Bill Francis – Iftekhar Hasan – Qiang Wu

Professors in the boardroom and their impact on corporate governance and firm performance

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Bill Francis [a], Iftekhar Hasan [b, c, *], Qiang Wu [a]

[a] *Lally School of Management, Rensselaer Polytechnic Institute, Troy, NY 12180, USA*
[b] *Schools of Business, 5 Columbus Circle, Fordham University, New York, NY 10019, USA*
[c] *Bank of Finland, FI 00101, Helsinki, Finland*

Abstract: Directors from academia served on the boards of around 40% of S&P 1,500 firms over the 1998–2011 period. This paper investigates the effects of academic directors on corporate governance and firm performance. We find that companies with directors from academia are associated with higher performance and this relation is driven by professors without administrative jobs. We also find that academic directors play an important governance role through their advising and monitoring functions. Specifically, our results show that the presence of academic directors is associated with higher acquisition performance, higher number of patents and citations, higher stock price informativeness, lower discretionary accruals, lower CEO compensation, and higher CEO forced turnover-performance sensitivity. Overall, our results provide supportive evidence that academic directors are valuable advisors and effective monitors and that, in general, firms benefit from having academic directors.

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[*] Corresponding author. Tel.: +1 646 312-8278; Fax: + 1 646 312 8295
Email address: ihasan@fordham.edu

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Abstract

Directors from academia served on the boards of around 40% of S&P 1,500 firms over the 1998–2011 period. This paper investigates the effects of academic directors on corporate governance and firm performance. We find that companies with directors from academia are associated with higher performance and this relation is driven by professors without administrative jobs. We also find that academic directors play an important governance role through their advising and monitoring functions. Specifically, our results show that the presence of academic directors is associated with higher acquisition performance, higher number of patents and citations, higher stock price informativeness, lower discretionary accruals, lower CEO compensation, and higher CEO forced turnover-performance sensitivity. Overall, our results provide supportive evidence that academic directors are valuable advisors and effective monitors and that, in general, firms benefit from having academic directors.

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Keywords: Academic directors; Professors; Firm performance; Advising; Monitoring

1. Introduction

U.S. corporations commonly elect professors to their boards. For instance, during the 1998–2011 period around 40% of Standard & Poor's (S&P) 1,500 firms had at least one professor in their boardrooms. For firms that have academicians on their boards, around 14.3% of their outside directors are drawn from academia. These facts raise several interesting and important questions. For example, what kinds of companies are more likely to have academic directors? Are academic directors effective monitors and/or important advisors? How do academic directors affect firm performance? In answering these questions, this paper sheds light on the effectiveness of the oversight and advice functions performed by academic directors and on their impact on firm performance.

Academic directors possess some unique characteristics compared to other types of outside directors. First, academic directors are outside directors with relatively higher reputation. They are trained to be independent and critical thinkers with their own opinions and judgments, and are less influenced by others and can be tough when necessary (Jiang and Murphy, 2007). Second, professors are specialized experts in their area(s) of expertise, such as business, technology or legal area. Audretsch and Lehmann (2006) contend that directors with academic backgrounds can enhance the competitive advantage of firms by facilitating the access to and absorption of external knowledge spillover. Third, academic directors tend to think through problems differently than non-academics and can provide different perspectives in the boardroom that adds to the board's diversity. Forbes and Milliken (1999) argue that job-related diversity, including the presence of academics on boards, could enhance the functional area knowledge and skill on the board.

Alternatively, one could argue that for several reasons professors may not be helpful for board effectiveness and firm performance. First, academics put more emphasis on scholarly rigor instead of what is important for firm performance. Second, professors' specialized expertise could be unrelated to how real business works. Third, the narrow business exposure of professors may limit their competence when making decisions in the real world of uncertain business environments. Fourth, academic directors might be less impartial as their income derived from directorship is a large share than the same for other outside directors. Finally, many academic directors have administrative jobs and they may have some sorts of connections with the companies (such as university endowments) which make them less independent from inside managers. From these perspectives, academic directors might not be effective monitors and/or valuable advisors.

Using S&P 1,500 firms during the period 1998–2011, we first examine the determinants of having academic directors in the boardroom. We find that larger firms and more research-intensive firms are more likely to have academic directors. In addition, we find that geographical distance between corporations and universities affects the likelihood of having academic directors. Furthermore, larger boards, more independent boards, boards with more female and old directors, and CEOs with more shareholdings are more likely to choose directors from academia. Lastly, the demand for academic directors varies greatly across industries. While high-tech companies and financial companies are more likely to appoint academic directors, the opposite is the case for certain manufacturing and wholesale and retail companies.

Next, we investigate the association between academic directors and firm performance. Using firm fixed-effect regressions with firm-clustered standard errors, we find that both the presence and the relative size of academic directors on the board have a statistically significant

and an economically meaningful impact on firm performance as measured by Tobin's Q and ROA. For example, Tobin's Q is about 3.5% higher and ROA is about 3.0% higher for firms with academic directors than firms without academic directors. The results are robust when we use instrumental variable two-stage regressions to partially address the endogeneity of academic directors. The long-run event study results also provide corroborating evidence to confirm the positive relation between academic directors and firm performance.

To further mitigate the endogeneity concerns, we run two additional tests. First, we focus on firms with academic directors and compare firm performance before and after the appointment of the first academic director. We construct a matching sample with nonacademic director appointments and then apply a difference-in-difference method to isolate the academic director effect on firm performance. Second, following Francis, Hasan, and Wu (2012), where they use the 2007-2009 financial crisis as an exogenous shock, we examine how academic directors immediately before the crisis affect firm performance during the crisis period. The results of both tests confirm the positive impact of academic directors on firm performance and suggest that academic directors bring about, and not merely reflect, an improvement in firm performance.

We further explore possible channels through which academic directors could affect firm performance. First, we examine the monitoring effectiveness of academic directors. Following Adams and Ferreira (2009), Masulis, Wang, and Xie (2012), and others, we compare governance characteristics between academic directors and nonacademic outside directors. We find that academic directors are more likely to attend board meetings than other outside directors. In addition, academic directors hold more committee memberships than other outside directors. Specifically, academic directors are more likely to sit on monitoring-related committees, such as

auditing committees and corporate governance committees, than nonacademic outside directors. The results indicate that academic directors are better at board governance than other outside directors.

We next examine the impact of academic directors on a firm's CEO compensation policy and a CEO's forced turnover, two decisions that are directly under the purview of corporate boards. Our analysis shows that firms with academic directors on boards are associated with significantly lower cash-based CEO compensation, but not equity-based CEO compensation. In addition, we find that CEO forced turnover is more sensitive to firm performance when academic directors are present. These results suggest that academic directors strengthen the management oversight by boards.

In further analyses, we investigate the impact of academic directors on financial reporting quality. We find that firms with academic directors are less likely to manage earnings through discretionary accruals and to be the subject of Securities and Exchange Commission (SEC) investigations, as evidenced by Accounting and Auditing Enforcement Releases (AAERs) against top executives. We also find that stock prices of firms with academic directors reflect more firm-specific information. The results provide supportive evidence for both diversity and monitoring roles of academic directors.

We examine the advising role of academic directors as well. We examine whether firms with academic directors are more innovative than firms without academic directors. Our results show that the presence of academic directors is significantly and positively related to the number of patents and patent citations, suggesting that academic directors enhance firms' innovation capacity through their specialized expertise. In addition, we examine whether academic directors affect firms' acquisition decisions. We find that the presence of academics on the board is

significantly and positively related to acquisition performance, suggesting that academic directors play important advising and monitoring roles during acquisition decisions.

Finally, we explore how academic directors' backgrounds affect the identified positive relation between academic directors and firm performance. We first partition academic directors into two groups: those without administrative positions, and those with certain administrative jobs such as presidents and deans. We find that academic directors without administrative positions are the main drivers of the positive relation between academic directors and firm performance. Our further test suggests that the attendance of less board meetings by administratively-engaged academic directors could be a reason why they are less effective. In an additional test, we find that the association between academic directors and firm performance appears to vary with professors' educational backgrounds as well. Specifically, of all the areas of study considered in our regressions, academic directors with business-related degrees have the most positive impacts on firm performance, followed by academic directors with technology (i.e., science and engineering) and political backgrounds.

Our paper makes several contributions to the literature. It is the first to focus solely on academic directors and to comprehensively examine the governance role played by them and their impact on firm performance.[1] This study complements the board-independence literature by showing that enhancing board efficacy takes more than just independence. The positive relation between academic directors and firm performance supports theoretical work, such as Adams and

1 Prior research on the role of academic directors is very limited. A few papers use academic directors as a control variable in the studies of other board characteristics. For example, Fich and Shivdasani (2006) find that academicians are less likely to be appointed as busy outside directors. Anderson, Mansi, and Reeb (2004) find that the presence of academic directors is associated with lower cost of debt. Guner, Malmendier, and Tate (2008) include business professors as one type of financial expertise in their study and find that business professors reduce the investment-cash flow sensitivity for financing unconstrained firms. They also find that business professors are associated with lower costs of public debt borrowing. However, in short-run event studies, Shivdasani and Yermack (1999) and Fich (2005) do not find that there are significantly different market reactions between appointments of academic directors and other outside directors.

Ferreira (2007) which emphasizes that both the monitoring and advising functions of directors are important for board efficacy and firm performance. Our results are also consistent with Fich (2005), Fich and Shivdasani (2006), and others, who argue that outside directors are not homogenous, and that some kinds of outside directors are better than others. Thus, our paper extends the stream of literature that examines how firm performance or governance is affected by specific types of outside directors, such as women directors (Adams and Ferreira, 2009), former CEO directors (Fahlenbrach, Minton, and Pan, 2011), foreign directors (Masulis, Wang, and Xie, 2012), banker directors (Sisli-Ciamarra, 2012), and lawyer directors (Litov, Sepe, and Whitehead, 2013).[2]

The remainder of the paper is organized as follows. We review related literature and develop our hypotheses in Section 2. Section 3 describes the sample selection and summary statistics. Section 4 reports the results on the determinants of having academic directors. Section 5 provides empirical results on the relation between academic directors and firm performance. Section 6 explores the monitoring, advising, and diversity roles of academic directors. Additional tests on the impact of academic directors' backgrounds on firm performance are provided in Section 7. Section 8 concludes.

[2] A recent study by White, Woidtke, Black, and Schweitzer (2014; hereafter, WWBS) examines the appointments of academic directors. Our paper differs from WWBS in several ways. First, our paper focuses on the relation between academic directors and firm value while WWBS focuses on the short-term (two-day) market reactions to the appointments of academic directors. As we point out in Section 5.5, there are several issues which could make short-term event study results noisy and less informative. Second, we apply a series of identification strategies, such as an instrumental variable two-stage regression, a difference-in-difference method, using the 2007-2009 financial crisis as an natural experiment, to establish the causal effect of academic directors on firm performance, while WWBS does not. Third, we explore the corporate governance role of academic directors in details (e.g., board meeting attendance behaviors and board committee membership) while WWBS does not. Fourth, we investigate the monitoring, advising and diversity roles of academic directors by examining how academic directors affect various corporate decisions (e.g., CEO compensation policy, CEO's forced turnovers, financial reporting quality, innovations, acquisitions, etc.) while WWBS does not.

