directors older 72	0.126	-0.010		-0.165***	1.021**	-0.776***	-1.024***
	(0.687)	(-1.460)		(-5.111)	(2.474)	(-5.056)	(-3.225)
Director non-attend. (%)	0.297	-0.004		0.064	-0.074	0.105	0.236
	(1.107)	(-0.232)		(1.171)	(-0.183)	(0.286)	(0.850)
Busy board (dummy)	0.274*	0.005		0.032	0.082	0.189	0.607***
	(1.878)	(0.626)		(0.857)	(0.282)	(1.063)	(3.461)
Delaware (dummy)	0.025	0.001		0.038***	-0.220**	0.024	0.055
	(0.593)	(0.423)		(3.568)	(-2.023)	(0.638)	(1.308)
% female directors	0.155	-0.017*		-0.192***	1.278***	-0.386**	-0.396*
	(0.823)	(-1.921)		(-4.105)	(2.639)	(-2.060)	(-1.939)
Year × industry fixed effects	Yes	No	No	No	No	No	No
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	Yes	No	No	No	No
Observations	10,033	8,166	10,827	10,033	10,033	8,608	8,608
R-squared	0.462	0.054	0.730	0.340	-	-	0.434

Table 7: Ordinary least squares (OLS) regressions of cumulative abnormal returns (CARs) around outside director deaths on industry experience dummy

This table reports results from cross-sectional OLS regressions of the event returns on a dummy variable indicating whether the deceased outside director possesses industry experience. The sample comprises deaths of outside directors that occurred in the year following a meeting date from our initial sample selection process. In addition, the sample was supplemented by events where the director also serves as an outside director on the board of a US non-financial and non-utilities firm outside of our initial sample. The independent variable are the cumulated abnormal returns (*CAR*s), which are calculated as the observed return minus the expected return that is estimated using a market model over a 200-day estimation window from t = -220 to t = -21. The *CAR*s are aggregated over a three-day event window from t = 0 to t = 2 and winsorized at the 1% and 99% level. In Column 1, only an indicator variable that equals one if the director has industry experience and zero otherwise (*Director ind. exp. (dummy)*) is used as an independent variable. Column 2 additionally includes a set of director control variables, where *Age* is the age of the deceased director, *Age squared* is the age of the deceased director squared, *#Add. directorships* is the number of additional directorships held by the deceased director, *Male (dummy)* is an indicator dummy which equals one if the deceased director is a male and zero if the director is a female, *CEO (dummy)* is an indicator variable, which equals one if the deceased director has been the CEO of another firm at his death, and *Independent (dummy)* is an indicator variable, which equals one if the deceased director is independent (compared to gray). Column 3 adds firm controls. In Columns 4 and 5, the sample is restricted to sudden deaths classified as in Nguyen and Nielsen (2010). Column 4 replicates Column 3 for the subset of 83 sudden deaths. Columns 1-4 include industry fixed effects based on the two-digit standard industry classification (SIC) code industry classification and year fixed effects. Column 5 replicates Column 4 but omits the industry fixed effects. The *t*-values are based on White (1980) heteroskedasticity-robust standard errors (reported in parentheses). ***, **, * denotes statistical significance at the 1%, 5%, 10% level.

Dependent variable	*CARs (0;2)*	*CARs (0;2)*	*CARs (0;2)*	*CARs (0;2)*	*CARs (0;2)*
	(1)	(2)	(3)	(4)	(5)
Constant	0.088 ***	0.186	0.176	0.575 *	0.330
	(3.504)	(1.342)	(1.297)	(1.783)	(1.403)
Director ind. exp. (dummy)	-0.013 ***	-0.014 ***	-0.015 ***	-0.019	-0.017 *
	(-2.638)	(-2.735)	(-2.916)	(-1.426)	(-1.998)
Age		-0.000	-0.004	-0.018 *	-0.011
		(-1.337)	(-1.157)	(-1.974)	(-1.592)
Age squared		0.000	0.000	0.000 *	0.000
		(1.331)	(1.120)	(1.845)	(1.543)
# Add. directorships		-0.000	-0.001	-0.001	-0.001
		(-0.304)	(-0.778)	(-0.278)	(-0.489)
Male (dummy)		0.015	0.014	0.069	0.041 ***
		(1.504)	(1.311)	(1.310)	(3.996)
CEO (dummy)		-0.004	-0.003	0.030	0.001
		(-0.470)	(-0.298)	(1.199)	(0.040)
Independent (dummy)		0.009	0.008	0.012	0.038 **
		(1.283)	(1.059)	(0.264)	(2.576)
ln(Total assets)			-0.002	-0.001	-0.002
			(-1.111)	(-0.242)	(-0.843)
ROA			-0.026	-0.008	0.012
			(-0.815)	(-0.126)	(0.246)
R&D / Sales			0.001	0.002	0.001
			(0.861)	(0.854)	(0.854)
Market-to-book			-0.000	0.001	-0.000
			(-0.013)	(0.540)	(-0.108)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	No
Observations	300	291	291	83	83
R-squared	0.193	0.209	0.227	0.547	0.246

Table 8: Pooled ordinary least squares (OLS) and Tobit regressions of board industry experience on financial and corporate governance characteristics

This table reports the results from pooled OLS (Columns 1 to 3) and pooled Tobit regressions (Column 4) of the fraction of experienced outside directors on various financial and corporate governance variables. All explanatory variables in Column 3 are lagged by one year. All regressions include year fixed effects and two-digit standard industry classification (SIC) code industry fixed effects. The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are based on robust standard errors clustered at the firm level and are reported in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively. Definitions and data sources of all variables are provided in the Appendix.

