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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. We find that firms with more experienced outside directors are valued at a premium compared to firms with less experienced outside directors. We provide a number of auxiliary analyses to mitigate endogeneity concerns including a quasi-experimental setting based on director deaths. Firms with experienced boards are able to limit investment distortions (lower investment-cash flow sensitivities) by building up valuable financial slack. Overall, board industry experience seems to be a valuable corporate governance mechanism.

JEL Classification: G32; G34

Keywords: Board of directors; Director skills and experience; Cash holdings; Corporate governance

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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 – has been the focus of the empirical corporate governance literature. In a nutshell, this strand of the literature finds that smaller, outsider-dominated boards are more effective in monitoring management and thus serve shareholders' interests best.[1] In contrast, direct empirical evidence supporting the notion that directors add value beyond their role as a monitor is scarce, although the importance of the advisory role is regularly admitted in empirical papers. For example, Field et al. (2013) emphasize the importance of the advising function of directors and argue that busy directors positively influence firm value because the "experience of busy directors likely make[s] them better advisors" (p. 65). By and large, studies do acknowledge the benefits of having experienced directors for the advisory role; however, these studies use simple variables such as director age, education, or tenure to proxy for the unobserved director characteristic "experience". Field et al. (2013), for example, "surmise that directors with longer tenure with the firm have more specialized knowledge. Similarly, older directors are likely to have more experience. Directors that are associated with top 25 VC firms are presumably more skilled and/or more experienced" (p. 75). In this paper, we introduce and test a measure of board industry experience, defined as the fraction of outside directors with prior work experience in the same two-digit standard industry classification (SIC) code industry, that arguably captures a director's superior monitoring and advising capabilities. We argue that both roles – monitoring and advising – require specific knowledge of a firm's business. Most important, we conjecture that such

[1] For a comprehensive overview see Hermalin and Weisbach (2003) and Adams et al. (2010).

specific industry knowledge is the most important component of a board's ability to perform its role in a manner that enhances shareholder value.[2]

Practical support for this claim is abundant as investor attention in industry experience at the board level has recently increased. In the aftermath of the recent financial crisis, the main focus of shareholder activists, the press, and various corporate governance experts shifted from board independence, which is nowadays heavily regulated, to board industry experience. In particular, concerns that the industry experience on corporate boards is insufficient have been raised (Pozen, 2010; Bertsch, 2011). Deloitte LLC (2013) and Corporate Board Member (2014) even claim that industry experience of directors is one of or the most desired skill safeguarding board success in the near future. 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 others, director qualifications, thereby also reflecting an increased interest in director qualifications and experience.[3]

In this paper, we estimate the percentage fraction of industry experienced outside directors 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

[2] Outside directors' advising services could also be provided by external consultants, but alignment of their interests with shareholder interests is problematic (Casamatta, 2003). Fama (1980) and Coles and Hoi (2003) argue that outside directors additionally face reputational effects and liability from litigation.

[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).

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. Additionally, 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, 2014) industry classification, which arguably reflects product similarity, or when we estimate board industry experience using segment rather than firm industry classifications. We find that our results are not driven by active affiliations of directors within the same industry or by general managerial experience. Firm fixed effects regressions suggest that our results are driven by within-firm variation of board industry experience. 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. To further mitigate potential endogeneity concerns, we use an event-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 percent points 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 effect on firm value.

In addition to measuring 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. We focus on these channels because both have been ex-

tensively studied in the literature on boards (e.g., Güner et al., 2008) and in the literature on corporate governance (e.g., Dittmar and Mahrt-Smith, 2007). Our results show that experienced boards lower investment-cash flow sensitivities and help to avoid investment distortions. On the one hand, more experienced boards may be able to mitigate the information asymmetry between managers and the outside directors within a firm, thereby enhancing investment decisions through better monitoring. On the other hand, experienced outside directors possess a comparative advantage in anticipating future conditions in the industry, enabling them to provide active advice to managers about the optimal investment policy. Moreover, we find 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, experienced boards are able to limit potential managerial misuse of precautionary cash holdings. These firms use their cash reserves in order 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.

In the overall corporate governance context, our contribution is twofold. First, we add to the literature on board characteristics and its implications on corporate performance. 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. With respect to personal director characteristics, 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 as-

sociated with better attendance records and stronger monitoring, but not higher value. Masulis et al. (2012b) find that foreign independent directors at US corporations show poor board meeting attendance and are associated with lower firm values. Coles, Daniel, and Naveen (2014) show that directors appointed after the CEO assumed office are weak monitors and thus seem to have allegiance to the CEO. Cremers, Litov, and Sepe (2014) find staggered boards to be associated with higher value, in particular in firms where longer-term commitment by directors seems more relevant. We add to the literature on board characteristics by providing evidence of a positive relationship between board industry experience and firm performance. In addition, we identify specific channels through which directors with industry experience influence firm performance.