2. Related literature and hypotheses development

2.1. Academic directors and firm performance

Boards of directors are believed to play a pivotal role in corporate governance through their monitoring and advising functions. In general, both the academic community and policymakers view board independence as one of the most important indicators of board quality (Fama, 1980; Fama and Jensen, 1983; the Sarbanes-Oxley Act of 2002, or SOX). Nevertheless, the empirical evidence of the connection between board independence and board efficacy and subsequent firm performance is still ambiguous. For example, some studies find that there is no significant association between board independence and firm performance (Baysinger and Butler, 1985; Hermalin and Weisbach, 1991; Mehran, 1995; Bhagat and Black, 2001), while others find that board independence is negatively related to firm performance (Agrawal and Knoeber, 1996; Barnhart and Rosenstein, 1998; Devos, Prevost, and Puthenpurackal, 2009).

More recent studies emphasize the importance of going beyond broad board independence and explore specific types of outside directors. These studies find that not all outside directors are equally effective monitors or valuable advisors, and certain kinds of outside directors even weaken corporate governance and destroy firm value. For example, Adams and Ferreira (2009) examine the role of female directors, and they find that female directors are associated with better corporate governance but worse firm performance. Fahlenbrach, Minton, and Pan (2011) find a positive relation between former CEO directors and firm performance and CEO turnover-performance sensitivity. Masulis, Wang, and Xie (2012) examine the costs of having foreign directors. They find that foreign directors are less likely to attend board meetings and are associated with higher likelihood of financial misreporting, higher CEO compensation, a lower sensitivity of CEO turnover to performance, and poorer firm performance. Sisli-Ciamarra

(2012) focuses on banker directors and finds that the presence of banker directors is associated with more use of debt in a firm's capital structure and more favorable debt contract terms. A recent study by Litov, Sepe, and Whitehead (2013) examines the rise of lawyer directors. They find that lawyer directors reduce corporate risk-taking and increase firm value.

Compared to other kinds of outside directors, academic directors have several unique characteristics that could enhance the effectiveness of corporate boards. First, professors are specialized experts in their research fields, including business, technology, and law. Audretsch and Lehmann (2006) argue that directors with academic backgrounds can enhance the competitive advantage of firms by facilitating access to and absorption of external knowledge spillover. In most announcements of appointing professors as non-executive directors, CEOs and chairmen often note that a professor's academic expertise will be of great benefit to the company.[3] Adams and Ferreira (2007) point out that outside directors spend most of their time advising rather than monitoring management. More recent literature has begun to emphasize the importance of the advising role, not merely the monitoring role that outside directors play (Adams and Ferreira, 2007; Coles, Daniel, and Naveen, 2008; Brickley and Zimmerman, 2010).[4] Thus, the *expertise* theory indicates that academic directors can be valuable advisors who bring unique expertise into the boardroom.

Second, academic directors' primary areas of expertise are academic in nature. They tend to think through problems differently than nonacademics and can provide different perspectives in the boardroom, which adds to the board's diversity. Prior studies find that board diversity is an important factor that influences board efficacy and firm performance (Carter, Simkins, and

[3] An article in *Directors and Boards* (January 1, 1997) points out that U.S. companies recruit directors from academia to benefit from their special expertise and to enrich board diversity.

[4] In their survey, Demb and Neubauer (1992) find that "setting the strategic direction of the company" is one of the board's most important jobs.

Simpson, 2003; Adams and Ferreira, 2009; Anderson, Reeb, Upadhyay, and Zhao, 2011; Gul, Srinidhi, and Ng, 2011). Forbes and Milliken (1999) argue that job-related diversity, including the presence of academics on boards, could enhance the functional area knowledge and skill on the board. Thus, the *diversity* theory also predicts that academic directors increase board diversity and improve board efficacy.

Third, academic directors are outside directors with relatively strong reputations and a tradition of independent thinking. They are trained to be critical thinkers with their own opinions and judgments, and they are less influenced by others and can be tough when necessary (Jiang and Murphy, 2007). In addition, professors have less direct connections with insiders as compared to many other outside directors, and therefore can be more independent. Fama (1980) and Fama and Jensen (1983) argue that outside directors have incentives to monitor management because they want to protect their reputation as effective, independent decision makers. Thus, the *monitoring* theory indicates that academic directors would be important monitors of management.

Overall, based on the above discussions, we propose our hypothesis as follows:

H1: There is a positive relation between academic directors and firm performance.

2.2. Academic directors and firm policies

Academic directors could increase firm value through their impacts on various corporate decisions. We further hypothesize how academic directors affect major corporate decisions based on their monitoring, advising and diversity roles. These could provide possible channels through which academic directors affect firm value.

2.2.1. Academic directors and CEO compensation

Prior studies show a significant relation between board effectiveness and CEO compensation and subsequent firm performance. For example, Core, Holthausen, and Larcker

(1999) find that firms with less effective corporate boards have greater agency problems; that CEOs at firms with greater agency problems receive greater compensation; and that firms with greater agency problems perform worse. Mehran (1995) argues that firm performance is positively related to equity-based compensation, because equity-based compensation gives CEOs incentives to increase firm value. CEO compensation is directly under the purview of corporate boards. If academic directors play an important monitoring role on management, we would expect that they affect CEO compensation policy. We hypothesize that:

> *H2-1: There is a negative relation between academic directors and the level of CEO compensation.*

2.2.2. Academic directors and CEO forced turnover

Warner, Watts and Wruck (1988) argue that there is an inverse relation between the probability of management changes and firm stock performance, and this relation can result from the monitoring by board of directors. Borokhovich, Parrino, and Trapani (1996) find empirical evidence that board quality is positively related to forced CEO turnovers when firms are performance worse. Fahlenbrach, Minton, and Pan (2011) find that the presence of former CEO directors is associated with a higher CEO turnover-performance sensitivity. If academic directors are in the boardroom and they are effective monitors, we would expect that CEOs are more likely to be fired when firms have bad stock performance. Therefore, we hypothesize that:

> *H2-2: There is a positive relation between academic directors and CEO forced turnover-performance sensitivity.*

2.2.3. Academic directors and earnings quality and stock price informativeness

Corporate boards play an important role in monitoring corporate financial reporting quality and provide reliable information to outside investors. Klein (2002) finds that board and

audit committee effectiveness have a significant positive effect on earnings quality. Beasley (1996) detects a negative relation between board quality and the probability of corporate accounting frauds. Prior studies also show a negative relation between earnings quality and firm performance. For example, using IPO and stock repurchases as market events, Teoh, Welch, and Wong (1998) and Gong, Louis, and Sun (2008) find a negative relation between earnings management and firm market performance. Higher quality earnings also provide more reliable public information about the firm, which increases stock price informativeness. For example, Hutton, Marcus, and Tehranian (2009) find that stock prices of firms with high quality earnings reflect more firm-specific information. Vafeas (2000) also finds that board quality is positively related to earnings informativeness. Focusing on gender diversity of boards, Gul, Srinidhi, and Ng (2011) show that board diversity improves the informativeness of stock prices. Based on the existing literature, we expect that if academic directors increase the monitoring and diversity of the board, they could increase the earnings quality and informativeness of stock prices. Therefore, we hypothesize that:

> *H2-3: There is a positive relation between academic directors and earnings quality and the informativeness of stock prices.*

2.2.4. Academic directors and innovation

Innovation can be crucial for the development and performance of the firm. For example, Hall, Jaffe, and Trajtenberg (2005) find a significantly positive relation between patent citations and firm performance. Prior studies find there is a positive relation between corporate governance and firm innovation (e.g., Miozzo and Dewick, 2002). Most academic directors are researchers or experts in certain areas. Audretsch and Lehmann (2006) argue that directors with academic backgrounds can enhance the competitive advantage of firms by facilitating access to

and absorption of external knowledge spillover. Thus, we expect that academic directors could enhance firms' innovation capabilities through their advising roles in the boardroom. We hypothesize that:

H2-4: There is a positive relation between academic directors and firm innovation.

2.2.5. Academic directors and acquisition performance

The takeover market is a means to study boards and their roles in corporate governance (Shivdasani, 1993; Hermalin and Weisbach, 2003). Prior studies find that boards of directors play both monitoring and advising roles during acquisitions. For example, Byrd and Hickman (1992) finds that bidding firms on which independent outside directors hold at least 50% of the seats have significantly higher announcement-date abnormal returns than other bidders. Masulis, Wang, and Xie (2012) find firms with foreign directors have better cross-border acquisition market performance than firms without foreign directors because foreign directors can provide valuable advising during cross-border acquisitions. If academic directors are effective monitors and valuable advisors, we expect that acquirer firms with academic directors make better acquisition decisions. Thus we hypothesize that:

H2-5: There is a positive relation between academic directors and acquirer's market performance.

3. The data

3.1. Sample

The sample begins with all firms in the Investor Responsibility Research Center (IRRC) director database, which covers S&P 500, S&P MidCap 400, and S&P SmallCap 600 for the 1998–2011 proxy seasons. Since 1998, IRRC has recorded each director's primary employer and

primary title, which is how this study detects academic directors. We use keyword searches for directors from academia in the IRRC (e.g., university, college, institute, school, and academy). In order to confirm that the selected directors from academia are professors, and to find occupational and educational information for each academic director, we manually collect each director's background information, including his or her affiliation, degree, area of study, and title by searching his or her personal website, school website, or other business websites.[5] The final academic director-year sample includes 10,456 observations for 1,391 unique academic directors.

Table 1 reports the distribution of academic directors by year, title, and area of study. Panel A shows that the total number of academic directors over time is relatively stable. The sample does not show an increase in the number of academic directors (or business-related professors) after the implementation of the SOX, which requires financial experts on boards. Panel B of Table 1 shows that among 10,456 academic director observations, 6,348 also hold certain administrative titles such as president, dean, chancellor, and department chair. Presidents and deans account for 2,923 (28%) and 1,580 (15%) directorships, respectively. As shown in Panel C, over 39% of academic directors are in the business-related fields, including finance, accounting, economics, and other business majors, followed by technology including both engineering and science (17%), medical (14%), and political science (10%).