	OLS		*OLS*		*OLS*		*Tobit*	
Dependent variable	*Board ind. exp. (%)*		*Board ind. exp. (%)*		*Board ind. exp. (%)*		*Board ind. exp. (%)*	
	(1)		(2)		(3)		(4)	
Constant	0.031		0.027		0.052		-0.237	
	(0.577)		(0.497)		(0.932)		(-1.245)	
Tobin's Q	0.018	***	0.015	***	0.015	***	0.017	***
	(4.033)		(3.247)		(2.946)		(2.799)	
ln (1+Number of nearby peer firms)			0.017	**	0.017	**	0.018	**
			(2.419)		(2.402)		(2.179)	
Non-competition enforce-index			-0.077	**	-0.074	**	-0.097	**
			(-2.394)		(-2.142)		(-2.256)	
ln(Total assets)	0.010	**	0.009	**	0.006		0.012	*
	(2.307)		(1.972)		(1.350)		(1.951)	
ROA	-0.428	***	-0.384	***	-0.386	***	-0.455	***
	(-7.305)		(-6.464)		(-5.736)		(-5.943)	
R&D / Sales	-0.001		-0.001		-0.002	***	-0.001	
	(-1.381)		(-1.348)		(-2.583)		(-1.285)	
CAPEX / PPE	0.127	***	0.112	***	0.105	***	0.158	***
	(4.058)		(3.666)		(3.149)		(3.938)	
Financial leverage	-0.075	**	-0.065	**	-0.054		-0.047	
	(-2.348)		(-1.986)		(-1.539)		(-1.065)	
E-Index	0.006		0.006		0.005		0.008	
	(1.417)		(1.479)		(1.172)		(1.421)	
Board independence (%)	0.031		0.041		0.052	*	0.060	
	(1.137)		(1.506)		(1.849)		(1.513)	
ln(Board size)	-0.085	***	-0.070	***	-0.066	***	-0.056	*
	(-3.836)		(-3.118)		(-2.796)		(-1.749)	
CEO-chair (dummy)	-0.036	***	-0.036	***	-0.038	***	-0.044	***
	(-4.221)		(-4.249)		(-4.268)		(-3.820)	
CEO in nom. com. (dummy)	0.010		0.011		0.020		0.012	
	(0.440)		(0.440)		(0.862)		(0.341)	
CEO stock own. (%)	-0.150	**	-0.136	**	-0.162	**	-0.240	**
	(-2.265)		(-2.019)		(-2.277)		(-2.234)	
Institutional own. (%)	0.082	***	0.086	***	0.078	***	0.123	***
	(3.567)		(3.749)		(3.150)		(3.762)	
% directors older 72	-0.166	***	-0.178	***	-0.176	***	-0.262	***
	(-5.099)		(-5.488)		(-5.033)		(-5.343)	
Director non-attend. (%)	0.056		0.043		0.062		0.040	
	(1.047)		(0.789)		(1.056)		(0.548)	
Busy board (dummy)	0.033		0.034		0.017		0.046	
	(0.863)		(0.887)		(0.479)		(0.907)	
Delaware (dummy)	0.042	***	0.033	***	0.033	***	0.044	***
	(3.914)		(3.014)		(2.858)		(2.790)	
% female directors	-0.197	***	-0.191	***	-0.188	***	-0.268	***
	(-4.282)		(-4.111)		(-3.790)		(-3.943)	
Year fixed effects	Yes		Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes		Yes	
Observations	10,033		9,851		8,018		9,851	
R-squared	0.340		0.346		0.353		-	
Pseudo R-squared	-		-		-		0.414	

Table 9: Investment-cash flow sensitivity regressions

This table reports results of estimating Equation (1) using pooled ordinary least squares (OLS) regressions. The dependent variable, investments, is defined as *CAPEX*, acquisition spending (*ACQ*), *R&D*, and the sum of *CAPEX+ACQ+R&D* (all scaled by lagged total assets) in Columns 1 and 2, 3 and 4, 5 and 6, and 7 to 10, respectively. Only the regression in Column 9 includes all corporate governance controls, abbreviated *CG controls*, that include the natural logarithm of board size, the E-Index, a dummy whether the CEO is also the chairman of the board, a dummy whether the CEO is also a member of the nominating committee, the fraction of stock owned by the CEO, the fraction of stock owned by institutional investors, the fraction of directors older than 72 years of age, the fraction of directors attending less than 75% of the meeting dates, a dummy whether the majority of the board holds three or more other directorships, a dummy whether the firm is incorporated in the state of Delaware, and the fraction of female directors on the board. Regressions shown in Columns 1 to 9 include year and two-digit standard industry classification (SIC) code industry fixed effects, while Column 10 includes year and firm fixed effects. The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are based on robust standard errors clustered at the firm level and are reported in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively. Definitions and data sources of all variables are provided in the Appendix.