Second, and perhaps even more important, our paper helps to shed light on the tasks and roles fulfilled by directors sitting on the board, which, in turn, enhances our understanding of what boards effectively do. Empirically, this question has been tackled indirectly by studying board composition and relating it to observable firm characteristics, which means that the board of directors has been treated as a 'black box'.[4] This problem is difficult to circumvent given the limited data availability. We document an empirical association between investment-cash flow sensitivities and industry experience of the directors sitting on the board. We thus conjecture that directors are not only passive monitors, but simultaneously fulfill an active advisory role, i.e., they influence and actively shape corporate strategies and policies. This conclusion is in line with earlier survey evidence. Already Mace (1971) suggests that boards provide expertise and thereby fulfill an advisory role, while Demb and Neubauer (1992, p. 43) find that "setting the strategic direction of the company" was considered by two thirds of the directors as one of their tasks.

[4] Exemptions are the work of Schwartz-Ziv and Weisbach (2013), who use a sample of minutes of board meetings of Israeli firms in which the government owns a substantial share, and studies based on surveys among directors, for example Mace (1971) and Demb and Neubauer (1992), among others.

Our findings also contribute to the recent 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 acquirer's 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 refocussing, Huang (2014) documents significant performance improvements, supporting the notion that managerial industry experience matters. Wang et al. (2013) focus on the industry experience of the board of directors rather than the CEO in S&P 500 firms from 2000 to 2007 and find that industry experience on the audit committee reduces earnings management and the probability of committing financial fraud. Our study is different because we focus on the relation between industry experience of the board and firm value rather than on earnings management or financial fraud. Additionally, we use a sample with a much larger firm universe (S&P 1500) and a longer time horizon (2000 to 2010), develop more granular measures of industry experience, and find that experience gained while working as a CEO is most (firm-value) relevant. Most important, we also show that board industry experience is related to operating policies such as investment decisions and cash holdings. Other work by Faleye et al. (2014) and Masulis et al. (2012a) also documents a positive valuation effect associated with a higher fraction of experienced outside directors on firms' boards but focuses on different valuation channels such as innovation, acquisition outcomes, or CEO turnover. Furthermore, von Meyerinck et al. (2014) show 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. Two other studies investigate the effect of 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 as well as higher accounts payable.

The remainder of our study is organized as follows: Section 2 describes our data and variables. Section 3 shows our results on the relationship between board industry experience and firm value. Section 4 presents evidence how board industry experience affects firm value through its impact on investment behavior, and Section 5 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 financial firms (SIC codes 6000-6999) and utilities (SIC codes 4900-4949) from our sample. 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 date the names of all outside directors. This matching procedure delivers 90,002 outside directors. Next, we build an employment history for each outside director from the RiskMetrics database using information from the Annual Proxy Statements, LexisNexis, Factiva, and BoardEx.[5] Every director's work history, or CV, shows, among others, the employment history of the director and provides 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 all outside directors and their respective CVs as of each firm-year's annual meeting date.

[5] We are unable to build such a work history for 8,087 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.

We modify our dataset to measure director industry experience more precisely. 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. However, to estimate the effect of industry experience (and not firm experience), we separate the two effects by dropping all positions at the firm prior to becoming an outside director at the same firm. We use 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 also matches firm names 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 allocate 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 constitutes industry experience, namely when the firm he[7] worked for prior 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 varia-

[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. To reduce the potential noise in measuring director industry experience, however, we exclude from our analysis firms whose SIC codes stem from Factiva and LexisNexis.
[7] Given that the majority of the directors in our sample are males, we refer to a director as 'he'.

ble 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 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 length of each position held as the difference between the provided start and end dates using the variable *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 length of his industry experience by adding up the duration of the positions that offer industry experience. Similar to Custódio and Metzger (2013), we also introduce a weighted measure of industry experience, denoted as *Weighted director ind. exp.*, which assigns more weight to a position if a firm's industry is more closely related to the industry of the firm where the individual is active as an outside director. This measure takes a value of four if the firm is active in the same four-digit SIC code industry, a value of three if the firm is active in the same three-digit SIC code industry, a value of two if the firm is active in the same two-digit SIC code industry, a value of one if it is active in the same one-digit SIC code industry, and zero otherwise.

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 the 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. With respect to the length of the industry experience, we estimate the mean (median) industry experience to be 2.67 years (0.00 years).