[Insert Table 1 here]

As our main analysis is at firm-year level, we convert the IRRC director-year information into board (firm)-year information. Then we merge this information with other data sources. Data about other board information are also from the IRRC. Financial data are from Compustat. Data about insider ownership are from ExecuComp. After merging the data and deleting

[5] In the IRRC data, the majority of directors' title information is missing.

observations with missing information, we have 15,991 firm-year observations for 2,703 unique firms for the 1998-2011 sample period.[6]

3.2 Measures of academic directors and firm performance

To capture the presence of academic directors in the boardroom, we create a dummy variable, *Academic,* that equals one if a firm has at least one academic director in its boardroom, and zero otherwise. We also construct a continuous variable, *Academic Ratio*, which equals the number of academic directors divided by total number of directors, to capture the relative size of academic directors on the board.

In our paper, we use a market-based measure, Tobin's Q, as our proxy for firm performance. The Q regression is widely used in corporate board literature (Yermack, 1996; Ferris, Jagannathan, and Pritchard, 2003; Devos, Prevost, and Puthenpurackal, 2009; Masulis, Wang, and Xie, 2012). Tobin's Q is the ratio of a firm's market value to its book value. The firm's market value equals the book value of assets minus the book value of equity plus the market value of equity.

However, Tobin's Q is also often used as a measure of growth opportunities. Although we try to address this measurement error issue by using a number of controls for investment opportunities, we are still concerned about the possible impact that growth opportunities have on our coefficient estimates. Therefore, we supplement the Q tests with similar models using ROA as an accounting measure of operating performance. ROA is the ratio of net income before extraordinary items and discontinued operations to its book value of assets.[7]

[6] Our main results are quantitatively unchanged if we exclude finance and utility firms from our sample.
[7] We also use an operating cash flow measure for ROA and the results are qualitatively unchanged.

3.3. Summary statistics

Table 2 shows the summary statistics, which are based on 15,991 firm-year observations. The mean (median) value of Q is 1.56 (1.36) while the mean (median) value of ROA is 0.03 (0.04). Both Q and ROA vary across our sample. The results are similar to other studies such as Adams and Ferreira (2009), Devos, Prevost, and Puthenpurackal (2009), and Masulis, Wang, and Xie (2012).

[Insert Table 2 here]

We find during 1998 to 2011, 40% of the firm-year observations have at least one academic director. For firms with academic directors, 77% of firms have one academic director, 19% of firms have two academic directors, and 4% of firms have more than two academic directors. The relative size of academic directors is not very large for the full sample. The average ratio of academic directors to board size is 5.5%. However, we find that relative size of academic directors is considerably large within firms who have academic directors. For example, boards with academic directors, on average, have 10% of their total directors drawn from academia. When we calculate the ratio of academic directors to the total number of outside directors, the percentage increases to 14.3%, which is relatively high.

With respect to other board characteristics, we find the average board in our sample has 9.25 directors. The average board independence is 70%. About 72% of sample firms have dual CEOs. These numbers are similar to those in other recent studies, such as Adams and Ferreira (2009), Francis, Hasan, Koetter, and Wu (2012), and Masulis, Wang, and Xie (2012).

4. The determinants of having academic directors in the boardroom

Academic directors might not be randomly assigned to firms, so what drives their election to boards? Klein (1998) argues that firms' economic needs determine who sits on their boards. Coles, Daniel, and Naveen (2008) emphasize the advisory role of nonexecutive directors. Firms may recruit professors for their specialized expertise and advice on business strategies, legal suggestions, or technological solutions. Also, firms may recruit professors merely for their prestige (especially presidents and deans). In this section, we examine the determinants of having academic directors on boards. This analysis is also useful for evaluating firm performance because it could help us find determinants of academic directors for endogeneity correction in the 2SLS regression.

We include four sets of variables in our regressions. Firm specific characteristics may influence the decision to choose directors from academia. Thus, the first set of variables is firm characteristics. Firms with more intense research and development efforts may have higher demand for academic directors' specific expertise. Thus we include *R&D*, which is total R&D expenditures divided by total assets. We also include *Firm Size*, which is the natural log of total firm assets, to control for firm size effect. Both *R&D* and *Firm Size* are measured with a one-year lag to *Academic*. Lastly, we include a dummy variable, *Distance*, which equals one if the geographical distance between the firm and the academic director' university is less than 100 miles, and zero otherwise.[8] We expect that firms are more likely to choose professors from nearby universities.[9]

Boards of directors have the ultimate responsibility to appoint board members. Therefore, we include several board characteristics which are widely studied in the literature. *Independence* is the percentage of outside directors (excluding academic directors) on the board. *Board Size* is

[8] If there is more than one academic director on the board, we use the average distance.
[9] We try to include one to three lagged Q in the regression, and we do not find a significant relation between previous firm performance and having academic directors.

the natural log of the total number of directors on the board. *Duality* is a dummy variable that equals one if the CEO is also the chairman; it equals zero otherwise. *Female Director* is a dummy variable that equals one if at least one director is female; it equals zero otherwise. *Director Age* is the natural log of the directors' average age. *Director Tenure* is the natural log of the directors' average tenure. *Directorship* is the average number of directorships directors hold.

Board ownership and management ownership may affect firms' incentive to choose professors as board members. We also include these ownership variables in our regression. *Director Ownership* is the board's ownership as a percentage of all shares outstanding. *Insider Ownership* is management's ownership as a percentage of all shares outstanding.

Finally, we control for industry effect in the regression, as different industries may have different demands for directors from academia. We use one-digit SIC codes to separate firms into eight industries to test the industry effect.

The results are in Table 3. In Column 1, we use *Academic* as the dependent variable. We find that both *Firm Size* and *R&D* have significantly positive effects on the presence of academic directors. The results indicate that larger firms and more research-intensive firms are more likely to choose professors for their boards. Consistent with our expectation, we find *Distance* also impacts the possibility of choosing academic directors positively, suggesting that firms are more likely to choose professors from nearby universities.

[Insert Table 3 here]

We also find that coefficients on *Independence*, *Board Size*, *Female Director*, and *Director Age* are all positive and significant, indicating that more independent boards, larger boards, boards with more female and old directors are more likely to have academic directors.

The coefficient on *Insider Ownership* is positive and significant, suggesting that if a firm's managers hold more shares, the firm is more likely to have academic directors.

With regards to the industry effect, we find that the demand for academic directors varies among different industries. For example, although the financial services, transportation, and communications industries are more likely to choose professors for their boards, some manufacturing and wholesale and retail firms are less likely to do so. The results seem consistent with the expertise theory that financial and high-tech firms are more likely to seek academic directors for their specialized expertise.

5. Academic directors and firm performance

5.1. The association between academic directors and firm performance

In this section, we examine the relation between academic directors and firm performance. As we discussed before, we use Q as the main measure of firm performance. We use *Academic* and *Academic Ratio* to capture the presence and the relative size of academic directors on the board. Following prior studies, such as Bebchuk and Cohen (2005), and Devos, Prevost, and Puthenpurackal (2009), we control for board and firm characteristics that may affect Q in our regressions. For board characteristics, we include *Independence*, *Board Size* and *Duality* as described earlier. We also control for *Insider Ownership* in the regressions (Jensen and Meckling, 1976; Yermack, 1996). To account for the potential nonlinearity between firm value and insider ownership (Morck, Shleifer, and Vishny, 1988; McConnell and Servaes, 1990), we include a quadratic term of *Insider Ownership*.

For firm characteristics, we include *Firm Size* and *R&D* as defined earlier. We also include the following firm variables. *Leverage* is the book value of debt over total assets. *Cash* is

cash and short-term investments over total assets. *Cum. Sales Growth* is the compounded annual growth rate of sales over the last three years. All these firm characteristics are measured with a one-year lag to Q.

Table 4 reports the results of the association between academic directors and firm performance using firm and year fixed-effect regressions with robust and clustered standard errors at the firm level. In Column 1, we find that the coefficient on *Academic* is significantly positive at the 1% level. The economic magnitude of the coefficient is about 0.065, indicating that Tobin's Q is about 0.065 higher for firms with academic directors than firms without academic directors. The result supports our hypothesis H1 that the presence of academic directors is associated with higher firm performance.

[Insert Table 4 here]

In Column 2, we find the coefficient on *Academic Ratio* is positive and significant at the 1% level. The coefficient shows that a unit increase in *Academic Ratio* is associated with an increase of firm's Tobin's Q about 0.242 units. The results indicate that both the presence of academic directors and the relative size of academic directors matter to firm performance.

In Columns 3 and 4, we further use ROA as the dependent variable. The results show a positive and significant relation between academic directors (both the presence the relative size) and firm performance as measured by ROA. For example, the coefficient on *Academic* is 0.009, indicating that ROA for firms with academic directors is about 0.009 higher than that for firms without academic directors. Given our sample average ROA is 0.03, our results are economically

meaningful. The results triangulate the findings when we use Tobin's Q as the measure of firm performance, and they provide further evidence to support our hypothesis H1.[10]

Coefficients on control variables are in line with those reported by other studies. We find that *Independence* has no significant relations with firm performance (Baysinger and Butler, 1985; Hermalin and Weisbach, 1991; Mehran, 1995; Bhagat and Black, 2001). We also find that there is a negative relation between *Board Size* and firm performance when we use Tobin's Q as the measure of firm performance, and there is a negative relation between *Duality* and firm performance when we use ROA as the measure of firm performance. The results are consistent with prior studies such as Yermack (1996) and Rechner and Dalton (1991).

Consistent with our expectations and prior findings, we find that *Firm Size* and *Leverage* are negatively related to firm performance. We also find that *R&D*, *Cash*, and *Cum. Sales Growth* are all positively related to Tobin's Q. Finally, we find that neither *Insider Ownership* nor *Insider Ownership Square* is significantly related to firm performance.

In sum, results presented in Table 4 indicate that both the presence of academic directors and the relative size of academic directors are positively related to firm performance as measured by both Tobin's Q and ROA. The results are consistent with our hypothesis H1 and show that directors from academia appear to be valuable for firms.

5.2. Robustness checks

The fixed-effect regressions control for potential omitted variables. However, as academic directors may not be randomly assigned to boards, the potential problem of endogeneity of the choice of academic directors is still unaddressed. To deal with this issue, we

[10] Some firms located in Bay area are high-tech firms and they might have more academic directors from local universities such as Stanford and UC Berkeley. To ensure that our findings are not driven by Bay area firms, we rerun Table 4 using a reduced sample in which we exclude Bay area firms. We find all our results hold.

use an instrumental variable technique. Based on our results in Table 3, we choose *Distance* as an instrument for *Academic*, as we find that *Distance* is highly correlated with *Academic*, but it is less likely related to firm performance. To provide support for our choice of the instrument variable, in the 2SLS regression, we conduct the Cragg and Donald (1993) instrument relevance test to confirm the relevance of the instrumental variables (i.e., high correlation between *Distance* and *Academic*). We also find that *Distance* is uncorrelated with firm performance if we include it in the second-stage regression, which confirms *Distance* as a valid instrument for *Academic.*

We report the second-stage results in Column 1 of Table 5. We find that the coefficient on fitted *Academic* is 0.318 and is significant at the 5% level. The result indicates that the positive relation between academic professors and firm performance is robust after considering the potential endogeneity problem.