Dependent variable	*$CAPEX_t$ / Total $assets_{t-1}$*		*ACQ_t / Total $assets_{t-1}$*		*$R\&D_t$ / Total $assets_{t-1}$*		*$(CAPEX_t + ACQ_t + R\&D_t)$ / Total $assets_{t-1}$*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	0.033***	0.040***	-0.061***	-0.049***	0.010	0.030***	0.117***	0.097***	0.118***	-0.339***
	(5.672)	(6.402)	(-4.977)	(-3.791)	(1.225)	(3.876)	(3.523)	(2.984)	(4.125)	(-3.962)
Board ind. exp. (%)	-0.002	0.009**	0.002	0.020**	0.047***	0.078***	0.048***	0.109***	0.109***	0.083***
	(-0.496)	(2.032)	(0.341)	(2.200)	(7.658)	(6.800)	(4.789)	(6.651)	(6.686)	(3.393)
CF	0.251***	0.295***	0.209***	0.277***	-0.066*	0.049*	0.392***	0.621***	0.561***	0.615***
	(12.669)	(10.379)	(4.334)	(4.687)	(-1.773)	(1.648)	(5.435)	(8.072)	(6.446)	(5.573)
Board ind. exp. (%) × CF		-0.117***		-0.182***		-0.303***		-0.608***	-0.597***	-0.564***
		(-2.991)		(-2.785)		(-4.069)		(-5.467)	(-5.307)	(-3.993)
CF (lag)	0.125***	0.125***	0.122***	0.121***	0.016	0.014	0.264***	0.261***	0.270***	0.284***
	(11.608)	(11.794)	(4.561)	(4.528)	(0.918)	(0.829)	(7.517)	(7.529)	(8.159)	(7.118)
Past 3-year sales growth	0.013***	0.013***	-0.001	-0.001	0.008*	0.008*	0.020**	0.020**	0.014	-0.007
	(3.458)	(3.428)	(-0.184)	(-0.240)	(1.918)	(1.869)	(2.263)	(2.230)	(1.496)	(-0.809)
ln(Total assets)	-0.001*	-0.001*	-0.001	-0.001	-0.002**	-0.002*	-0.004**	-0.004**	0.000	0.052***
	(-1.912)	(-1.868)	(-0.579)	(-0.540)	(-1.984)	(-1.960)	(-2.382)	(-2.316)	(0.240)	(4.405)
ROA	-0.216***	-0.221***	-0.234***	-0.242***	-0.050*	-0.063**	-0.502***	-0.527***	-0.492***	-0.370***
	(-9.330)	(-9.453)	(-5.222)	(-5.302)	(-1.754)	(-2.284)	(-7.985)	(-8.476)	(-7.105)	(-4.238)
Firm age	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.001***	-0.001***	-0.001***	0.016
	(-3.543)	(-3.480)	(-4.301)	(-4.222)	(-3.053)	(-2.927)	(-6.773)	(-6.656)	(-6.490)	(1.254)
Financial leverage	0.015**	0.015**	0.173***	0.174***	-0.049***	-0.047***	0.139***	0.143***	0.129***	0.287***
	(2.354)	(2.457)	(11.644)	(11.587)	(-6.116)	(-6.259)	(8.067)	(8.356)	(7.283)	(8.711)
CG controls	No	No	No	No	No	No	No	No	Yes	No
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Firm fixed effects	No	No	No	No	No	No	No	No	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,695	11,695	11,763	11,763	11,763	11,763	11,695	11,695	9,904	11,695
R-squared	0.454	0.456	0.069	0.070	0.313	0.329	0.153	0.164	0.168	0.392

Table 10: Ordinary least squares (OLS) regressions of Tobin's *Q* on board industry experience interacted with four measures of investment

This table reports the results from ordinary least squares (OLS) regressions, where Tobin's *Q* is regressed on lagged board industry experience and interactions of lagged board industry experience with variables that proxy for the three investment channels. The proxies used are: capital expenditure scaled by property plant and equipment (*CAPEX / PPE*), research and development expenditure scaled by sales (*R&D / Sales),* acquisition cash outflows scaled by sales (*ACQ / Sales*), and the sum of capital expenditure, research and development expenses, and acquisition cash outflow scaled by sales (*(CAPEX+ ACQ +R&D) / Sales*). In addition, financial control variables (*ln(Total assets)*, *ROA*, and *Financial leverage*) are included as in Table 3. Following Cremers et al. (2014), all independent variables are lagged by one year, and all three continuous investment channel proxies are demeaned prior to calculating their interactions with board industry experience. The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999) for which lagged data is available. All regressions include firm and year fixed effects. The *t*-values are reported in parentheses and based on robust standard errors clustered at the firm level. ***, **, * denotes statistical significance at the 1%, 5%, 10% level.

Dependent variable	*Tobin's Q*		*Tobin's Q*		*Tobin's Q*		*Tobin's Q*	
	(1)		(2)		(3)		(4)	
Constant	6.667	***	6.498	***	6.488	***	0.843	***
	(7.219)		(6.861)		(6.851)		(12.319)	
Board ind. exp. (%; lag)	-0.077		-0.080		-0.082		-0.047	
	(-0.516)		(-0.535)		(-0.550)		(-0.308)	
Board ind. exp. (%) × CAPEX / PPE (lag)	0.150							
	(0.430)							
Board ind. exp. (%) × R&D / Sales (lag)			0.483	***				
			(4.324)					
Board ind. exp. (%) × ACQ / Sales (lag)					-0.278			
					(-1.197)			
Board ind. exp. (%) × (CAPEX+ ACQ +R&D) / Sales							0.376	**
							(2.549)	
CAPEX / PPE (lag)	0.191		0.248	**	0.249	**		
	(1.257)		(2.155)		(2.161)			
R&D / Sales (lag)	0.011		-0.085	***	0.006			
	(0.640)		(-4.625)		(0.339)			
ACQ / Sales (lag)	-0.503	***	-0.515	***	-0.502	***		
	(-2.827)		(-2.887)		(-2.821)			
(CAPEX+ ACQ +R&D) / Sales							-0.078	***
							(-2.899)	
ln(Total assets) (lag)	-0.000	*	-0.000	*	-0.000	*	-0.000	*
	(-1.775)		(-1.771)		(-1.775)		(-1.772)	
ROA (lag)	1.838	***	1.937	***	1.832	***	2.141	***
	(5.598)		(6.248)		(5.572)		(-2.852)	
Financial leverage (lag)	-0.233	**	-0.157	***	-0.148		-0.621	***
	(-2.034)		(-2.743)		(-0.930)		(-3.503)	
Year fixed effects	Yes		Yes		Yes		Yes	
Firm fixed effects	Yes		Yes		Yes		Yes	
Observations	9,723		9,723		9,723		9,698	
R-squared	0.750		0.753		0.750		0.752	

