12-7-2012

Two Essays on the Board's Uncertainty About the Contracting Environment and CEO Compensation Contracts

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TWO ESSAYS ON THE BOARD'S UNCERTAINTY ABOUT THE CONTRACTING ENVIRONMENT AND CEO COMPENSATION CONTRACTS

BY

BUNYAMIN ONAL

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree

Of

Doctor of Philosophy

In the Robinson College of Business

Of

Georgia State University

GEORGIA STATE UNIVERSITY
ROBINSON COLLEGE OF BUSINESS
2012

ACCEPTANCE

This dissertation was prepared under the direction of Bunyamin Onal's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctoral of Philosophy in Business Administration in the J. Mack Robinson College of Business of Georgia State University.

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ABSTRACT

TWO ESSAYS ON THE BOARD'S UNCERTAINTY ABOUT THE CONTRACTING ENVIRONMENT AND CEO COMPENSATION CONTRACTS

BY

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July 16, 2012

Committee Chair: Dr. Omesh Kini

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Essay 1: To delegate or not to delegate to stock markets: The case of boards with related industry expertise

Abstract: I examine the extent to which boards with expertise in related product markets, i.e., downstream (customer) or upstream (supplier) industries, delegate their monitoring and advisory functions to stock markets. Directors from related industries (*DRIs*) are argued to have greater access to information about the input and output product markets of the firm. This, in turn, is predicted to reduce the reliance on stock-based compensation, a costly mechanism, particularly for firms that depend more on information about product markets and whose stock prices are not very informative about product markets. The evidence documented in this paper is largely consistent with these predictions. A number of additional tests suggest that this evidence is not likely to be explained by the potential conflict of interests between the firm's stockholders and *DRIs*. Hence, I conclude that boards with related industry expertise delegate to stock markets to an optimally lesser extent due to their informational advantages.

Essay 2: Stock-based CEO compensation following conglomerate acquisitions

Abstract: I examine how stock-based incentive compensation for the CEO is designed following corporate acquisitions conditional on the economic nature of the acquisition. Large acquisitions represent significant changes in the economic environment of the firm. Furthermore, these changes are more likely to occur with conglomerate acquisitions. Accordingly, implications of the two mainstream theories of incentive compensation, i.e., efficient contracting theory and agency theory, are tested separately for conglomerate acquisitions. The empirical tests generally show that stock-based compensation is employed more intensely after conglomerate acquisitions than otherwise. Overall, the results documented in this paper seem consistent with the notion that greater economic uncertainties that are likely to follow conglomerate acquisitions induce the board to rely more heavily on stock-based incentives, an external monitoring mechanism.

SPECIAL THANKS AND DEDICATIONS

I owe my most special thanks to my main adviser and mentor Omesh Kini for his patience, wisdom and endless support. I am also extremely grateful to my committee members Mark Chen, Nishant Dass, Vikram Nanda and Chip Ryan for their encouragement, guidance and cooperation. I would like to thank profusely our department chair Gerald Gay, all the other faculty members, the PhD students, our department manager Christine Brown and coordinators Mocha Trimier and Theresa Hand at the Department of Finance of Georgia State University for their help and support during my studies and job search. Finally, I am very thankful to Eyup Ozveren at the Department of Economics of Middle East Technical University and Cem Karayalcin, Jesse Bull and Nejat Anbarci at the Department of Economics of Florida International University for motivating me to pursue an academic career.

I dedicate this dissertation to my devoted parents Abdurrahman Onal and Sabire Onal, my big brother and lifetime mentor Muhammed Islami Onal, my other big brother Ilhami Onal, my two little brothers Maksut Onal and Recai Onal and my little sister Mudrike Onal.