[Insert Table 5 here]

To mitigate statistical concerns arising from cross-sectional correlation, we estimate the baseline model using the Fama-MacBeth method. More specifically, we estimate the model by years, and then test the statistical significance of the average coefficients using a t-test. The results are in Column 2 of Table 5. We find that the coefficient on *Academic* is significantly positive. In Column 3, to mitigate the influence of the outlier effect, we perform a median regression. The results also hold.

In the earlier studies, we include finance and utility firms in our sample. As financial companies and utility firms may perform differently compared to other companies, some studies exclude these firms (e.g., Yermack, 1996). We retest our main analysis using a reduced sample in which we exclude finance and utility firms. We find that the results hold after using this

reduced sample. Lastly, Duchin, Matsusaka, and Ozbas (2010) argue that the effectiveness of outside directors depends on the cost of acquiring information about the firm. Outsiders improve firm performance when information cost is low and hurt firm performance when information cost is high. Following Duchin, Matsusaka, and Ozbas (2010), we collect analyst forecast information from I/B/E/S. we use standard deviation of analyst forecast as the measure of the information cost.[11] We construct a dummy variable, *Higher Information Cost*, which equals one if a firm's analyst forecast standard deviation is above median value, and zero otherwise. We interact *Academic* with *Higher Information Cost.* The results show that the interaction term, *Academic *Higher Information Cost*, is insignificant, indicating that the impact of academic directors on firm performance is not influenced by the information cost.[12] For brevity, the results from these robustness checks are not tabulated.

5.3. Difference-in-difference regression results

To further mitigate endogeneity concerns, such as time-variant omitted variable effect and reverse causality issues, we conduct a difference-in-difference analysis. Our testing sample is the firms with academic directors. The IRRC database provides the year in which the director begins his or her board service. Therefore we construct a dummy variable *Post*, which equals one if a year is after an academic director is appointed, and zero otherwise. For fair comparison, we also apply the following filters: (1) each academic director should be in office consecutively for at least 2 years; (2) if a firm has more than one change of academic directors, we only count the earliest change for each firm; (3) we exclude firms that have no pre-academic director appointment information.

[11] Using absolute error of analyst forecast yields similar results.
[12] We also examine the non-linearity of academic directors by including a square term of academic ratio. We do not find a non-linear relation between academic directors and firm performance.

We next construct a matching sample from the other outside director appointments sample. We apply a one-to-one propensity score match based on industry, year, assets, and leverage. This procedure ensures that each observation in the testing sample is paired with an observation in the matching sample. We estimate OLS regression using a sample that pools the testing sample and the matching sample. The final sample includes 6,086 observations.

Results from the difference-in-difference regression are reported in Column 4 of Table 5. We find that the coefficient on *Post* is insignificant, indicating that there is not a significant difference between pre- and post-period for firms with nonacademic director changes in terms of firm performance. The coefficient on the interaction term between *Post* and *Firms with Academic Directors*, which captures the incremental effect of academic directors on firm performance in the post period, is 0.105 and is significant at the 1% level. Hence, compared to firms with nonacademic director changes, academic directors increase firm performance more significantly after their appointments. The results mitigate endogeneity concerns and suggest that academic directors bring about, and not merely reflect, an improved firm performance.

5.4. Academic directors and firm performance during the 2007-2009 financial crisis

The 2007-2009 financial crisis is the most serious crisis since the Great Depression, and it represents an exogenous and systematic shock to most firms. Prior studies show that corporate governance including boards of directors is of the first-order importance in determining firm performance during crises (e.g., Johnson, Boone, Breach, and Friedman, 2000; Mitton, 2002; Francis, Hasan, and Wu, 2012). Following these studies, we examine how academic directors immediately before the crisis affect firm performance during the crisis period. As there is no consensus on the exact time window for the crisis, we use three different time windows to ensure

the robustness of our results. The first one is October 2007 to March 2009 which is based on the stock market performance. The second is December 2007 to June 2009 which is based on the definition of National Bureau of Economic Research (NBER). The third is September 2008 to March 2009 which is based on the bankruptcy of Lehman Brother. Accordingly, we use 2006 academic director information for the first two time windows and 2007 academic director information for the third time window. We run cross-sectional regressions to examine how academic directors before the crisis affect firm performance during the crisis period. We include industry fixed effect in the regressions to control of industry effects.

Following Johnson, Boone, Breach, and Friedman (2000), Francis, Hasan, and Wu (2012) and others, we use buy-and-hold abnormal return (*BHAR*) for the crisis period to capture firm relative performance during the crisis period. *BHAR* is calculated based on monthly stock return information from CRSP. We report the results in Table 6. We find that all three coefficients on *Academic* are significantly positive at the 1% level. For example, *BHAR* for firms with academic directors is about 0.105 higher than that for firms without academic directors when we define the crisis as from October 2007 to March 2009. Thus, our results in Table 6 confirm the positive effect of academic directors on firm performance and they further mitigate the endogeneity concerns.

[Insert Table 6 here]

5.5. Long-run event study results

Ideally, we could conduct a short-run event study to examine market reactions to the news of appointments of academic directors. However, there are several difficulties which could make the results noisy and less informative. First, perform a valid short-run event study we have

to know the exact dates of events. However, unlike other events, such as earnings announcements and stock splits, the exact dates of director appointments are ambiguous. Prior studies generally search director appointment dates from *The Wall Street Journal* or *Lexis/Nexis*. However, information from those media resources is known to be subject to leakage. Second, according to regulation requirements, most board appointments occur either at scheduled board meetings that involve other information releases or are communicated through proxy mailings and ratified by shareholders at annual meetings. In addition, it is common for there to be multiple additions to the board or simultaneous appointments and reassignments of directors. Given these complexities, the short-term event study results are more likely to be contaminated by confounding events. Third, results from short-run event studies are very sensitive to the sample selection problem.

If firm performance is in fact enhanced due to the appointments of academic directors, we expect to find positive long-run market reactions following the appointments of academic directors. As we do not necessarily need the exact appointment dates for the long-run study, we can use the S&P 1,500 director full sample. We trace each director's first year of appointment as an outside director, and we require that each director should be on the same board consecutively for at least 3 years excluding the appointment year. Our final sample includes 1,145 observations.

Our long-run event study is based on Fama-French Three-Factor Model. Specifically, for each calendar month in our sample period, we form a rolling portfolio of sample firms that have appointed academic directors. We then regress the portfolio excess return on the Fama and French three factors as follows:

$$(R_{pt} - R_{ft}) = \alpha + \beta(R_{mt} - R_{ft}) + sSMB_t + hHML_t + \varepsilon_t$$

where R_{pt} is the return on the portfolio of sample firms in month *t*; R_{mt} is the return on the equally-weighted index of NYSE, Amex, and NASDAQ stocks in month *t*; R_{ft} is the 3-month T-bill yield in month *t*; SMB_t is the return on small firms minus the return on large firms in month *t*; and HML_t is the return on high book-to-market stocks minus the return on low book-to-market stocks in month *t*. The factor definitions are described in Fama, French, Booth, and Sinquefield (1993). The sample period is January 1998 to December 2011 (168 months). If the model adequately describes returns, we expect the value of the intercept, α, which measures abnormal returns, is zero under the null hypothesis of no abnormal performance.

Panel A of Table 7 reports equal-weighted one-year stock performance of academic director portfolio. We find that the estimated coefficient of the intercept, α, is 0.004 and significant at the 5% level, indicating that firms with academic directors exhibit positive abnormal returns over the one-year period following the academic director appointments. Economically, the 0.4% abnormal returns per month compound to about 4.8% abnormal returns in a year.[13]

[Insert Table 7 here]

Panel B reports two-year market performance following academic director appointments. The estimated coefficient of the intercept is 0.003 and significant at the 10% level. When we test three-year market performance following academic director appointments in Panel C, we find the estimated coefficient of the intercept is 0.002 and marginally significant at the 5% level.

In summary, the results in Table 7 suggest that the market reacts positively to the appointments of academic directors in the long-run period. Firms with academic directors

[13] The results are similar when we use weighted least squares instead of OLS.

outperform firms without academic directors in the market. The results provide corroborating evidence that academic directors impact firm performance positively.

6. The monitoring, advising, and diversity roles of academic directors

In this section, we provide further tests on our hypotheses H2-1 to H2-5 on the relation between academic directors and various corporate decisions. These tests could provide further evidence on the monitoring, advising and diversity roles of academic directors, and they provide possible channels through which academic directors affect firm performance positively.

6.1. Comparison between academic directors and nonacademic outside directors

Our results show that academic directors affect firm performance positively, and we argue that academic directors could increase firm value through their governance role in the boardroom. Following Adams and Ferreira (2009), we first compare individual and governance characteristics between academic directors and other outside directors.

Adams and Ferreira (2009) point out that attendance behavior and committee assignments are important indicators of the quality of directors. In Table 8, we univariately test the differences between these two groups of outside directors. The IRRC data reports directors who do not meet the SEC's 75% attendance threshold in a given year. We construct a dummy variable, *Less attendance*, that equals one if a director does not meet the SEC's 75% attendance threshold in a given year, and zero otherwise. We find that academic directors are less likely to have attendance problems than other outside directors. While 2.1% of nonacademic outside directors attend less than 75% of board meetings in a given year, the percentage for academic directors is 1.6%, and the mean difference of 0.5% is significant at the 1% level. The result of

attendance behavior indicates that academic directors are better at attending board meetings than nonacademic outside directors.

[Insert Table 8 here]

In addition, academic directors are also more likely to sit on committees than nonacademic directors. On average, academic directors hold 1.78 committee memberships, but nonacademic outside directors hold 1.75 committee memberships. The mean difference is significant at the 1% level. Furthermore, when we compare committee assignments of each specific committee between these two groups, we find that academic directors are more likely to sit on the audit committee, corporate governance committee, and nomination committee, but are less likely to sit on the compensation committee.[14] The results show that academic directors are more likely to sit on a monitoring-related committee than other outside directors.

The other results in Table 8 are also interesting. The percentages of women and minorities in the academic director sample are much higher than those in the nonacademic outside director sample. The result seems consistent with Adams and Ferreira (2009), who find that female directors are less likely to have attendance problems and are more likely to sit on certain committees than male directors. Academic directors also hold far fewer shares than other outside directors. Although the average age of academic directors is elder than that of other outside directors, their tenure is shorter than other outside directors.

6.2. Academic directors, CEO compensation, and CEO forced turnover

[14] Although academic directors are less likely to sit on the compensation committee than other outside directors, they are more likely to sit on the compensation committee than all other directors. Therefore, it is not contradictory that we find that the presence of academic directors is negatively related to CEO cash-based compensation in Section 6.2.