In addition to industry experience, 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 the 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 now 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 (%)*). We further compute the mean score of the weighted industry experience measure, *Combined ind. exp. measure (one – four digit)*, ensuring that industry experience in a more closely related industry receives a higher weight compared to being measured binarily on the director level. 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 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), Morck et al. (1988), and Lang and Stulz (1994). 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*) and research and development (*R&D*) spending (scaled by property, plant, and equipment and sales, respectively) as well as 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 (Hoechle, et al., 2012; among others). We use from RiskMetrics the E-Index proposed by Bebchuk et al. (2009), 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 (me-

dian) 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: one consisting of high board industry experience firms and one of low board industry experience firms. 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 firm performance, measured as the difference in the mean Tobin's *Q* between the high and the low board industry experience portfolio, amounts to 0.50 and is statistically significant with a *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 with a *z*-value of 11.54. As these results could be driven by certain industries having high valuations and at the same time highly experienced boards, we employ the median industry adjusted Tobin's *Q* as an alternative performance measure. As expected, the average performance difference between the high and the low board industry portfolio becomes smaller (0.32), but it is still highly significant with a *t*-value of 8.56. These findings can be interpreted as preliminary evidence that industry experience among a firm's outside directors enhances the firm's market value.

Turning to the differences in other firm characteristics between the two board industry experience portfolios, it becomes evident that firms with more experienced outside directors

do not only differ in their market valuation, but also with respect to other firm characteristics. Moreover, board industry experience is related to financing and operating policies. Panel C of Table 2 shows that firms with more experienced boards are significantly larger, invest more in research and development, and exhibit higher asset growth. Based on the univariate comparisons, firms with more experienced boards also hold significantly more cash and have a lower propensity to pay dividends.

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, mainly due to two factors. First, firm-level financial and corporate governance 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. Thus, we also include year and two-digit SIC code industry fixed effects in most regression models in order 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. In line with our univariate results, 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 11.15 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, our univariate results can be confirmed in a multivariate setting, and 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 in 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]

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

[8] However, 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 possesses 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. The conclusion that can be drawn from the estimated coefficients, however, is that all three variables contribute to the positive relationship between firm performance and board industry experience.

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 as 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.[9] Overall, our results corroborate 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 suggesting 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-Index, is also negative and signifi-

[9] We investigate whether this result rather reflects the positive valuation effect of having CEOs as outside directors, as documented by Fich (2005) and Fahlenbrach et al. (2010), than having outside directors with industry experience gained in a CEO position on the board. To this end, we reestimated the regression and included the percentage fraction of outside directors in the board with a contemporaneous CEO position at another corporation as additional control variable (not tabulated). The coefficients on both industry experience variables remained qualitatively unchanged when compared to the results reported in Column 6 of Table 3 while the coefficient on the percentage fraction of outside directors in the board with a contemporaneous CEO position turned out to be close to zero (0.001, *t*-value 0.01).

cant 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.[10]

3.3 Robustness tests

We implement a number of robustness tests which are reported in Tables 4, 5, and 6. In a first step, we check whether our results are robust during different subperiods. 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), and we reestimate the baseline regression model from Column 1 of Table 3 for both subsamples. The coefficient on the board industry experience measure for the years 2000 to 2005 (Column 1) is almost double the size of the board industry experience coefficient 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

[10] The literature on busy boards and firm value has found differing results. Ferris et al. (2003) find no evidence for their "busyness hypothesis" that multiple directorships held by directors destroy firm value. However, Fich and Shivdasani (2006) claim that this is due to their definition of busyness and find that Forbes 500 firms with a majority of outside directors having three or more directorships at other major firms exhibit lower market-to-book-ratios. Recently, Field et al. (2013) find opposing results in their sample of S&P 1500 firms from 1996 to 2006. They argue that the advising needs of these firms are higher, and therefore busy boards increase firm value. Using a comparable sample of firms, we can confirm their findings.

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)*) that 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. To incorporate all four industry classifications, we use the combined board industry experience measure, denoted as *Combined ind. exp. measure (one – four digit)*, and two-digit SIC code fixed effects. The results are shown in Column 6 of Table 4. Most important, the board industry experience coefficient is positive and statistically significant in all specifications.

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 experi-

ence 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 more 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 might still be concerns whether the industry classification applied effectively captures the true relatedness of the business model of two companies. We aim at alleviating these concerns with two additional tests. First, we apply the Hoberg and Phillips (2010, 2014) 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.[11,12] The industry measures developed and tested in Hoberg and Phillips (2010, 2014) are based on a

[11] The data is provided by the Hoberg and Phillips Data library at: http://alex2.umd.edu/industrydata/.

[12] Applying the text-based industry classification provided by Hoberg and Phillips comes with certain drawbacks in our setup. First, the universe of firms for which industry classifications are provided is limited to firms filing their annual report with EDGAR. This reduces the number of companies for which we can assign industry classifications in the directors' working histories. Second, the Hoberg and Phillips database starts in 1997, since electronic filing with EDGAR was not required before 1997. We are therefore unable to assign entries in the directors' working histories to industries prior to 1997. Therefore, we will use the SIC classification in the remainder of the paper.

pair-wise textual comparison of the product descriptions in the annual reports available via the SEC's EDGAR database. For each year, this comparison yields a matrix of product similarity scores for all firms, which Hoberg and Phillips (2010, 2014) use to classify firms into time-variant industries of different granularity. We replicate the baseline regression from Column 1 of Table 3 and substitute the board industry experience variable with board industry experience measures based on Hoberg and Phillipps (2010, 2014) industry classifications. We start by using their coarsest industry classification, which assigns all firms to 50 industries (*Board ind. exp. (%; Hoberg-Phillips 50)*) in Column 1 of Table 5. We find that board industry experience has a significantly positive coefficient on Tobin's *Q*. We proceed by applying finer industry measures in Columns 2 and 3, where firms are assigned to 100 (*Board ind. exp. (%; Hoberg-Phillips 100)*) and 200 (*Board ind. exp. (%; Hoberg-Phillips 200)*) industries, respectively. The coefficient on the board industry experience measures remains similar in magnitude and significance.