Table 11: Value of cash regressions

This table reports the results of Equation (2). Following Pinkowitz et al. (2006), X_t is the level of a variable at time t, ΔX_t the change from t-1 to t, and ΔX_{t+1} the change from year t to $t+1$ (all inflated by total assets in year t). The dependent variable V is firm market value (market value of equity plus book value of short-term and long-term debt). E is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, NA is net assets (total assets less cash and cash equivalents), RD is research and development expenses (set to zero if missing), I is interest expenses, D is dividends (common dividends paid), and L is liquid asset holdings (cash and cash equivalents). We add the E-Index of Bebchuk et al. (2009) and board industry experience (*Board ind. exp. (%)*). In Columns 1 and 2, we split the sample into high and a low board industry experience subsamples (above and below sample median board industry experience). Column 3 shows *p*-values of a test for inequality of coefficients from the previous two Columns. Column 4 estimates the regression over the full sample. The sample contains firms in the S&P 1500 from 2000-2010 for which necessary data is available, excluding utilities and financial firms (SIC codes 6000-6999 and 4900-4949). Variables are winsorized at the 1% and 99% level. R-squared for the Fama-MacBeth (1973) regressions are time-series averages for all 11 cross-sections. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level.

	High industry experience	*Low industry experience*	*p-value of difference*	*Full sample*
	(1)	(2)	(3)	(4)
Constant	0.752***	0.791***	0.000	0.808***
	(14.051)	(15.072)		(17.431)
E_t	5.679***	8.225***	0.000	6.617***
	(10.152)	(13.300)		(13.012)
ΔE_t	-0.839**	-1.315***	0.123	-1.023***
	(-3.001)	(-3.666)		(-4.234)
ΔE_{t+1}	3.513***	4.601***	0.000	3.968***
	(7.767)	(10.697)		(10.664)
ΔNA_t	0.868***	0.534***	0.003	0.745***
	(6.504)	(3.792)		(6.697)
ΔNA_{t+1}	0.459**	0.158	0.050	0.325*
	(2.453)	(1.043)		(2.150)
RD_t	4.599***	5.114***	0.001	4.764***
	(5.963)	(5.646)		(5.955)
ΔRD_t	5.681**	5.908**	0.005	5.900**
	(2.718)	(2.700)		(3.132)
ΔRD_{t+1}	10.329***	9.458***	0.000	10.093***
	(5.096)	(3.992)		(6.385)
I_t	-2.202*	-8.241***	0.000	-5.535***
	(-1.844)	(-5.682)		(-6.038)
ΔI_t	-5.253	1.023	0.971	-2.248
	(-1.363)	(0.368)		(-0.800)
ΔI_{t+1}	-7.011***	-4.376	0.001	-6.698***
	(-3.963)	(-1.369)		(-3.632)
D_t	10.746***	6.882***	0.001	9.059***
	(5.892)	(7.436)		(10.723)
ΔD_t	2.164	4.286	0.361	4.004
	(0.727)	(1.723)		(1.666)
ΔD_{t+1}	8.733**	8.323***	0.064	9.387***
	(2.648)	(4.731)		(4.510)
ΔV_t	-0.196*	-0.201	0.075	-0.196*
	(-1.955)	(-1.789)		(-1.936)
L_t	2.252***	1.648***	0.000	1.699***
	(9.262)	(13.150)		(6.252)
E-Index	-0.041**	-0.051***	0.000	-0.049***
	(-2.456)	(-6.385)		(-4.751)
L_t ×*E-Index*				0.020
				(0.269)
Board ind. exp. (%)$_t$				-0.018
				(-0.348)
L_t × *Board ind. exp. (%)*$_t$				0.792***
				(3.954)
Observations	5,291	6,010		11,301
R-squared	0.517	0.556		0.530