In this section, we test the hypotheses H2-1 and H2-2 with regard to the relation between academic directors and CEO compensation and CEO forced turnover. We obtain CEO compensation information from ExecuComp database.

In Column 1, Panel A of Table 9, we first examine how academic directors impact CEO total compensation. We find that the presence of academic directors has a significantly negative effect on CEO compensation. Economically, we find CEO compensation at firms with academic directors is about 173,423 USD lower than that at firms without academic directors, indicating that boards with academic directors are more effective in monitoring CEOs, which leads to fewer agency problems. The results provide supportive evidence to our hypothesis H2-1.

[Insert Table 9 here]

We further separate CEO compensation into cash-based (cash and bonus) and equity-based (stock and option) compensation. We rerun our regressions using these two as dependent variables. The results in Columns 2 and 3 of Panel A show that the presence of academic directors significantly reduces CEO cash-based compensation, but the effect on CEO equity-based compensation is insignificant. The results are consistent with the argument by Mehran (1995) and indicate that boards with academic directors do not forgo CEO incentive compensation, but control for cash based payments to CEOs.

We further test hypothesis H2-2 by examining the relation between academic directors and the sensitivity of CEO forced turnover to firm performance. We obtain CEO forced turnover from Eisfeldt and Kuhnen (2013) for the period 1998-2005. For the time period 2006-2011, we first obtain all CEO turnover information from ExecuComp dataset. Then following Eisfeldt and Kuhnen (2013) criteria, we classify CEO turnover in to exogenous turnover, unclassified

turnover and forced turnover by searching business website news. We obtain firm stock return information from CRSP dataset.

We estimate a probit regression in Column 4 of Panel A. The dependent variable is a dummy variable *CEO Forced Turnover* which equals one if a firm's CEO was forced out in a year, and zero otherwise. Firm stock return is the buy-and-hold stock return over the fiscal year. Industry return is the median stock return of all firms in the same two-digit SIC code. We construct *Industry Adjusted Return* by subtracting industry return from firm stock return. Consistent with hypothesis H2-2, we find that poor firm performance increases the possibility of CEO turnover. The coefficient on our interest variable, *Academic*Industry adjusted return*, is negative and significant at the 5% level, indicating that CEO forced turnover-firm performance sensitivity is significantly increased when firms have academic directors on boards. The magnitude of coefficient on *Industry Adjusted Return* is -0.977 and it is -0.808 on *Academic*Industry Adjusted Return*, implying the CEO forced turnover and performance sensitivity is about two times higher for firms with academic directors than firms without academic directors.

Overall, the results in Panel A of Table 9 suggest that the presence of academic directors strengthen the effectiveness of boards in overseeing management. Boards with academic directors can better control for CEO overpay and replace underperforming CEOs when necessary compared to boards without academic directors.

6.3. Academic directors, earnings quality, and stock price informativeness

We test hypothesis H2-3 with regard to the relation between academic directors and earnings quality and stock price informativeness. We first use *Discretionary Accruals* as the

measure of earnings management. *Discretionary Accruals* is calculated based on the modified cross-sectional Jones model (Jones, 1991) as described in Dechow, Sloan, and Sweeney (1995). The results are in Column 1 of Panel B. We find that the coefficient on *Academic* is -0.184 and is significant at the 1% level, indicating that firms with academic directors have lower level of earnings management than firms without academic directors.

While *Discretionary accruals* include within-GAAP earnings management, firms may be subject to Accounting and Auditing Enforcement Releases (AAERs) by engaging in earnings manipulations in violation of GAAP. Following Dechow, Sloan, and Sweeney (1996), we identify firms with AAERs in which actions are brought against firms pursuant to Section 13(a) of the Securities Exchange Act of 1934. We use a dummy variable, *AAER*, which equals one if the firm is subject to SEC enforcement action for a given fiscal year, and zero otherwise. The results using *AAER* as the measure of earnings quality are in Column 2 of Panel B. Consistent with our expectation, we find a significantly negative relation between the presence of academic directors and earnings management in violation of GAAP. The results are consistent with our hypothesis and reinforce the monitoring role of academic directors in improving earnings quality.

We further examine the relation between academic directors and the informativeness of stock prices. Following Morck, Yeung, and Yu (2000) and Hutton, Marcus, and Tehranian (2009), we first calculate $R^2_{i,t}$ by regressing firm weekly returns on industry weekly returns (Fama and French industry) and market returns for each firm year. Then we measure *Stock Price Informativeness* (dependent variable) by logistic transformation of the ratio (1- $R^2_{i,t}$)/ $R^2_{i,t}$. Consistent with our prediction, we find that the coefficient on *Academic* is 0.017 and is significant at the 1% level, indicating that stock prices of firms with academic directors are more informative than stock prices of firms without academic directors.

Audit committees play an important role in monitoring the financial-reporting process and providing credible information to outsiders (e.g., Klein, 2002; Francis, Hasan, Koetter, and Wu, 2012). If academic directors are effective monitors and hence improve the quality of financial reporting, we expect that academic directors who are sitting in audit committees have stronger effects on earnings quality and information quality. To examine this conjecture, we construct a dummy variable *Academic Audit*, which equals one if an academic director is also an audit committee member, and zero otherwise. We test how *Academic Audit* affects *Discretionary Accruals*, *AAER* and *Stock Price Informativeness.* The results are in Column 4 to 6 of Panel B. Consistent with our expectation, we find that all three coefficients on *Academic Audit* are statistically significant. Additionally, we find that magnitudes of all coefficients on *Academic Audit* are higher than those on *Academic*, confirming that academic directors improve accounting and information qualities more if they also sit in audit committees.

6.4. Academic directors and innovation

We test hypothesis H2-4 about the relation between academic directors and innovation. Following prior studies such as Miozzo and Dewick (2002), we use corporate patents and citations to measure innovation. We obtain the patent citation information from the NBER patent dataset.[15] Our dependent variables are *Log (Patent)*, which is the natural log of the total number of patents and *Log (Citation)*, which is the natural log of the total number of citations. The results are reported in Columns 1 and 2 of Panel C of Table 9. We find that both coefficients on

[15] Patent citation information is only available till 2010. The patent related variables are constructed from the latest version of the National Bureau of Economic Research's (NBER) patent database, which was initially created by Hall, Jaffe and Trajtenberg (2001) and covers the detailed information for all patents granted by the US Patent and Trademark Office (USPTO) up to 2006. The number of patents for a firm in a specific year in this study is defined by the number of patent applications filed in that year that are eventually granted. Patent data beyond 2006 is extracted from PATSTAT (release of April 2013). Patent Statistical Database (PATSTAT) is a database developed by *EPO-OECD Taskforce on Patent Statistics* that covers patent data from over 80 patent offices worldwide. We retrieved the all the patents from PATSTAT whose applicants (also called assignees) are from the United States for the 2007-2010 period.

Academic are positive and significant, indicating firms with academic directors are more innovative than firms without academic directors. Economically, firms with academic directors have about 13% more patents (19% more citations) than firms without academic directors.[16] The results provide support evidence for our hypothesis H2-4.

6.5. Academic directors and acquisition

We further test hypothesis H2-5 about the relation between academic directors and acquisition performance. We obtain merger and acquisition information from the Securities Data Company (SDC), and then we match with our academic director sample. Our final sample includes 9,551 acquisitions for our S&P 1,500 sample firms from 1998 to 2011. We measure an acquirer's performance by its cumulative abnormal returns by the 3-day event window (-1, 1), where date 0 is the announcement date from SDC.[17] Column 3 of Panel C reports the results on how academic directors affect acquisition performance. We find that the coefficient on *Academic* is 0.009 and is significant at the 5% level, indicating firms with academic directors make better acquisition decisions than firms without academic directors. The result is consistent with our hypothesis and confirms both monitoring and advising roles of academic directors.

Taken together, Tables 8 and 9 provide supportive evidence to our hypotheses H2-1 to H2-5, and they show that academic directors are effective monitors and valuable advisors and provide diversities in the boardroom. The results also provide possible channels through which academic directors affect firm performance positively.

[16] Our dependent variables (Log(patent) and Log(citation)) are Log transformed. The exponentiated coefficient for *Academic* is the ratio of the expected geometric mean for firms with academic directors over the expected geometric mean for firms without academic directors. For example, for Log (patent), exp(.122) = 1.129, implying that the patent level is about 13% higher for firms with academic directors than for firms without academics directors.
[17] The results hold when we use a one-day event window.

7. Additional analysis

7.1. The occupational backgrounds of academic directors and firm performance

In this section, we examine whether academic directors with and without administrative positions have different impacts on firm performance. Toward this end, we rerun our baseline model, replacing the dummy variable *Academic* with two separate dummy variables: *Professor*, which indicates academic directors without administrative positions, and *Administrative*, which indicates academic directors with administrative positions. The results are in Table 10.

[Insert Table 10 here]

As Table 10 shows, the coefficient on *Professor* is 0.081 and is significant at the 1% level, but the coefficient on *Administrative* is insignificant.[18] The results indicate that the positive association between academic directors and firm performance is mainly attributed to academic directors who do not have administrative jobs in academia, but not to academic directors with administrative positions.[19]

Why do two groups of directors from academia have different impacts on firm performance? We think about two possible reasons that may hinder academic directors with administrative jobs as effective monitors and valuable advisors. First, academic directors with administrative positions may be less independent than those without administrative jobs. It is more likely that those university presidents and deans have some kinds of connections with the companies, or have personal relationships with the managements. For example, it is less likely that a university president has strong incentives to monitor the CEO if the company contributes money to the university's endowment.

[18] We perform an F test to reject (at the 1% level) the hypothesis that the estimated coefficients of *Professor* and *Administrative* are the same.

[19] We exclude observations with more than one academic director to rule out the possibility that a boardroom has both professor and administrative. The results hold.

Second, Adams and Ferreira (2009) point out that attending board meetings is very important for the effectiveness of directors because it is the major way they obtain information and fulfill their monitoring and advising responsibilities. Prior studies also find that busier directors are less effective (e.g., Adams, Hermalin, and Weisbach, 2008; Fich and Shivdasani, 2006). We conjecture that because of their heavy administrative jobs, academic directors with administrative jobs attend less board meetings than academic directors without administrative jobs, and consequently, they are less effective than academic directors without administrative jobs.[20] To test our conjecture, we further interact *Administrative* with *Less Attendance* to see whether missing board meetings is a reason which reduces the effectiveness of academic directors with administrative jobs.

The results are reported in Column 3 of Table 10. Consistent with our expectation, we find the coefficient on the interaction term *Administrative* * *Less Attendance* is significant and negative, indicating that missing board meetings is a plausible explanation on the insignificant relation between academic directors with administrative jobs and firm performance.[21]

7.2. The educational and personal backgrounds of academic directors and firm performance

We investigate whether the educational backgrounds of academic directors also affect their effectiveness and consequent firm performance. We manually collected information about the area of study in which each academic director earned his or her highest degree. We then group academic directors into categories, such as education, technology (including science and engineering), business-related (including finance, accounting, economics, and other business

[20] We find that academic directors with administrative jobs are more likely to miss board meetings compared to academic directors without administrative jobs. For brevity, we do not tabulate the results.