As a second test to check whether our measure of board industry experience captures the true relatedness of firms, we merge our firm sample with the COMPUSTAT segment file and re-estimate 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 observations with at least two business segments that operate in different two digit SIC code industries. Similar to our standard measure of director industry experience,

[13] As discussed by 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 one digit SIC code of the company. Furthermore, the sum of the segment sales do not equal the sales reported by the company for many cases. This is why we report these results only as a robustness test.

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 the 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 4 of Table 5 shows the result of the baseline regression using the 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 5 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 with our standard measure of firm-level board industry experience (*Board ind. exp. (%)*) and find similar results. This approach does effectively assume that firms not covered in the COMPUSTAT segment database are not diversified. Lastly, we use a measure of director industry experience which reflects the idea that the benefit of working experience in a segment industry depends on the relative importance of the segment for the firm. For each director, we therefore add up the fractions of sales of those 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 6 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, 2014) industries or on segment industries does not change our main result that industry experience of the outside directors is positively related to firm value.

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

Finally, we test whether our board industry experience measure captures rather general managerial experience than industry experience. We use the age of the directors, the number of firms the directors worked for, and the number of two-digit SIC code industries in which the directors were active in at least once throughout their career as measures of general experience. In Column 1 of Table 6, 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. The results show that coefficient on the board industry experience variable remains positive and significant at the 1% level. In addition, the coefficient on the mean number of firms the outside directors worked for is positive and significant while the coefficient on the mean number of industries in which the outside directors were active in is negative and significant. The coefficient on the mean age of the outside directors is insignificant. In Column 2, we transform the three general board experience measures using the natural logarithm of one plus the experience measure to account for the skewness of these variables and find the results to remain virtually unchanged. In Columns 3 and 4, we replicate the analysis from Columns 1 and 2 but use the median instead of mean age, number of firms, and number of industries to measure the outside directors' general experience. The results remain virtually unchanged when compared to Columns 1 and 2 with one important exception: The coefficient on the mean number of industries the directors worked in turns insignificant. Overall, the results in Table 6 suggest that board industry experience remains value-relevant when we account for other measures of (general) managerial experience. In addition, board industry experience seems to represent a distinct board characteristic which is different from general board experience. We also find some evidence that general experience as measured by the number of firms the outside directors worked for in the past is value-relevant.

A remaining concern with our results is the existence of legal constraints that prevent certain individuals from serving as an outside director, thereby biasing the true impact of board industry on firm value. Specifically, the Clayton Antitrust Act of 1914 prevents individuals to serve as a director or officer in two corporations for which the elimination of competition would trigger a violation of antitrust law. In addition, executives are regularly required to sign non-competition agreements with their firms.[15] Consequently, the industry-experienced directors sitting on boards might be of relatively lower quality because they never had to sign non-competition agreements due to their low hierarchy position or due to the fact that they are currently not an executive or officer of a direct competitor (arguably offering industry experience with the highest relevance). As we observe a positive and significant effect of board industry experience on firm value and expect the impact of the non-competition agreements and the Clayton Antitrust Act to rather weaken our results, we conjecture that our estimates of the impact of board industry experience on firm value are, if biased, rather on the conservative side.

3.4 Endogeneity concerns

Our results suggest that industry experience on corporate boards is associated with higher firm value. It is possible, however, that endogeneity concerns plague our empirical analysis of the relationship between board industry experience and firm value. 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 (thus omitted) variables which affect both firm value and industry

[15] Non-competition agreements and their enforcement are typically governed by the employment law of the state where an employee works. While most states allow non-competition agreements, the permitted types of agreements vary substantially by state (Garmaise, 2009). Therefore, it is difficult to draw general conclusions about the impact of non-competition agreements on the board composition and thus also on the industry experience of the directors. Garmaise (2009) collects 500 SEC filings of randomly selected firms from the COMPUSTAT ExecuComp universe from 1992 to 2004. Even though firms are not required to disclose non-competition agreements signed with their employees, he finds that 351 (70.2%) of the sample firms have non-competition contracts in place.

experience on boards. In this section, 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 appears to be 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 alternative 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 7. We find the coefficient on our board industry experience variable to remain 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. It follows that firms with 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 7. Most important, the coefficient on lagged Tobin's Q is statistically insignificant and economically negligible, thus 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 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. The goal of this specification is to control 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. Therefore, we specify a firm fixed effects regression model similar to Cremers and Ferrell (2014) 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 as well as firm and year fixed effects and firm clusters are shown in Column 3 of Table 7. The estimated coefficient on the board industry experience variable remains positive and statistically significant. We conclude that board industry experience is positively associated with Tobin's *Q*, 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. To instrument for the presence of outside directors with industry

[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 relation 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 7 without the lagged board industry experience variable. Our results remain unchanged (not tabulated).