Table 12: Robustness tests using excess cash as in Dittmar and Mahrt-Smith (2007)
This table reports results for value of cash regressions using excess cash as in Dittmar and Mahrt-Smith (2007). Column 1 shows the first stage of their regression to predict optimal cash levels, where the market-to-book-ratio is instrumented using compounded past three-year sales growth. The second column shows the second stage of the cash level prediction. The dependent variable, *Ln(Cash /Net Assets)*, is the logarithm of cash over net assets (set to the sample minimum in order to avoid the logarithm going to infinity). The residuals from this regression are used to estimate excess cash (*XCash*), which is the difference between observed cash and predicted cash. Column 3 and 4 show the standard regression from Dittmar and Mahrt-Smith (2007), with the market-to-book-ratio as the dependent variable, when we add board industry experience as well as an interaction term between board industry experience and excess cash (*Board ind. exp. (%)× XCash*). Controls in Columns 3 and 4 are estimated as in Dittmar and Mahrt-Smith (2007) and include two year lagged changes of the deflated variables earnings, net assets, R&D, interest payments, dividend paid, two year future changes of the deflated variables earnings, net assets, R&D, interest deflated, dividends paid, market value, and current realizations of the deflated variables earnings, R&D, interest deflated, and dividends paid. As in Dittmar and Mahrt-Smith (2007), we exclude observations with negative excess cash: Column 3 excludes firm-years with negative excess cash and Column 4 excludes all observations for a firm that has one observation with negative excess cash during our sample period. *MV* is defined as firm market value (market value of equity plus book value of total debt), *NA* is net assets (total assets less cash and cash equivalents), *FCF* is free cash flow (operating income minus interest minus taxes minus cash), *NWC* is net working capital (current assets minus current liabilities minus cash), *IndustrySigma* is the FF48 industry median standard deviation of the past ten year cash flow over net assets, *RD* is R&D expenses (set to zero if missing), *3-year sales growth* is the compounded past three year sales growth, *Institutional own. (%)* is institutional share ownership, *E-Index* is the entrenchment index of Bebchuk et al. (2009), *I* is interest expenses, *D* is dividend paid (common dividends paid), *E* is earnings (earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits), and *XCash* is excess cash. All regressions are estimated as firm fixed models and include year dummies. All financial ratios are winsorized at the 1% and 99% level. The entire sample contains firms in the S&P 1500 from 2000-2010 for which necessary data is available, excluding utilities and financial firms. *t*-values are report in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level.

	Optimal cash prediction (2SLS)		*Value of cash regressions*	
	First stage (OLS)	*Second stage (OLS)*	*OLS*	*OLS*
Dependent variable:	*MV / NA*	*Ln(Cash / NA)*	*MV / NA*	*MV / NA*
	(1)	(2)	(3)	(4)
Constant	10.436***	2.251***		
	(24.988)	(3.085)		
Ln(NA)	-1.210***	-0.603***		
	(-23.903)	(-7.176)		
FCF / NA	6.193***	0.690		
	(26.033)	(1.562)		
NWC / NA	-0.814***	-0.888***		
	(-3.950)	(-7.133)		
IndustrySigma	-14.388***	0.544		
	(-6.041)	(0.324)		
R&D / NA	6.796***	-0.652		
	(12.017)	(-1.167)		
3-year sales growth	0.474***			
	(8.191)			
MV / NA		0.179***		
		(2.639)		
Institutional own. (%)	0.693***	-0.162**		
	(5.397)	(-1.912)		
E-Index	-0.057***	-0.033**	-0.015	-0.038
	(-2.422)	(-2.388)	(-0.400)	(-0.676)
Board ind. exp. (%)			-0.112	-0.294
			(-0.398)	(-0.692)
XCash			-0.019	-0.223
			(-0.063)	(-0.512)
E-Index × XCash			-0.112	-0.239 *
			(-0.398)	(-1.951)
Board ind. exp. (%)× XCash			1.686***	2.799***
			(3.325)	(4.106)
Controls as in Dittmar and Mahrt-Smith (2007)	-	-	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	9,499	9,499	2,319	1,221
R-squared	0.229	0.288	0.583	0.599

Appendix: Variable definitions

Panel A: Firm performance

Variable	Definition	Source
Tobin's Q	(Total assets + market value common stock – book value common stock – deferred taxes) / total assets; if deferred taxes are missing in COMPUSTAT, the value is set to zero; winsorized at 1% and 99% level	CRSP/COMPUSTAT
Median industry adjusted Tobin's Q	Tobin's *Q* – median two-digit SIC code industry Tobin's *Q* in respective year	CRSP/COMPUSTAT

Panel B: Board industry experience

Variable	Definition	Source
Board ind. exp. (%)	Fraction of outside directors with work experience in the same two-digit SIC code industry to all outside directors	BoardEx / COMPUSTAT NORTH AMERICA / COMPUSTAT GLOBAL/ CRSP/AMADEUS
Maj. of board exp. (dummy)	Dummy variable equal to one if majority of outside directors possesses industry experience, zero otherwise	
Board ind. exp. (%; one-digit)	Fraction of outside directors with work in the same one-digit SIC code industry to all outside directors	
Board ind. exp. (%; three-digit)	Fraction of outside directors with work experience in the same three-digit SIC code industry to all outside directors	
Combined board exp. measure (one – four digit)	Mean score among all outside directors that equals four for each outside director with work experience in the same four-digit SIC code industry, three for each outside director with experience in the same three-digit SIC code industry, two for each outside director with work experience in the same two-digit SIC code industry, one for each outside director with work experience in the same one-digit SIC code industry, and zero otherwise. This measure is similar to the measure proposed by Custódio and Metzger (2013).	
Board ind. exp. empl. (%)	Fraction of outside directors with work experience as an employee without a board membership in the same two-digit SIC code industry to all outside directors	
Board ind. exp. exec. dir. (%)	Fraction of outside directors with work experience as an executive director in the same two-digit SIC code industry to all outside directors	
Board ind. exp. CEO (%)	Fraction of outside directors with work experience as Chief Executive Officer in the same two-digit SIC code industry to all outside directors	
Board ind. exp. exec. dir non-CEO (%)	Fraction of outside directors with work experience as an executive director outside the role of the Chief Executive Officer in the same two-digit SIC code industry to all outside directors	
Board ind. exp. outs. dir. (%)	Fraction of outside directors with work experience as an outside director in the same two-digit SIC code industry to all outside directors	
Mean board ind. exp. (years)	Mean years of work experience in the same two-digit SIC code industry among all outside directors	
σ board ind. exp. (years)	Standard deviation of years of work experience in the same two-digit SIC code industry among all outside directors	
# of ind. experienced directors increased (dummy)	Dummy variable that equals one if the number of industry experienced outside directors increases compared to the previous year, zero otherwise	
Board ind. exp. (%; Hoberg-Phillips 50)	Fraction of outside directors with work experience in the Hoberg and Phillips (2010; 2015) FIC 50 industry to all outside directors	
Board ind. exp. (%; Segment)	Fraction of outside directors with work experience in the two-digit SIC code industry of at least one business segment to all outside directors	
Board ind. exp. (%; Segment/Main)	Fraction of outside directors with work experience in the two-digit SIC code industry of at least one business segment to all outside directors, but *Board ind. exp. (%; Segment/Main)* is replaced with the standard board industry experience measure (*Board ind. exp. (%)*) for firm-year observations without coverage in the COMPUSTAT segment database industry measure	
Board ind. exp. (%, Segment-Sales weighted)	Mean segment sales industry experience score among all outside directors. An outside director's segment industry experience score is the sum of the sales to total sales of the segments that operate in two-digit SIC code industries where the outside directors possesses work experience	