[21] We also examine the impact of academic directors' administrative background on various corporate decisions which we examine in Table 9. We find the academic directors without administrative jobs have no significant impacts on any of the dependent variables.

majors), law, medicine, political science, and others. We examine how educational backgrounds of academic directors affect firm performance using the sample firms with academic directors.

We focus on sample firms which have academic directors, and academic directors might not be randomly selected into firms. To deal with this potential self-selection bias, we apply the Heckman two-stage procedure. The first-stage model is the same as Table 3 which examines determinants of having academic directors. We obtain *Inverse Mills Ratio* from the first-stage regression and include this *Inverse Mills Ratio* in the second-stage performance model to mitigate selection bias. The second-stage results are reported in Table 11.

[Insert Table 11 here]

In Column 1, we find that different areas of study have different impacts on firm performance. Specifically, academic directors with business-related degrees have the most positive effects on firm performance, followed by academic directors with technology degrees and with political degrees. However, academic directors with law, education, and medical degrees have no different impacts on firm performance compared to other unclassified academic directors. Several papers, such as Guner, Malmendier, and Tate (2008), discuss the impact of financial expertise on corporate decision-making. Additionally, the SOX requires that audit committees include at least one financial expert. In our study, we provide some empirical evidence of the benefits of having financial experts on boards. The better performance of firms with science and engineering background is consistent with the advising roles of academic directors. It is interesting that we also find academic directors with political backgrounds have similar positive effect on firm performance as academic directors with business and technology backgrounds. Agrawal and Knoeber (2001) find companies with higher litigation risk and political capital are more likely to elect lawyers and politicians to their boards. Our findings are

consistent with prior studies which show a positive relation between executives and board members political background and firm performance (e.g., Goldman, Rocholl, and So, 2009; Boubakri, Guedhami, Mishra, and Saffar, 2012; Do, Lee, and Nguyen, 2013). [22]

Finally, we examine whether academic directors' various personal characteristics affect firm performance differently. Those factors include academic directors' gender, age, tenure, directorship and ownership. Again, we control *Inverse Mills Ratio* in the regression to mitigate selection bias concern. Interestingly, we find there is a weakly negative relation between academic director age and firm performance, indicating that firms with younger academic directors perform better than firms with elder academic directors. We also find that academic directors' tenure has a positive impact on firm performance. We do not find significantly different effects of other academic directors' characteristics on firm performance.

8. Conclusion

This paper empirically investigates whether the presence of academic directors affects firm performance and corporate governance. Based on the *independence* theory, *expertise* theory, and *diversity* theory, we hypothesize that academic directors can improve board efficacy and subsequent firm performance. The key result is in line with our hypothesis. We find that the presence of directors from academia in the boardroom is associated with higher firm performance. We further examine the monitoring, advising and diversity roles of academic directors through various corporate decisions. We find that firms with academic directors have

[22] We also examine whether professor directors with business-related backgrounds have more significant impacts on financial firms' performances. Specifically, we interact *Business* and *Financial companies* (SIC Code 6000-6900). We find that the coefficient of the interaction term is insignificant, indicating that the impact of business professor directors on performance is not significantly different between financial companies and non-financial companies. We further test whether academic directors with science and engineering backgrounds are more important for technological company performance. We interact *Technology* and *High-tech companies*. Again, we find the coefficient of the interaction term is also insignificant.

higher CEO forced turnover-performance sensitivity, lower cash-based CEO compensation, more patent and citation numbers, higher acquisition performance, higher earnings quality and stock price informativeness. The results provide several channels through which academic directors affect firm value positively.

We also find evidence that academic directors with administrative jobs do not improve firm performance as much as academic directors without administrative jobs. Additional analysis finds that academic directors with administrative jobs have more severe board-meeting attendance problems. Furthermore, we find that academic directors' areas of study have different impacts on firm performance.

Our paper is the first to focus entirely on the impact of academic directors on corporate governance and firm performance. Our analysis extends the literature on board characteristics and firm performance. We find that directors from academia are beneficial to shareholders. Our results indicate that directors' monitoring, advising and diversity functions are important for board efficacy and firm performance. Furthermore, our study complements the board-independence literature by showing that independence is not enough to enhance board efficacy. Additional director attributes, such as advising abilities, could be important for making outside directors more beneficial to firm value. Therefore, this paper furthers our understanding on the relation between board independence and firm value.

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Table 1: Distribution of Academic Directors

This table presents distribution of the total 10,456 director-year observations for academic directors by year, primary title and major. The sample is drawn from the IRRC database for the 1998 to 2011 period. The directors' areas of study are based on their primary doctoral degrees.

Panel A: by Year

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	total
number	742	867	797	750	638	723	755	745	725	759	756	755	747	697	10,456
percentage	7.10%	8.29%	7.62%	7.17%	6.10%	6.91%	7.22%	7.13%	6.93%	7.26%	7.23%	7.22%	7.14%	6.67%	100.00%

Panel B: by Title

	professor	president	dean	chancellor	director	department chair	others	total
number	4,108	2,923	1,580	391	386	324	744	10,456
percentage	39.29%	27.96%	15.11%	3.74%	3.69%	3.10%	7.12%	100.00%

Panel C: by Major

	business	technology	medical	political	law	education	others	total
number	4,113	1,766	1,514	1,091	783	218	971	10,456
percentage	39.34%	16.89%	14.48%	10.43%	7.49%	2.08%	9.29%	100.00%

Table 2: Summary Statistics

This table presents descriptive statistics for the firm-year full sample. The sample is for the 1998 to 2011 period. *Q* is Tobin's Q which is measured as the ratio of the firm's market value to its book value. The firm's market value is calculated as the book value of assets minus the book value of equity plus the market value of equity. *ROA* is the ratio of net income before extraordinary items and discontinued operations to its book value of assets. *Academic* is a dummy variable that equals one if a firm has at least one academic director; it equals zero otherwise. *Academic Ratio* equals the ratio of academic directors to the board size. *Independence* is the percentage of independent directors (exclude academic directors) on the board. *Board Size* is the total number of directors on the board. *Duality* is a dummy variable that equals one if the CEO is also the chairman of the board, and 0 otherwise. *Female Director* is a dummy variable that equals one if at least one director is a female; it equals zero otherwise. *Interlock* is a dummy variable that equals one if at least one director is an interlocked director; it equals zero otherwise. *Director Age* is the average age of all directors of a firm. *Director Tenure* is average tenure of all directors of a firm. *Directorship* is the average number of directorships directors hold. *Director Ownership* is the percentage of outstanding shares all directors own. *Firm Size* equals the firm's total assets. *Leverage* is the book value of debt over total assets. *R&D* equals total R&D expenditures divided by total assets. *Cash* is cash and short-term investments over total assets. *Cum. Sales Growth* is the compounded annual growth rate of sales over the last three years. *Insider Ownership* is the percentage of outstanding shares top management owns.

	n	mean	sd	p25	p50	p75
Q	15,991	1.561	0.67	1.094	1.364	1.822
ROA	15,991	0.030	0.19	0.013	0.043	0.079
Academic	15,991	0.397	0.49	0.000	0.000	1.000
Academic Ratio	15,991	0.055	0.08	0.000	0.000	0.111
Independence	15,991	0.697	0.17	0.600	0.727	0.833
Board Size	15,991	9.246	2.49	7.000	9.000	11.000
Duality	15,991	0.716	0.45	0.000	1.000	1.000
Female Director	15,991	0.635	0.48	0.000	1.000	1.000
Interlock	15,991	0.044	0.21	0.000	0.000	0.000
Director Age	15,991	60.083	4.42	57.538	60.333	62.875
Director Tenure	15,991	10.195	4.02	7.400	9.634	12.429
Directorship	15,991	1.817	1.58	1.375	1.727	2.167
Director Ownership	15,991	1.227	2.63	0.000	0.274	1.161
Firm Size	15,991	13,467	79,159	651	1,760	5,713
Leverage	15,991	0.197	0.17	0.037	0.177	0.307
R&D	15,991	0.027	0.06	0.000	0.000	0.029
Cash	15,991	0.054	0.07	0.019	0.036	0.067
Cum. Sales Growth (3 years)	15,991	0.127	0.21	0.017	0.082	0.180
Insider Ownership	15,991	3.202	6.83	0.832	1.160	1.650

Table 3: The determinants of Academic Directors

This table presents regression results on the determinants of academic directors. The dependent variables are *Academic* and *Academic Ratio*. *Academic* is a dummy variable that equals one if a firm has at least one academic director; it equals zero otherwise. *Academic Ratio* equals the ratio of academic directors to the board size. *Firm Size* is the natural log of total assets of the firm. *R&D* equals total R&D expenditures divided by total assets. *Distance (<100 mile)* is a dummy variable which equals one if the distance between the corporate headquarter and the professor's school is less than 100 miles. *Independence* is percentage of independent directors on the board. *Board Size* is the natural log of the total number of directors on the board. *Duality* is a dummy variable that equals one if the CEO is also the chairman; it equals zero otherwise. *Female Director* is a dummy variable that equals one if at least one director is female; it equals zero otherwise. *Log (Age)* is the natural log of the directors' average age. *Log (Tenure)* is the natural log of the directors' average tenure. *Directorship* is the average number of directorships directors hold. *Director Ownership* is the percentage of outstanding shares all directors own. *Insider Ownership* is the top management team's percentage ownership of all shares outstanding. We also control for industry effect by using one-digit SIC codes in the regression. Values of the heteroskedasticity robust z-statistics are in parentheses. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively.