To Delegate or Not to Delegate to Stock Markets?
The Case of Boards with Related Industry Expertise

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Current Draft: July 2012

Abstract

I examine the extent to which boards with expertise in related product markets, i.e., downstream (customer) or upstream (supplier) industries, delegate their monitoring and advisory functions to stock markets. Directors from related industries (*DRIs*) are argued to have greater access to information about the input and output product markets of the firm. This, in turn, is predicted to reduce the reliance on stock-based compensation, a costly mechanism, particularly for firms that depend more on information about product markets and whose stock prices are not very informative about product markets. The evidence documented in this paper is largely consistent with these predictions. A number of additional tests suggest that this evidence is not likely to be explained by the potential conflict of interests between the firm's stockholders and *DRIs*. Hence, I conclude that boards with related industry expertise delegate to stock markets to an optimally lesser extent due to their informational advantages.

JEL Classification: D8; J3; G3
Keywords: Board of Directors; Related Industries; Stock-Based CEO Compensation; Pay-for-Performance Sensitivity; Forced CEO Turnovers; Pay for Sector Performance

* I am grateful to Mark Chen, Nishant Dass, Radhakrishnan Gopalan, Wayne Guay, Omesh Kini, Vikram Nanda, and Chip Ryan for helpful comments and suggestions. I also thank seminar and workshop participants at Aalto University, Bilkent University, Rotterdam School of Management, Essec Business School, Georgia State University, Ozyegin University, and Sabanci University. I thank Stephen Brown for sharing his quarterly estimates of probability of informed trading, Nishant Dass for sharing his data on counties of all Compustat firms and Husayn Shahrur and Ryan Williams for sharing their data on the identities of customer firms from Compustat segment tapes. I acknowledge financial support from Max Burns Fellowship. All remaining errors are mine. Contact information: Suite 1229, Department of Finance, Georgia State University 35 Broad St. Atlanta, GA 30303 Email: bonal1@gsu.edu Phone: (404) 413-7318.

"Obviously, if shareholders (or board of directors) could directly observe the firm's opportunities and the executives' actions and know beforehand which actions would maximize shareholder wealth, no incentives would be necessary."

Core, Guay, and Larcker (2003)

The role of corporate boards has recently been examined using a conceptual framework where there is a tradeoff between intense monitoring of management and value-enhancing information flows from management to the board.[1] In general, however, the board may not be entirely dependent on management for strategic information. I argue, in this paper, that directors who serve a significant role in downstream (customer) or upstream (supplier) industries of the firm can act as a conduit of information about the firm's product markets and opportunity set.[2] This is because multiple roles in economically-connected industries can provide a director with less costly access to private information on current and possible future developments in these industries such as the degree and likelihood of demand and supply shocks, major changes in corporate policies or in market structures through acquisitions or spinoffs, and so forth. Thus, a director from related industries (*DRI*) has the potential to expand the board's information set about the opportunities of the firm and optimality of executive actions. A natural question that arises from these arguments and the excerpt from Core, Guay, and Larcker (2003), then, is whether *DRIs* are associated with less reliance on incentive mechanisms. I examine stock-based incentives in CEO compensation contracts to address this question.

The extant literature indicates that the choice of board composition and its effect on firm value depend critically on information-related factors such as complexity of the firm (e.g., Coles, Daniel, and Naveen, 2008), availability and quality of sources of information such as analyst forecasts (e.g., Duchin, Matsusaka, and Ozbas, 2010) or informative stock prices (e.g., Ferreira,

[1] Adams and Ferreira (2007), for example, develop a model where the monitoring role of the board is traded off against information flows from the CEO to the board that enhance the advisory role of the board. Adams, Hermalin and Weisbach (2010) provide an extensive survey of recent theoretical studies on the role of directors.

[2] For example, Arthur Martinez, a director of PepsiCo since 1999, serves also as a director at International Flavors and Fragrances Inc., a firm in a supplier industry of PepsiCo. Mr. Martinez is argued to have access to more information about the developments in the supply chain of beverage industry than a director without an economic link to PepsiCo's industry, such as Victor Dzau, M.D., another director on PepsiCo's board and, at the same time, the Chancellor for Health Affairs and President and CEO of Health System at Duke University.