Panel C: Firm-specific variables

Variable	Definition	Source
ACQ / Total assets	Acquisition spendings$_t$ / total assets$_{t-1}$	COMPUSTAT
ACQ / Sales	Acquisition spendings / sales	COMPUSTAT
Board independence (%)	Fraction of independent outside directors (as opposed to gray outside directors) to all outside directors	RiskMetrics
Board size	Board size	RiskMetrics
Busy board (dummy)	Dummy variable equal to one if the majority of board members holds three or more than three additional directorships, zero otherwise	RiskMetrics
CAPEX / Total assets	CAPEX$_t$ / total assets$_{t-1}$	COMPUSTAT
CAPEX / PPE	CAPEX / property, plant, and equipment	COMPUSTAT
Cash holdings	Cash and cash equivalents / non-cash assets	COMPUSTAT
CEO in nom. com. (dummy)	Dummy variable equal to one if the CEO is a member of the nominating committee, zero otherwise	RiskMetrics
CEO stock own. (%)	Fraction of shares held by the CEO to all shares outstanding	COMPUSTAT ExecuComp
CEO-chair (dummy)	Dummy variable equal to one if the CEO is at the same time the Chairman of the board, zero otherwise	RiskMetrics
CF	Cash flow$_t$ / total assets$_{t-1}$; winsorized at 1%and 99% level	COMPUSTAT
Delaware (dummy)	Dummy variable equal to one if the company is incorporated in the state of Delaware, zero otherwise	COMPUSTAT
Director non-attend. (%)	The fraction of outside directors on the board attending less than 75% of the board meetings	RiskMetrics
Dividend payer (dummy)	Dummy equal to one if the firm paid dividends, zero otherwise	COMPUSTAT
E-Index	Entrenchment index as proposed by Bebchuk et al. (2009)	RiskMetrics
Non-competition enforcement index	State-level non-competition enforcement index of Garmaise (2009), continued through 2010 using 2004 values for the state where the firm is headquartered	Garmaise (2009) / COMPUSTAT
Financial leverage	(Long term debt + debt due in one year) / total assets; winsorized at 1% and 99% level	COMPUSTAT
Firm age	Years since firm data is available	COMPUSTAT
Institutional own. (%)	Percentage ownership of blockholders with > 5% ownership	CDA Spectrum
(CAPEX + ACQ + R&D) / Total assets	(CAPEX$_t$ + acquisition spendings$_t$ + research and development spendings$_t$) / total assets$_{t-1}$	COMPUSTAT
Market-to-book	(Shares outstanding × closing price) / book value of equity	CRSP / COMPUSTAT
Mean # of firms among outs. directors	Mean number of different firms the outside directors worked for at the day of the annual meeting date	BoardEx
Mean # of industries among outs. directors	Mean number of different two-digit SIC code industries the outside directors worked for at the day of the annual meeting date	BoardEx
Mean age among outs. dir.	Mean age of the outside directors	RiskMetrics
Number of nearby peer firms	Number of firms that are located in the same 3-digit zip code and share the same two-digit SIC code, but not the same 4-digit SIC code	COMPUSTAT
Past 3-year sales growth	Past three year compound sales growth	COMPUSTAT
Past 3-year ROA	Arithmetic average of the ROA of the previous three years	COMPUSTAT
ROA (%)	Earnings before interest and taxes$_t$ / total assets$_t$; winsorized at 1% and 99% level	COMPUSTAT
R&D / Sales	R&D expenses / sales	COMPUSTAT
R&D / Total assets	R&D$_t$ / total assets$_{t-1}$	COMPUSTAT
Total assets	Total asset	COMPUSTAT
% directors older 72	Fraction of directors older than 72 years of age	RiskMetrics
% female directors	Fraction of female directors	RiskMetrics

Online Appendix to Board Industry Experience, Firm Value, and Investment Behavior

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Table A1: Robustness tests using director industry experience at public and private firms

This table reports reestimated results from pooled ordinary least squares (OLS) regressions of Tobin's *Q* on different board industry experience measures similar to Table 3. Instead of including only SIC codes from CRSP, COMPUSTAT North America, COMPUSTAT Global, Amadeus, and Datastream to estimate director and board industry experience, this table additionally includes SIC codes retrieved from LexisNexis and Factiva, which we collect by hand (see Footnote 7). The financial and the corporate governance controls, abbreviated *Financial controls* and *Corporate governance controls*, respectively, are the same as in Table 3: (*ln(Total assets)*, *ROA*, *R&D/Sales*, *CAPEX/PPE*, *Financial leverage*, *E-Index*, *Board independence (%)*, *ln(Board size)*, *CEO-Chair (dummy)*, *CEO in nom. com. (dummy)*, *CEO stock own. (%)*, *Institutional own. (%)*, *% directors older 72*, *Director non-attend. (%)*, *Busy board (dummy)*, *Delaware (dummy)*, *% female directors*). All regressions include year and two-digit SIC code industry fixed effects. The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are based on robust standard errors clustered at the firm level and are reported in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively. Definitions and data sources of all variables are provided in the Appendix.