	(1)	(2)
	Logit	Tobit
VARIABLES	Academic	Academic Ratio
Firm Size	0.131***	0.006***
	(3.88)	(4.88)
R&D	3.924***	0.194***
	(4.74)	(4.73)
Distance (<100 Mile)	0.314***	0.007**
	(3.56)	(2.43)
Independence	0.899***	0.033***
	(3.86)	(3.85)
Board Size	1.041***	-0.006
	(5.67)	(-0.94)
Duality	-0.025	-0.002
	(-0.35)	(-0.81)
Female Director	0.604***	0.021***
	(7.18)	(6.72)
Director Age	0.045***	0.002***
	(3.97)	(4.19)
Director Tenure	-0.004	-0.000
	(-0.34)	(-1.13)
Directorship	0.108	0.002
	(1.52)	(0.64)
Director Ownership	-0.025	-0.000
	(-1.49)	(-0.73)
Insider Ownership	0.015**	0.001**
	(2.56)	(2.51)
SIC1000-1999 (Mining & construction)	-0.899	-0.041
	(-1.34)	(-1.61)
SIC2000-2999 (Manufacturing: food, apparel, paper & chemical)	-0.948	-0.020
	(-1.49)	(-0.79)
SIC3000-3999 (Manufacturing: rubber, leather, stone, metal & electronic)	-1.512**	-0.030
	(-2.18)	(-1.21)
SIC4000-4999 (Transportation & communications)	1.447**	0.031
	(2.06)	(1.24)
SIC5000-5999 (Wholesale & retail trade)	-1.527**	-0.031
	(-2.18)	(-1.23)
SIC6000-6999 (Financial services)	0.203***	0.035
	(3.68)	(1.38)
SIC7000-7999 (Travel & entertainment)	-0.393	-0.037
	(-0.55)	(-1.45)
SIC8000-8999 (Other services)	-1.325	-0.020
	(-1.26)	(-0.74)

Firm cluster	Y	Y
Year fixed effect	Y	Y
Observations	15,991	15,991
Pseudo R-square	0.098	0.043

Table 4: Academic Directors and Firm Performance

This table presents the OLS regression results of the relation between academic directors and firm performance. The dependent variables are Tobin's Q and ROA. *Q* is measured as the ratio of the firm's market value to its book value. The firm's market value is calculated as the book value of assets minus the book value of equity plus the market value of equity. *ROA* is the ratio of net income before extraordinary items and discontinued operations to its book value of assets. *Academic* is a dummy variable that equals one if a firm has at least one academic director; it equals zero otherwise. *Academic Ratio* equals the ratio of academic directors to the board size. *Independence* is the percentage of independent directors (exclude academic directors) on the board. *Board Size* is the natural log of the total number of directors. *Duality* is a dummy variable that equals one if the CEO is also the chairman; it equals zero otherwise. *Firm Size* is the natural log of the firm's total assets. *Leverage* is the book value of debt over total assets. *R&D* equals total R&D expenditures divided by total assets. *Cash* is cash and short-term investments over total assets. *Cum. Sales Growth* is the compounded annual growth rate of sales over the last three years. *Insider Ownership* is the percentage of outstanding shares top management owns. All firm characteristics are measured with a one-year lag compared to Q. Values of the heteroskedasticity robust t-statistics are in parentheses. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	Q	Q	ROA	ROA
Academic	0.065***		0.009***	
	(4.10)		(2.74)	
Academic Ratio		0.242**		0.041*
		(2.14)		(1.88)
Independence	0.021	0.026	0.001	0.011
	(0.39)	(0.49)	(0.08)	(0.80)
Board Size	-0.114**	-0.098**	-0.014	-0.013
	(-2.41)	(-2.07)	(-0.95)	(-0.91)
Duality	0.002	0.002	-0.010***	-0.008**
	(0.15)	(0.12)	(-2.71)	(-2.36)
Firm Size	-0.168***	-0.169***	-0.017*	-0.014
	(-6.54)	(-6.54)	(-1.94)	(-1.40)
Leverage	-0.564***	-0.565***	-0.213***	-0.205***
	(-7.01)	(-7.01)	(-7.04)	(-6.60)
R&D	0.626*	0.627*	1.630***	1.620***
	(1.82)	(1.83)	(3.54)	(3.49)
Cash	2.058***	2.055***	0.808**	0.766*
	(4.38)	(4.35)	(1.99)	(1.89)
Cum. Sales Growth (3 years)	0.347***	0.345***	0.023	0.012
	(7.07)	(7.03)	(0.91)	(0.48)
Insider Ownership	-0.002	-0.002	0.000	0.000
	(-0.84)	(-0.84)	(0.42)	(0.62)
Insider Ownership Square	0.000	0.000	-0.000	-0.000
	(0.29)	(0.30)	(-0.29)	(-0.39)
Firm cluster	Y	Y	Y	Y
Firm fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
Observations	15,991	15,991	15,991	15,991
Adjusted R-square	0.709	0.709	0.549	0.556

Table 5: Robustness Checks on the Relation between Academic Directors and Firm Performance

This table presents robustness tests on the relation between academic directors and firm performance. In Column 1, we use an IV with fixed effects regression. We use the *Distance (<100 mile)* as the instrument for *Academic*. *Distance (<100 mile)* is a dummy variable which equals one if the distance between the corporate headquarter and the professor's school is less than 100 miles. In Column 2, we use a Fama and MacBeth method. In Column 3, we use a median regression. In Column 4, we use a difference-in-difference regression. *Post* is a dummy variable which equals one after the year a professor is appointment to the board. *Firms with Academic Directors* refer to firms with academic directors. We select matching sample from firms with nonacademic director appointments. We use one-to-one propensity score matching based on industry, year and assets and leverage. The dependent variable is Tobin's Q, which is measured as the ratio of the firm's market value to its book value. *Academic* is a dummy variable that equals one if a firm has at least one academic director; it equals zero otherwise. Other control variables are the same as in Table 4. They include following variables. *Independence* is the percentage of independent directors (exclude academic directors) on the board. *Board Size* is the natural log of the total number of directors. *Duality* is a dummy variable that equals one if the CEO is also the chairman; it equals zero otherwise. *Firm Size* is the natural log of the firm's total assets. *Leverage* is the book value of debt over total assets. *R&D* equals total R&D expenditures divided by total assets. *Cash* is cash and short-term investments over total assets. *Cum. Sales Growth* is the compounded annual growth rate of sales over the last three years. *Insider Ownership* is the percentage of outstanding shares top management owns. All firm characteristics are measured with a one-year lag compared to Q. Values of the (heteroskedasticity robust) t-statistics / z-statistics are in parentheses. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)
	IV with fixed effect	Fama and MacBeth	Median regression	Difference-in-difference
VARIABLES	Q	Q	Q	Q
Academic	0.318**	0.182***	0.087***	
	(2.05)	(7.48)	(7.14)	
Post				-0.022
				(-0.71)
Firms with Academic Directors				0.020
				(0.66)
Post* Firms with Academic Directors				0.105***
				(2.84)
Control variables	Y	Y	Y	Y
Firm cluster	Y	N	N	Y
Firm fixed effect	Y	N	N	Y
Year fixed effect	Y	N	N	Y
Observations	15,991	15,991	15,991	6,086
Pseudo /Adjusted/ R-square	0.244	0.272	0.148	0.565

Table 6: Academic Directors and Firm Performance during the 2007-2009 Financial Crisis

This table presents OLS regression results for the effect of academic directors on firm stock performance during the 2007-2009 financial crisis period. The dependent variable is *BHAR (Crisis)*, which is the buy-and-hold abnormal returns during the financial crisis period. *Academic* is a dummy variable that equals one if a firm has at least one academic director; it equals zero otherwise. *Firm Size* is the natural log of the firm's total assets. *Leverage* is the ratio of total liabilities to total assets. *M/B* is the market value of equity to the book value of equity. *ROA* is the ratio of net income before extraordinary items and discontinued operations to its book value of assets. *CEO Tenure* is the number of years the executive has been CEO of the firm. *Segments* is the number of two-digit SIC codes in which the firm operates. *Beta* is calculated by regressing a firm's monthly stock returns five years before the crisis period on the corresponding NYSE/AMEX/NASDAQ Value-Weighted Index from CRSP. All variables are measured at the end of fiscal year 2006 in Columns 1 and 2, and at the end of fiscal year 2007 in Column 3. We estimate our regressions using indicator variables for a firm's primary two-digit SIC code to control for industry differences. Heteroskedasticity robust t-statistics are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)
VARIABLES	BHAR (October 2007 to March 2009)	BHAR (December 2007 to June 2009)	BHAR (September 2008 to March 2009)
Academic	0.105***	0.109***	0.055***
	(5.72)	(5.90)	(3.69)
Firm Size	-0.010*	0.001	0.001
	(-1.65)	(0.09)	(0.13)
Leverage	-0.132**	-0.172***	-0.076*
	(-2.33)	(-3.04)	(-1.66)
M/B	0.017**	0.032***	0.025***
	(2.25)	(4.24)	(4.04)
ROA	-0.227*	-0.324***	-0.183*
	(-1.89)	(-2.70)	(-1.89)
CEO Tenure	0.001	0.001	0.001
	(1.06)	(1.16)	(1.37)
Segments	0.003	0.004	-0.007*
	(0.66)	(0.85)	(-1.82)
Beta	-0.244***	-0.250***	-0.178***
	(-13.60)	(-13.89)	(-12.26)
Industry fixed effect	Y	Y	Y
Observations	876	876	876
Adjusted R-square	0.345	0.368	0.328

Table 7: Long-Run Market Reactions to the Appointments of Academic Directors

This table presents time-series regressions of monthly stock returns of firms after they appoint academic directors on boards. We use Fama and French's three-factor model

$$(R_{pt} - R_{ft}) = \alpha + \beta(R_{mt} - R_{ft}) + sSMB_t + hHML_t + \varepsilon_t$$

where R_{pt} is the return on the portfolio of sample firms in month *t*; R_{mt} is the return on the equally-weighted index of NYSE, Amex, and NASDAQ stocks in month *t*; R_{ft} is the 3-month T-bill yield in month *t*; SMB_t is the return on small firms minus the return on large firms in month *t*; and HML_t is the return on high book-to-market stocks minus the return on low book-to-market stocks in month *t*. The factor definitions are described in Fama et al. (1993). The sample period is January 1998 to December 2011 (168 months). Values of the t-statistics are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	α	β	s	h	Adjusted R-square
Panel A: One-year market performance after the announcements of academic directors (N=1,145)					
	0.004**	1.073***	0.224***	0.375***	0.852
	(2.12)	(27.15)	(4.27)	(6.93)	
Panel B: Two-year market performance after the announcements of academic directors (N=1,145)					
	0.003*	1.034***	0.323***	0.442***	0.883
	(1.70)	(35.28)	(8.21)	(10.53)	
Panel C: Three-year market performance after the announcements of academic directors (N=1,145)					
	0.002**	1.023***	0.295***	0.461***	0.896
	(2.28)	(37.31)	(7.91)	(12.16)	

Table 8: Comparison between Academic Directors and nonacademic independent Directors

This table presents univariate test on the differences between academic independent directors and nonacademic independent directors. *Less Attendance* is a dummy variable that equals one if a director attends less than 75% of board meetings in given year; it equals zero otherwise. *Committee Membership* is the total number of committee memberships (including nomination committee, compensation committee, audit committee, and governance committee) a director has. *Audit Committee (Dummy)* is a dummy variable that equals one if a director is also an audit committee member, and zero otherwise. *Governance Committee (Dummy)* is a dummy variable that equals one if a director is also a governance committee member, and zero otherwise. *Nomination Committee (Dummy)* is a dummy variable that equals one if a director is also a nomination committee member, and zero otherwise. *Compensation Committee (Dummy)* is a dummy variable that equals one if a director is also a compensation committee member, and zero otherwise. *Female Director (Dummy)* is a dummy variable that equals one if a director is a female; it equals zero otherwise. *Minority Director (Dummy)* is a dummy variable that equals one if a director is minority; it equals zero otherwise. *Director Ownership* is a director's percentage ownership of all shares outstanding. *Director Age* is the age of a director. *Director Tenure* is the tenure of a director. The means of the differences between the variables for two subsamples and values of *t*-statistics are also reported. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively.