Ferreira, and Raposo, 2008), and geographical distance of directors from the firm's headquarters (Alam, Chen, Ciccotello, and Ryan, 2010). Thus, firms seem to take into account the availability of information to director candidates along with their other qualifications such as political connections (Goldman, Rocholl, and So, 2009) or financial expertise (Guner, Malmendier, and Tate, 2008) before appointing them. The amount and quality of information available to its members determine the board's uncertainty about the operating environment of the firm and optimality of executive actions, which in turn determines the way it conducts its role. Stock-based compensation, on the other hand, ties CEO pay to the stock price which is based on the information produced in the stock market. It can be interpreted as the mechanism through which the board delegates its monitoring (and advising) functions to stock investors. Further, the degree of this delegation is expected to depend on the uncertainties faced by the board (Prendergast, 2000; 2002). Therefore, to the extent that the flow of information from *DRIs* can reduce such uncertainties, boards with these directors are likely to resort less to the stock-based incentive mechanism and substitute it with board monitoring and advising.[3] Consequently, *DRIs* are expected to be associated with a lower sensitivity of CEO pay to the stock price (*PPS*). The hypothesis based on the preceding arguments and the resulting prediction is coined the *Information Hypothesis*.

Weaker stock-based incentives can, however, also be an outcome of potential conflict of interests between *DRIs* and shareholders. At least some *DRIs* are expected to be the agents of customer or supplier firms that maintain trading relationships with the incumbent CEO. Others may collaborate with the CEO for that purpose. The CEO may further have influence over current or future employment opportunities of *DRIs*, particularly in related industries. Through these and other possible channels, the CEO who is risk averse and prefers a more stable compensation can create incentives for *DRIs* to help him extract a contract that features lower sensitivity to the stock price. The hypothesis that formalizes these arguments and also predicts a lower *PPS* in the presence of *DRIs* is coined the *Conflict-of-Interests Hypothesis*.

[3] The information flow from a *DRI* is to the board and is argued to reduce the uncertainties that predicate the board's ability to monitor and to advise. It is unlikely to have any effect on the uncertainty in the stock price, i.e., stock volatility, because directors are legally bound to not trade on their information or transmit it to stock markets. Therefore, the effect of *DRIs* on stock-based compensation is not expected to be through any changes in stock volatility.

A crucial implication of the *Information Hypothesis* is that the information that *DRIs* can provide must be associated with their industry expertise. Hence, their impact on *PPS* is expected to be more negative for firms with greater dependence on information about customer and supplier industries.[4] Another important implication of the *Information Hypothesis* pertains to the informativeness of the stock price. Firms whose stock prices are less informative about product markets are more likely to substitute its board members' information for stock-based compensation. Under this scenario, then, *DRIs* are expected to have a more negative effect on *PPS* when the firm's stock price is less informative. As discussed earlier, the *Conflict-of-Interests Hypothesis* also predicts lower *PPS*. Therefore, to understand the underlying explanation for any effect of *DRIs* on *PPS*, I also derive and test a number of implications of the *Conflict-of-Interests Hypothesis*.[5] One implication, for example, is that dependent *DRIs*, i.e., those who are expected to be under CEO influence, are associated with a lower *PPS* than independent *DRIs*.[6]

Pay for sector performance (*PSP*) is another type of stock-based incentive contracts that has received considerable attention. Standard models suggest that the agent should not be compensated for luck, i.e., factors that are beyond his control, as introducing luck into his compensation makes it riskier without providing additional incentives (e.g., Holmstrom, 1979). This prediction, however, is not supported by empirical studies which commonly use sector performance as their measure of luck (e.g., Bertrand and Mullainathan, 2001).[7] Subsequent studies provide explanations consistent with the optimal contracting theory. Among others,[8] Gopalan, Milbourn, and Song (2010) suggest that *PSP* gives the CEO incentive to choose the optimal level of exposure to the firm's primary sector. Optimal sector exposure, on the other