Dependent variable	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	2.683***	2.662***	2.674***	2.747***	2.701***	2.686***
	(11.117)	(10.909)	(11.021)	(11.561)	(11.259)	(11.134)
Board ind. exp. (%)	0.352***					
	(3.502)					
Board ind. exp. empl. (%)		0.388**			0.123	
		(2.529)			(0.702)	
Board ind. exp. exec. dir. (%)			0.540**		0.226	
			(2.435)		(0.926)	
Board ind. exp. outs. dir. (%)				0.515***	0.434***	
				(4.171)	(3.650)	
Board ind. exp. CEO (%)						0.717***
						(2.722)
Board ind. exp. exec. dir. non-CEO (%)						-0.044
						(-0.181)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes
Corporate governance controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,033	10,033	10,033	10,033	10,033	10,033
R-squared	0.416	0.414	0.414	0.416	0.419	0.414

Table A2: Regression results for other robustness and endogeneity tests

This table reports reestimated results for a number of auxiliary tests. Column 1 presents reestimated regression results from the regression from Column 6 of Table 3. In order to control for the valuation effect of having CEOs as outside directors, the fraction of outside directors that are currently CEOs (*% of CEOs as outside directors*) is added to the model (see Footnote 10 in the Paper). Regression results in Columns 2 to 4 aim at investigating whether directors' currently active industry affiliations drive the result, as suggested by Dass et al. (2014). The board industry experience variable is split into two variables: *Current board ind. exp. (%)* estimated as the fraction of outside directors with current affiliation in a firm that is active in the same two-digit SIC code industry, while *Non-current board ind. exp. (%)* is estimated based on terminated affiliations in the same two-digit SIC code industry. In Column 2, only *Current board ind. exp. (%)* is included in the regression. In Column 3, only *Non-current board ind. exp. (%)* is included in the regression. In Column 4, both variables are added simultaneously. Columns 5 and 6 show reestimated regression results of the regression in Column 1 of Table 5, where Hoberg and Philipps (2010; 2015) industries are estimated using 100 (*Board ind. exp. (%; Hoberg-Phillips 100)*) and 200 industries (*Board ind. exp. (%; Hoberg-Phillips 100)*; see Footnote 13 in the Paper). Column 7 shows reestimated regression results for the regression in Column 2 of Table 6, but neglects the lagged change in *Board ind. exp. (%)* as a control variable (see Footnote 157 in the Paper). All regressions include financial and corporate governance controls as in Table 3: (*ln(Total assets)*, *ROA*, *R&D/Sales*, *CAPEX/PPE*, *Financial leverage*, *E-Index*, *Board independence (%)*, *ln(Board size)*, *CEO-Chair (dummy)*, *CEO in nom. com. (dummy)*, *CEO stock own. (%)*, *Institutional own. (%)*, *% directors older 72*, *Director non-attend. (%)*, *Busy board (dummy)*, *Delaware (dummy)*, *% female directors*) in addition to year fixed effects and two-digit standard industry classification (SIC) code industry fixed effects. The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are based on robust standard errors clustered at the firm level and are reported in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively.

Dependent variable	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Δ Board ind. exp. (%)*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	3.407***	2.703***	2.690***	2.688***	2.646***	2.620***	-0.013
	(12.166)	(11.342)	(11.166)	(11.264)	(10.792)	(10.856)	(-0.889)
Board ind. exp. CEO (%)	0.779**						
	(2.253)						
Board ind. exp. exec. dir. non-CEO (%)	-0.224						
	(-0.684)						
% of CEOs as outside directors	0.002						
	(0.009)						
Current board ind. exp. (%)		0.960***		0.822***			
		(4.981)		(4.261)			
Non-current board ind. exp. (%)			0.396***	0.198*			
			(3.501)	(1.752)			
Board ind. exp. (%; Hoberg-Phillips 100)					0.369***		
					(3.965)		
Board ind. exp. (%; Hoberg-Phillips 200)						0.453***	
						(4.322)	
Tobin's Q							-0.000
							(-0.191)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Corporate governance controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,033	10,033	10,033	10,033	10,033	10,033	8,166
R-squared	0.333	0.417	0.413	0.413	0.412	0.416	0.011

Table A3: Pooled ordinary least squares (OLS) regressions of Tobin's *Q* on initial values of board industry experience measures