	Nonacademic Independent Directors			Academic Independent Directors				
	n	mean	sd	n	mean	sd	Difference	t value
Less Attendance (Dummy)	131,735	0.021	0.13	10,456	0.016	0.12	-0.005***	(-3.66)
Committee Membership	131,735	1.750	1.09	10,456	1.783	1.09	0.033***	(3.07)
Audit Committee (Dummy)	131,735	0.463	0.49	10,456	0.506	0.50	0.043***	(8.83)
Governance Committee (Dummy)	131,735	0.362	0.48	10,456	0.405	0.49	0.043***	(9.02)
Nomination Committee (Dummy)	131,735	0.422	0.49	10,456	0.462	0.50	0.040***	(8.17)
Compensation Committee (Dummy)	131,735	0.493	0.50	10,456	0.420	0.49	-0.073***	(-14.66)
Female Director (Dummy)	131,735	0.125	0.33	10,456	0.236	0.42	0.111***	(32.91)
Minority Director (Dummy)	131,735	0.604	0.49	10,456	0.692	0.46	0.088***	(18.14)
Director Ownership (%)	131,735	0.169	1.46	10,456	0.024	0.45	-0.145***	(-9.67)
Director Age	131,735	60.266	8.34	10,456	61.538	7.19	0.272***	(3.30)
Director Tenure	131,735	9.230	6.72	10,456	8.812	5.83	-0.418***	(-6.32)

Table 9: The Monitoring and Advising Roles of Academic Directors

Panel A presents the results on the relation between academic directors and CEO compensation and CEO turnover. Panel B presents the results on the relation between academic directors and earnings management and stock price informativeness. Panel C presents the results on the relation between academic directors and innovation and acquisition performance. *CEO Total Compensation* is the total compensation of the CEO. *CEO Forced Turnover* equals one if a CEO was forced out. *Discretionary Accruals* is calculated based on the modified cross-sectional Jones model (Jones, 1991) as described in Dechow, Sloan and Sweeney (1995). *AAER* is a dummy variable, which equals one if the firm is subject to SEC enforcement action for a given fiscal year, and zero otherwise. *Stock Price Informativeness* is the logistic transformation of the ratio $(1-R^2_{i,t})/R^2_{i,t}$. $R^2_{i,t}$ is calculated from regressing firm weekly returns on industry weekly returns (Fama and French industry) and market returns for each firm year. *Patent* is the count of number of patents. *Citation* is the number of citations. Patent and citation information comes from the NBER patent dataset. *CAR (-1, 1)* is cumulative abnormal returns over the 3-day acquisition announcement window (-1, 1) for acquirer firms. *Academic* is a dummy variable that equals one if a firm has at least one academic director; it equals zero otherwise. *Academic Audit* is a dummy variable that equals one if a firm has at least one academic director who is also an audit committee member; it equals zero otherwise. Other control variables are the same as in Table 4. They include following variables. *Independence* is the percentage of independent directors (exclude academic directors) on the board. *Board Size* is the natural log of the total number of directors. *Duality* is a dummy variable that equals one if the CEO is also the chairman; it equals zero otherwise. *Firm Size* is the natural log of the firm's total assets. *Leverage* is the book value of debt over total assets. *R&D* equals total R&D expenditures divided by total assets. *Cash* is cash and short-term investments over total assets. *Cum. Sales Growth* is the compounded annual growth rate of sales over the last three years. *Insider Ownership* is the percentage of outstanding shares top management owns. Values of the heteroskedasticity robust t-statistics / z-statistics are in parentheses. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively.

Panel A: CEO compensation and CEO turnover

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	Logit
VARIABLES	CEO Total Compensation	CEO (Cash+Bonus)	CEO (Stock+Option)	CEO Forced Turnover
Academic	-173.423**	-229.252***	56.235	0.309
	(-2.12)	(-3.31)	(0.74)	(1.34)
Industry Adjusted Return				-0.977***
				(-3.02)
Academic*Industry Adjusted Return				-0.808**
				(-1.98)
Control variables	Y	Y	Y	Y
Firm cluster	Y	Y	Y	Y
Firm fixed effect	Y	Y	Y	N
Year fixed effect	Y	Y	Y	Y
Observations	15,991	15,991	15,991	14,308
Adjusted/ Pseudo R-square	0.042	0.071	0.201	0.078

Panel B: Earnings quality and Price informativeness

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	Logit	OLS	OLS	Logit	OLS
VARIABLES	Discretionary Accruals	AAER	Stock Price Informativeness	Discretionary Accruals	AAER	Stock Price Informativeness
Academic	-0.184***	-0.382*	0.017***			
	(-2.93)	(-1.88)	(2.67)			
Academic Audit				-0.303***	-0.518**	0.019*
				(-3.64)	(2.24)	(2.85)
Control variables	Y	Y	Y	Y	Y	Y
Firm cluster	Y	Y	Y	Y	Y	Y
Firm fixed effect	Y	N	Y	Y	N	Y

Year fixed effect	Y	Y	Y	Y	Y	Y
Observations	13,834	15,991	12,713	13,834	15,991	12,713
Adjusted/ Pseudo R-square	0.131	0.114	0.662	0.136	0.115	0.662

Panel C: Innovation and M&A

	(1)	(2)	(3)
	OLS	OLS	OLS
VARIABLES	Log (Patent)	Log (Citation)	CAR(-1,1)
Academic	0.122**	0.178**	0.009**
	(2.34)	(2.02)	(2.46)
Control variables	Y	Y	Y
Firm cluster	Y	Y	Y
Firm fixed effect	Y	Y	Y
Year fixed effect	Y	Y	Y
Observations	4,689	3,901	9,551
Adjusted R-square	0.891	0.826	0.132

Table 10: Professors with Administrative Jobs vs. Professors without Administrative Jobs

This table presents OLS regressions results of the relation between professor/administrative academic directors and firm performance. The dependent variables are Tobin's Q, which is the ratio of the firm's market value to its book value. *Professor* is a dummy variable that equals one if a firm has at least one academic director without an administrative job; it equals zero otherwise. *Administrative* is a dummy variable that equals one if a firm has at least one academic director with an administrative job; it equals zero otherwise. *Less Attendance* is a dummy variable that equals one if there is at least one board member attends less than 75% of board meetings in given year; it equals zero otherwise. Other control variables are the same as in Table 4. They include following variables. *Independence* is the percentage of independent directors (exclude academic directors) on the board. *Board Size* is the natural log of the total number of directors. *Duality* is a dummy variable that equals one if the CEO is also the chairman; it equals zero otherwise. *Firm Size* is the natural log of the firm's total assets. *Leverage* is the book value of debt over total assets. *R&D* equals total R&D expenditures divided by total assets. *Cash* is cash and short-term investments over total assets. *Cum. Sales Growth* is the compounded annual growth rate of sales over the last three years. *Insider Ownership* is the percentage of outstanding shares top management owns. All firm characteristics are measured with a one-year lag compared to Q. Values of the heteroskedasticity robust t-statistics are in parentheses. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively.

	(1)	(2)	(3)
VARIABLES	Q	Q	Q
Professor	0.081***		
	(3.27)		
Administrative		-0.005	0.010
		(-0.32)	(0.56)
Less Attendance (Dummy)			-0.005
			(-0.36)
Administrative * Less Attendance (Dummy)			-0.081*
			(-1.91)
Control variables	Y	Y	Y
Firm cluster	Y	Y	Y
Firm fixed effect	Y	Y	Y
Year fixed effect	Y	Y	Y
Observations	15,991	15,991	15,991
Adjusted R-square	0.709	0.708	0.709

Table 11: Backgrounds of Academic Directors and Firm Performance

Column1 presents regression results on how academic directors' educational backgrounds affect firm performance. Column 2 presents regression results on how academic directors' personal backgrounds affect firm performance. The dependent variables are Tobin's Q, which is the ratio of the firm's market value to its book value. *Business* is a dummy variable that equals one if a firm has at least one academic director with Ph.D. in finance, accounting, marketing, management, or economics; it equals zero otherwise. *Technology* is a dummy variable that equals one if a firm has at least one academic director with Ph.D. in science or engineering; it equals zero otherwise. *Political* is a dummy variable that equals one if a firm has at least one academic director with Ph.D. in political science; it equals zero otherwise. *Law* is a dummy variable that equals one if a firm has at least one academic director with a JD; it equals zero otherwise. *Medical* is a dummy variable that equals one if a firm has at least one academic director with an MD; it equals zero otherwise. *Education* is a dummy variable that equals one if a firm has at least one academic director with a Ph.D. degree in education; it equals zero otherwise. *Female Academic Director* is a dummy variable that equals one if at least one academic director is female; it equals zero otherwise. *Academic Director Age* is the natural log of academic directors' age. *Academic Director Tenure* is the natural log of academic directors' tenure. *Academic Directorship* is the average number of directorships academic directors hold. *Academic Director Ownership* is the academic directors' percentage ownership of all shares outstanding. Other control variables are the same as in Table 4. They include following variables. *Independence* is the percentage of independent directors. *Board Size* is the natural log of the total number of directors. *Duality* is a dummy variable that equals one if the CEO is also the chairman; it equals zero otherwise. *Firm Size* is the natural log of total assets of the firm. *Leverage* is the book value of debt over total assets. *R&D* equals total R&D expenditures divided by total assets. *Cash* is cash and short-term investments over total assets. *Cum. Sales Growth* is the compounded annual growth rate of sales over the last three years. *Insider Ownership* is the percentage of outstanding shares top management owns. All firm characteristics are measured with one-year lag compared to Q. Values of the heteroskedasticity robust t-statistics are in parentheses. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively.

	(1)	(2)
VARIABLES	Q	Q
Business	0.220***	
	(4.99)	
Technology	0.193***	
	(4.13)	
Political	0.133**	
	(2.21)	
Law	0.064	
	(1.29)	
Medical	0.076	
	(1.44)	
Education	0.078	
	(0.95)	
Female Academic Director		0.074
		(0.59)
Academic Director Age		-0.019*
		(-1.72)
Academic Director Tenure		0.016**
		(2.24)
Academic Directorship		0.003
		(0.08)
Academic Director Ownership		0.004
		(0.52)
Inverse Millers Ratio	0.131	0.165
	(1.38)	(0.59)
Control variables	Y	Y
Firm cluster	Y	Y
Firm fixed effect	Y	Y
Year fixed effect	Y	Y
Observations	6,354	6,354
Adjusted R-square	0.821	0.818

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