[4] For example, sales of firms that produce differentiated products are likely to be more sensitive to demand and supply shocks. Thus, the information that *DRIs* can provide is more relevant for these firms.
[5] A summary of all implications of the *Information* and the *Conflict-of-Interests Hypotheses* is presented in Table 1.
[6] The other implications of the *Conflict-of-Interests Hypothesis* are as follows. The level of CEO pay is expected to be significantly higher in the presence of *DRIs*. Furthermore, the conflict, if any, and thereby the negative impact on *PPS* is expected to be stronger with directors from active customers and suppliers of the firm than it is with *DRIs* from firms with no trading relationship with the firm. Finally, any asymmetry in the sensitivity of CEO pay to positive and negative stock returns is likely to be greater in the presence of *DRIs*.
[7] Bertrand and Mullainathan's other proxies for luck, that is, prices in the oil industry and exchange rates in traded goods sectors are also related to product markets.
[8] See, e.g., Aggarwal and Samwick (1999b), Garvey and Milbourn (2003), Oyer (2004) and Rajgopal, Shevlin, and Zamora (2006).

hand, clearly depends on developments in key input and output product markets. A permanent shock to these markets, for example, is expected to change conditions in the sector and the degree to which the firm should be exposed to that sector. Therefore, the information and advice that *DRIs* can offer may help the CEO identify optimal sector exposure with less effort. Correspondingly, the *Information Hypothesis* predicts the extent of *PSP* to be smaller for firms with *DRIs*. On the other hand, the *Conflict-of-Interests Hypothesis* suggests that boards with *DRIs* will lower *PSP* only in the case of negative sector performance.

My empirical tests of these predictions use a large dataset on directors and officers drawn from *Compact Disclosure*. To identify directors with more than one position in related industries, I first match the SIC industry code(s) associated with one position of a director to SIC industry codes of his other positions in the same year.[9] I then identify the pairs of SIC codes that are vertically related using benchmark input-output tables published every five years by the Bureau of Economic Analysis. More specifically, suppose that a given firm is in industry *i* and one of its directors is also an executive or director in industry *j*. To quantify the vertical relatedness of industry *j* to industry *i*, I compute the proportion of output products of industry *i* sold to industry *j* and the proportion of input products of industry *i* bought from industry *j*. If the sum of these proportions exceeds 1% (5%), then industry *j* is classified as vertically related to industry *i* at the 1% (5%) vertical-relatedness threshold and the corresponding director is considered to be from a related industry (*DRI*). As the main explanatory variable in *PPS* regressions, I use either a dummy variable that equals one if the firm has at least one *DRI* on its board or the proportion of *DRIs* on the board. I refer to these variables as *DRI Measures*. Merging the data on compensation from *ExecuComp* with the data on directors leads to a sample of 19,616 firm-year observations that span the period 1993 – 2005. About 56% (24%) of this sample involves at least one director from related industries where related industries are identified using the 1% (5%) vertical-relatedness threshold.

Overall, the results documented in this paper are largely consistent with the *Information Hypothesis*. Univariate tests show that firms with *DRIs* have significantly higher stock-based compensation. However, after controlling for other determinants of *PPS* such as firm size, *DRIs*

[9] Matching to the positions over the last two years and defining *DRI* accordingly yield qualitatively similar results.

are found to have a negative effect on *PPS*. This implies that had those firms not appointed *DRIs* on their board, they would have used greater stock-based compensation. The negative effect of *DRIs* on *PPS* holds with a variety of alternative measures of *DRIs* and *PPS*.[10] More crucially, among the subsample of firms that produce differentiated products or have low stock price informativeness, those with *DRIs* are more likely to lower *PPS*, consistent with the *Information Hypothesis*.[11] These findings suggest that the information that *DRIs* can bring to the table is more likely to be employed by the board when it is more relevant and when the private information conveyed by the firm's stock price is limited.