This table reports reestimated results from Table 3 of the Paper, i.e., pooled OLS regressions of Tobin's *Q* on the fraction of experienced outside directors. As a test for endogeneity, we follow Dittmar and Mahrt-Smith (2007) and Bebchuk et al. (2009) and replace the variables that capture board industry experience with its initial time-series value. Column 1 presents regression results where industry experience is estimated as the fraction of experienced outside directors to all outside directors, while the remaining columns show regression results where industry experience is defined based on different hierarchical levels: Column 2 considers only industry experience as an employee, Column 3 only industry experience as an executive director, and Column 4 only industry experience as an outside director. Column 5 introduces all three hierarchical measures jointly. Column 6 uses the fraction of outside directors that possess industry experience as a CEO as well as industry experience as an executive director outside the role of the CEO. All regressions include financial and corporate governance controls as in Table 3: the natural logarithm of board size, the E-Index, a dummy whether the CEO is also the chairman of the board, a dummy whether the CEO is also a member of the nominating committee, the fraction of stock owned by the CEO, the fraction of stock owned by institutional investors, the fraction of directors older than 72 years of age, the fraction of directors attending less than 75% of the meeting dates, a dummy whether the majority of the board holds three or more other directorships, a dummy whether the firm is incorporated in the state of Delaware, and the fraction of female directors on the board in addition to year fixed effects and two-digit standard industry classification (SIC) code industry fixed effects. The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are based on robust standard errors clustered at the firm level and are reported in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively.

Dependent variable	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*	*Tobin's Q*
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	2.702***	2.619***	2.667***	2.774***	2.674***	2.656***
	(11.270)	(10.711)	(11.078)	(11.723)	(11.182)	(11.082)
Board ind. exp. (%)	0.479***					
	(4.686)					
Board ind. exp. empl. (%)		0.698***			0.369*	
		(3.713)			(1.665)	
Board ind. exp. exec. dir. (%)			0.853***		0.403	
			(3.057)		(1.286)	
Board ind. exp. outs. dir. (%)				0.533***	0.375***	
				(4.380)	(3.163)	
Board ind. exp. CEO (%)						0.984***
						(3.001)
Board ind. exp. exec. dir. non-CEO (%)						0.112
						(0.328)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes
Corporate governance controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,033	10,033	10,033	10,033	10,033	10,033
R-squared	0.416	0.414	0.414	0.416	0.419	0.414

Table A4: Board industry experience as a determinant of cash holdings

This table reports regression results where cash holdings are used as the dependent variable. The independent variables, abbreviated *Financial controls* and *Corporate governance* controls, include the standard set of controls used throughout the Paper: the natural logarithm of board size, the E-Index, a dummy whether the CEO is also the chairman of the board, a dummy whether the CEO is also a member of the nominating committee, the fraction of stock owned by the CEO, the fraction of stock owned by institutional investors, the fraction of directors older than 72 years of age, the fraction of directors attending less than 75% of the meeting dates, a dummy whether the majority of the board holds three or more other directorships, a dummy whether the firm is incorporated in the state of Delaware, and the fraction of female directors on the board in addition to Tobin's *Q*. Furthermore, year fixed effects and two-digit standard industry classification (SIC) code industry fixed effects are added. The sample contains all firms in the S&P 1500 from 2000-2010 for which necessary data is available, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are based on robust standard errors clustered at the firm level and are reported in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively.

	(1)	
Constant	0.784	***
	(6.135)	
Board ind. exp. (%)	0.311	***
	(5.360)	
Financial controls	Yes	
Corporate governance controls	Yes	
Year fixed effects	Yes	
Industry fixed effects	Yes	
Observations	10,025	
R-squared	0.239	

Table A5: Value of cash regressions for pre and post financial crises subsamples

This table reports the reestimated results of Equation (2) from the Paper for two different subsamples (see Footnote 30 in the Paper). Column 1 shows regression results for all firm-years prior to 2008, while Column 2 shows regression results for all firm-years after 2007. Variable definitions are similar to Table 11. The R-squared for the Fama-MacBeth (1973) regressions are time-series averages for all 11 cross-sections. Definitions and notation is similar to Pinkowitz et al. (2006). The sample contains all firms in the S&P 1500 during the 2000-2010 sample period, excluding utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999). The *t*-values are based on robust standard errors clustered at the firm level and are reported in parentheses. ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively.

	Pre-2008	*Post-2007*
	(1)	(2)
Constant	0.864***	0.659**
	(19.212)	(9.089)
E_t	7.014***	5.557***
	(11.154)	(10.569)
ΔE_t	-0.930**	-1.272*
	(-3.094)	(-2.957)
ΔE_{t+1}	4.239***	3.243**
	(9.567)	(5.527)
ΔNA_t	0.833***	0.510**
	(5.933)	(7.260)
ΔNA_{t+1}	0.374	0.196
	(1.837)	(1.328)
RD_t	5.900***	1.735*
	(7.875)	(4.039)
ΔRD_t	6.282**	4.882
	(2.462)	(2.584)
ΔRD_{t+1}	11.707***	5.788
	(7.454)	(1.826)
I_t	-6.459***	-3.068
	(-6.308)	(-2.560)
ΔI_t	-2.887	-0.544
	(-0.800)	(-0.119)
ΔI_{t+1}	-6.678**	-6.753
	(-2.799)	(-2.225)
D_t	9.189***	8.711***
	(7.857)	(17.985)
ΔD_t	5.610	-0.279
	(1.813)	(-0.141)
ΔD_{t+1}	8.405**	12.007*
	(3.245)	(3.455)
ΔV_t	-0.194	-0.201
	(-1.534)	(-1.024)
L_t	1.714***	1.661**
	(4.749)	(4.471)
E-Index	-0.066***	-0.005
	(-9.954)	(-0.340)
L_t ×*E-Index*	0.055	-0.072
	(0.539)	(-1.496)
Board ind. exp. (%)$_t$	0.020	-0.120
	(0.330)	(-1.425)
L_t × *Board ind. exp. (%)*$_t$	0.685**	1.076*
	(2.800)	(3.095)
Observations	8,069	3,232
R-squared	0.536	0.514