[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). Hence, a fixed effects regression would 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. Still, we show that our results hold when we include firm fixed effects.

experience on the board, we use an instrumental variable that captures the supply of local director candidates introduced by Wang et al. (2013) in their study on the relation between industry experience on the audit committee and earnings management. The idea of their instrument is that directors are more likely to be appointed to boards of firms that are located in close proximity (Knyazeva et al., 2013), that experience as an executive is a regularly observed background for outside directors (Linck et al., 2008), and that firms avoid or are prohibited to appoint directors from direct competitors (see Section 3.3). The instrumental variable for the first stage regression is measured as 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 the instrument affects firm only through its effect on the endogenous board experience variable. There is no obvious channel through which the location of the firm, and thus the supply of experienced directors, could be expected to affect firm value. Hence the supply of directors can be considered an exogenous factor and thereby a valid instrument. The results of the first stage of the regression, shown in Column 4 of Table 7, are consistent with this notion and indicate that firms located closely to a larger number of non-competing industry peers exhibit a higher fraction of industry-experienced directors among their outside directors. When controlling for endogeneity in the second stage of the 2SLS regression (Column 5), we confirm the finding that more experienced directors on the board are associated with higher firm valuations.

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 variable that equals one if the number of experienced directors on the board increased compared to the previous year and zero otherwise as dependent variable. 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 nearby peer firms, the fraction of other firms in the same two-digit SIC industry that increased the number of experi-

enced 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 7. 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.[18]

In another approach to avoid endogeneity problems, we use the methodology from Dittmar and Mahrt-Smith (2007) and Bebchuk et al. (2009). In particular, we replace the potentially endogenous board industry experience variable with its initial value, thereby forcing the board industry experience to remain constant. The intuition of this approach is that governance changes only slowly and that future firm value is exogenous. In results not shown, we reestimate the regressions of Table 3 and find the coefficients on the board industry experience to remain economically and statistically similar.

Finally, we use 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 using event study methodology. The most intuitive and most frequently

[18] 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 the industry experience on its board and firm value.

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.[19] Extending the analysis in von Meyerinck et al. (2014), 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 that our sample directors hold at other listed non-financial and non-utilities US companies. We identify 215 deaths of directors holding 300 directorships in 272 listed US firms. The approach explained in Section 2.1 is 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-days 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

[19] Johnson et al. (1985), Worrell et al. (1986), Bennedsen et al. (2010), Salas (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. (2014) the deaths of outside directors.

the deaths of inexperienced directors. Results from regressions of three-day CARs (from $t = 0$ to $t = 2$), which are winsorized at the 1 and 99 percentile, on a number of director and firm-level control variables are shown in Table 8.[20] As hypothesized, we find a significantly negative coefficient on the industry experience indicator variable even if we control for director (Column 2) and firm-level characteristics (Column 3). Specifically, 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 were not anticipated by the market. As there is no unambiguously accepted definition of a sudden death in the literature, we follow previous literature in the classification of sudden deaths (Nguyen and Nielsen, 2010; Falato, Kadyrzhanova, and Lel, 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 8, 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 not quite significant at conventional levels. However, the inclusion of 2-digit SIC code level industry controls results in very few degrees of freedom in this regression. Hence, in Column 5, we replicate the regression in Column 4 but omit the industry controls. 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.

[20] 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.

In summary, the results from our event study confirm that firm performance suffers if industry experience on the board wanes and 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.

The results so far show a univariate and a multivariate association between industry experience of the board of directors and firm value. Our findings survive a number of robustness tests and suggest that firms with more experienced directors on the board are valued at a premium compared to their inexperienced peers. What remains an open question, however, is *how* outside directors with industry experience can influence corporate policies and thus impact a firm's market value.

4. How does board industry experience affect firm value?

Already our univariate tests discussed in Section 3.1 and shown in Panel C of Table 2 indicate that boards with more experienced directors implement different operational strategies. In this section, we further analyze this conjecture in a multivariate regression framework. In particular, we evaluate differences in investment behavior (as reflected in firms' investment-cash flow sensitivities) as one potential channel through which outside directors with industry experience can help to enhance firm value.

4.1 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 have linked 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 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 such a conflict 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 boards reduce the information asymmetry between managers and boards members and 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):

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

where $INV_{i,t}$ is either capital expenditures (*CAPEX*), acquisition spending (*ACQ*), research and development expenses (*R&D*), or the sum of acquisition spending and capital expenditures (*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. Regression results in Columns 1 and 2 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). 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). As a result, firms with industry-experienced boards are able to mitigate financial market frictions, and 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 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. (2012a) and Faleye et al. (2014) that industry experience allows directors to better evaluate and implement innovative activities and to trigger corporate innovation. Moreover, the investment-cash flow sensitivity coefficient in Column 6 is negative and significant 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 expenditures is used to proxy for investment expenditures and scaled by lagged total assets, 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 regression, 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.[21]

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 expect that investments undertaken by a board with higher industry experience are associated with a higher firm value. We test such a relation by adapting the regression framework of Cremers, Litov, and Sepe (2014), who show that staggered boards have a positive influence on firm value when analyzing the time-series (rather than the cross-section). They also find that a staggered board represents 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) as well as interactions between the investment channel proxies and board industry experience. We further add other 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. Investments are positively associated with Tobin's *Q* if made by a board with more industry experience, while controlling for time-invariant firm characteristics. 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

[21] The corporate governance controls used in Column 9 of Table 8, 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.

by an experienced board seem to affect Tobin's *Q* positively, given that 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 Column4 of Table 10, we conclude that boards with more industry experienced members seem to positively affect Tobin's *Q* via their investment decisions. Industry experienced members of the board effectively influence investment decisions and are able to identify investments that enhance shareholder value.

4.2 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. Facilitated capital market access seems unlikely in the case of industry-experienced outside directors, thus the question arises how firms with a higher fraction of experienced directors on the board are able to achieve lower investment-cash flow sensitivities.[22] The most immediate answer is that these firms use the available liquidity to finance their investments after exogenous cash flow shocks occur, an argument which is usually referred to as the precautionary motive of cash holding (Opler et al, 1999). In fact, our univariate tests in Panel C of Table 2 indicate that firms with more industry experience on the board hoard more cash. Supporting this notion, Panel C of Table 2 further shows that firms with experienced boards generally have a lower propensity to pay dividends, which is another indication that these firms hoard cash rather than paying it out and that shareholders are will-

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

ing to relinquish dividends.[23] 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.[24, 25]

Higher cash holdings can have a positive valuation impact since they allow for more financial flexibility in the sense that firms are not forced to forgo profitable investment opportunities if adverse selection costs from going to the 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 also the assets most likely to be misused by management (Myers and Rajan, 1998). High cash holdings are generally 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. While Faulkender and Wang (2006) and Dittmar and Mahrt-Smith (2007) show that the value of cash is higher in US firms with better corporate governance, Drobetz et al. (2010) provide international evidence.

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:

[23] We also run multivariate regressions with cash holdings as the dependent variable (results not shown). We find the coefficient on board industry experience to be significantly positive and conclude that experienced boards hoard cash to build up financial slack.

[24] 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 potentially allow managers to stockpile cash. Interestingly, they also take reference to expertise of directors in the context of controlling for board independence: "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).

[25] In an international setting, Dittmar et al. (2003) and Pinkowitz et al. (2006) find that agency problems are an important determinant of a firm's cash holdings since cash holdings are related to shareholder protection rights.

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

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 with results shown in Table 11. 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 that are above or below the sample median board industry experience. If the industry experience of outside directors matters, we expect the estimated coefficient on liquid assets (*L*) 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. The difference between the two coefficients is also statistically significant using the methodology applied in Pinkowitz et al. (2006). 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 overall 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 in Column 4, the value of liquid assets (cash) is significantly higher if overseen by an experienced board of

directors. Overall, we conclude that shareholders prevent managers from wasting firm resources by electing industry-experienced directors with industry experience to the board, who are in a better position to monitor and advise on the efficient use of cash than are inexperienced directors.[26]

5. 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 effect regressions 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 market frictions to spill over to their real-side decisions, as indicated by their lower investment-cash flow sensitivities. 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 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. Besides our contribution to the literature on the impact of director characteristics, our results are also of interest for shareholders electing their representatives to boards and for regulators,

[26] 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 (results not shown). While the coefficient on the interaction term between liquidity and board industry experience is statistically significant in both subsamples, the coefficient is 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.

which have recently stressed the importance of director qualification disclosure adopted by the Securities and Exchange Commissions in late 2009.

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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 director if the director possesses experience in the same two-digit industry in one of his past employments (and zero otherwise), except for the *Weighted director industry experience measure*. This latter 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). *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
Weighted director ind. exp.	0.95	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 low and high board industry experience subsample together with mean and median difference tests. 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
Combined ind. exp. measure (one – four digit)	1.56	1.43	1.01	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 for the entire sample

	Mean	Median	SD	N
Total assets	6,745.25	1,379.56	27,271.98	12,266
Market capitalization	7,906.12	1,499.72	26,542.35	11,691
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
Asset growth	15.13%	6.84%	64.78%	12,261
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%	11,363
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

Table 2 – Continued

Panel C: Selected firm characteristics of subsamples with firms in the highest and lowest 20% board industry experience quintiles

	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 ***
Median industry adjusted. Tobin's Q	0.29	0.00	0.62	0.08	0.32	0.08	8.56 ***	4.93 ***
Total assets	4,418.38	1,151.54	5,902.27	1,166.17	1,483.90	11.63	3.26 ***	0.33
Market capitalization	5,731.07	1,162.90	7,491.93	1,707.03	1,760.87	544.13	2.90 ***	8.45 ***
CAPEX / PPE	0.22	0.18	0.30	0.25	0.08	0.07	15.08 ***	15.33 ***
R&D / Sales	0.03	0.00	0.20	0.09	0.17	0.09	8.23 ***	33.03 ***
Dividend payer (dummy)	60.12%	100.00%	24.56%	0.00%	-35.56%	-100.00%	-26.95 ***	-25.36 ***
Asset growth	6.30%	6.37%	8.25%	6.91%	14.44%	0.54%	6.30 ***	5.00 ***
Cash holdings	0.19	0.07	0.60	0.27	0.40	0.20	20.80 ***	22.88 ***
Financial leverage	0.19	0.18	0.16	0.12	-0.03	-0.06	-6.30 ***	-9.16 ***

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, 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 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

This table reports results from pooled ordinary least squares (OLS) regressions of Tobin's *Q* on different board industry experience measures. Column 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 Column 1, 2, 3 and as well as 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 test with Hoberg and Phillips (2010, 2014) industry classifications and segment industry experience

This table reports results from pooled ordinary least squares (OLS) regressions of Tobin's *Q* on alternative board industry experience measures. Column 1 to 3 show the results of the baseline regression model from Column 1 of Table 3, but for three alternative board industry experience measures that use the Hoberg and Phillips (2010; 2014) industry classification to determine board industry experience. Hoberg and Phillips (2000, 2014) argue that their industry classification scheme has the advantage of capturing product similarity among firms by applying textual analysis to the product description section of the annual report. Regression results showing the application of their most granular industry classification, which differentiates between 50 industries, to the board industry experience calculation (*Board ind. exp. (%; Hoberg-Phillips 50)*) are shown in Column 1. Columns 2 and 3 display results using industry classifications differentiating between 100 and 200 industries, respectively. Columns 4 to 6 show results where board industry experience is measured on firm segment level for diversified firms rather than on firm level. In Column 4, an outside director is classified as industry experienced if he possesses working experience in at least one of the two digit SIC code industries the segments operate in. The measure then takes the mean score among all outside directors (*Board ind. exp. (%; Segment)*). In Column 5, 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 6, an outside director receives a segment sales-weighted industry experience score. This score takes 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 total segment sales. The measure then takes the mean score among all outside directors (*Board ind. exp. (%, Segment-Sales weighted)*). 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 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	2.629***	2.646***	2.620***	3.082***	2.748***	3.011***
	(10.766)	(10.792)	(10.856)	(12.137)	(11.497)	(11.800)
Board ind. exp. (%; Hoberg-Phillips 50)	0.374***					
	(4.108)					
Board ind. exp. (%; Hoberg-Phillips 100)		0.369***				
		(3.965)				
Board ind. exp. (%; Hoberg-Phillips 200)			0.453***			
			(4.322)			
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)
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	8,553	10,033	8,553
R-squared	0.413	0.412	0.416	0.416	0.412	0.419

Table 6: Alternative board experience proxies

This table reports the results from pooled OLS regressions of Tobin's *Q* on the fraction of experienced outside directors including alternative board experience proxies. Column 1 includes the mean age of the outside directors (*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 2 replicates the results from Column 1, but transforms the three general experience variables using the natural logarithm of one plus the variable. Column 3 includes the median age of the outside directors, the median number of firms the outside directors worked for (*Median # of industries among outs. director*), and the median number of different two-digit SIC code industries the outside directors worked in (*Median # of firms among outs. directors*) as additional explanatory variables. Column 4 replicates the results from Column 3, but transforms the three general experience variables using the natural logarithm of one plus the variable. The financial and corporate governance controls included in all four regressions are the same as in Table 3, except for the fraction of directors older 72 years of age (*% directors older 72*) which is omitted here, and include *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. (%)*, *Director non-attend. (%)*, *Busy board (dummy)*, *Delaware (dummy)*, and *% female directors*. All regressions include year fixed effects 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*
	(1)	(2)	(3)	(4)
Constant	2.083***	2.701*	2.190***	2.996**
	(5.170)	(1.866)	(6.131)	(2.560)
Board ind. exp. (%)	0.333***	0.315***	0.311***	0.305***
	(3.042)	(2.835)	(2.781)	(2.688)
Mean age among outs. dir.	-0.003	-0.236		
	(-0.558)	(-0.659)		
Mean # of firms among outs. directors	0.071***	0.437***		
	(3.021)	(3.435)		
Mean # of industries among outs. director	-0.089**	-0.341**		
	(-2.228)	(-2.352)		
Median age			-0.004	-0.280
			(-0.889)	(-0.964)
Median # of firms among outs. directors			0.056***	0.233***
			(3.103)	(2.981)
Median # of industries among outs. director			-0.040	-0.081
			(-1.407)	(-0.941)
Financial controls	Yes	Yes	Yes	Yes
Corporate governance controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	10,033	10,033	10,033	10,033
R-squared	0.416	0.417	0.417	0.416

Table 7: Endogeneity tests

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 in 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 firm-level control variables as well as the number of nearby peer firms (*ln (1+Number of 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 (*% 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 two-digit SIC 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 dependent variable and including the standard controls from the baseline regression (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 # of 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 8: 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 her 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.

	(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 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 results from time-series analysis 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, Litov, and Sepe (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.

	(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), assessing the impact of board industry experience on the value of cash. Following Pinkowitz et al. (2006), X_t is the level of a variable at time t, ΔX_t denotes 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 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 cash equivalents, RD is research and development expenses (set to zero if missing), I is interest expenses, D is dividends defined as common dividends paid, and L is liquid asset holdings defined as cash and cash equivalents. We introduce additional terms, which relate the value of cash to the corporate governance structure (using the E-Index of Bebchuk at al. (2009)) and board industry experience, defined as the fraction of outside directors with experience in the same two-digit standard industry classification (SIC) code industry (*Board ind. Exp. (%)*). In Columns 1 and 2, we split the sample and estimated the regressions for high and low board industry experience (classified as above and below sample median board industry experience). Column 3 shows the p-values of a test for equality of the coefficients from Columns 1 and 2 following Pinkowitz et al. (2006). Column 4 estimates the regression over the full sample and additionally introduces interaction terms. 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). All variables are winsorized at the 1% and 99% level. 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). ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% level, respectively.

	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

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 to all outside directors with work experience in the same two-digit SIC code industry	Proxy Statements / 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 to all outside directors with work in the same one-digit SIC code industry	
Board ind. exp. (%; three-digit)	Fraction of outside directors to all outside directors with work experience in the same three-digit SIC code industry	
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 to all outside directors with work experience as an employee without a board membership in the same two-digit SIC code industry	
Board ind. exp. exec. dir. (%)	Fraction of outside directors to all outside directors with work experience as an executive director in the same two-digit SIC code industry	
Board ind. exp. CEO (%)	Fraction of outside directors to all outside directors with work experience as Chief Executive Officer in the same two-digit SIC code industry	
Board ind. exp. exec. dir non-CEO (%)	Fraction of outside directors to all 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	
Board ind. exp. outs. dir. (%)	Fraction of outside directors to all outside directors with work experience as an outside director in the same two-digit SIC code industry	
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 to all outside directors with work experience in the Hoberg and Phillips (2010, 2014) FIC 50 industry	
Board ind. exp. (%; Hoberg-Phillips 100)	Fraction of outside directors to all outside directors with work experience in the Hoberg and Phillips (2010, 2014) FIC 100 industry	
Board ind. exp. (%; Hoberg-Phillips 200)	Fraction of outside directors to all outside directors with work experience in the Hoberg and Phillips (2010, 2014) FIC 200 industry	
Board ind. exp. (%; Segment)	Fraction of outside directors to all outside directors with work experience in the two-digit SIC code industry of at least one business segment	Proxy Statements / BoardEx / COMPUSTAT NORTH AMERICA / COMPUSTAT GLOBAL/ CRSP/AMADEUS / COMPUSTAT segment database
Board ind. exp. (%; Segment/Main)	Fraction of outside directors to all outside directors with work experience in the two-digit SIC code industry of at least one business segment, 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
Asset growth	(Total assets$_{t-1}$ / total assets$_t$) - 1	COMPUSTAT
Board independence (%)	Fraction of independent outside directors (as opposed to gray outside directors) to all outside directors	RiskMetrics / Proxy filings
Board size	Board size	RiskMetrics
Busy board (dummy)	Dummy variable equal to one if the majority of board members holds 3 or more than 3 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
Financial leverage	(Long term debt + debt due in 1 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 capitalization	Shares outstanding × closing price	CRSP
Market-to-book	Market capitalization / 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	Proxy Statements / BoardEx
Mean # of industries among outs. director	Mean number of different two digit SIC code industries the outside directors worked for at the day of the annual meeting date	Proxy Statements / BoardEx
Mean age among outs. dir.	Mean age of the outside directors	RiskMetrics
Median # of firms among outs. directors	Median number of different firms the outside directors worked for at the day of the annual meeting date	Proxy Statements / BoardEx
Median # of industries among outs. director	Median number of different two digit SIC code industries the outside directors worked for at the day of the annual meeting date	Proxy Statements / BoardEx
Median age	Median 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