As discussed earlier, lower *PPS* in the presence of *DRIs* is also consistent with the *Conflict-of-Interests Hypothesis.* Thus, I conduct several additional tests as an attempt to uncover the main reason. First, using the *IRRC* (now *RiskMetrics*) database, *DRIs* are classified as independent or dependent and as non-co-opted or co-opted (Coles, Daniel and Naveen, 2010).[12] I find that *PPS* is significantly lower largely for firms with independent or non-co-opted *DRIs* rather than dependent or co-opted *DRIs*, inconsistent with the *Conflict-of-Interests Hypothesis*,. Second, I examine the influence of *DRIs* on the level of CEO compensation. Under the *Conflict-of-Interests Hypothesis*, CEO compensation is predicted to be higher in the presence of *DRI*s. Inconsistent with this prediction, I find an insignificant relationship between the level of compensation and *DRIs.* Third, if *DRIs* have conflicted interests, they are expected to be associated with a lower *PPS* only when the stock price are heading downward. CEO pay is found to be equally less sensitive to the positive stock return with *DRIs* on the board. Last, but not the least, *DRIs* that represent the active suppliers or customers of the firm on the board are likely to face a more severe conflict with shareholders than *DRIs* from firms with no business ties to the firm. Hence, the effect of directors from customer and supplier firms on *PPS* should be more negative than otherwise. To test this possibility, I first identify directors that represent customer or supplier firms listed in *Compustat* segment tapes. I observe that 465 firm-year observations involve a director from either a supplier or a customer firm. These directors do not seem to have

[10] I also find that serving on the compensation committee is not necessary for *DRIs* to communicate their information that has influence on the compensation contract.

[11] In unreported regressions, it is also documented that, among firms with *DRIs*, those in differentiated industries and those with low stock price informativeness are more likely to reduce their use of stock-based pay.

[12] Co-opted directors are defined as directors who are appointed after the incumbent CEO assumed the CEO post.

a significant effect on *PPS*. Hence, the negative relationship between *DRIs* and *PPS* is, on average, not likely to be explained by a possible conflict between *DRIs* and shareholders.

The *PPS* measure described above captures the sensitivity of CEO compensation to the stock price but does not account for the possibility that the CEO is replaced. Therefore, I also test whether *DRIs* are related to the sensitivity of non-routine CEO turnovers to the stock price in a similar way that they are to *PPS*. The economic magnitude of the sensitivity of forced CEO turnovers to the recent stock performance is smaller especially for firms with independent or non-co-opted *DRIs*, consistent with earlier findings. However, this effect is statistically insignificant in many cases. This implies that boards with *DRIs* act more consistently with the stock market at the stage where the stock price signals the need for forcefully replacing the incumbent CEO. Finally, I investigate how directors from related industries affect pay for sector performance. Consistent with earlier studies, I confirm that CEOs are paid for sector performance. *DRIs*, on the other hand, are associated with lower pay for sector performance (*PSP*). Following Garvey and Milbourn (2006), I also look into the asymmetry of *PSP*. Consistent with the *Information Hypothesis* and inconsistent with the *Conflict-of-Interests Hypothesis*, *DRIs* are associated with a lower sensitivity of pay to positive sector performance. Further support for the *Information Hypothesis* is provided by the evidence that *DRIs* impact on *PSP* is observed primarily in industries with more research and development (R&D) activities. This implies that *DRIs* are effective particularly in environments with potentially greater industry-related information challenges such as high-R&D industries.[13] [14]

In my empirical analysis, it is necessary to account for the possibility that there are factors leading to both the presence of *DRIs* on the board and lower PPS. To address this concern, I first use the Heckman treatment effects model, where in the first stage, a number of industry and firm characteristics are employed to control for selection of *DRIs*. Moreover, I employ instrumental variables that are both economically meaningful and also pass the validity

[13] In unreported regressions, I also find that the *DRIs* are associated with lower pay for sector performance only for firms producing differentiated products.

[14] This evidence can also mean that *DRIs* play a role in the choice of the degree of sector exposure when the firm has the strategic flexibility to change its exposure, to the extent that R&D activities measure such flexibility.

and the relevance tests.[15] Finally, to control for potential simultaneity biases, *PPS* and *DRI* regressions are estimated simultaneously. The main findings in the paper are robust to all these alternative estimation methods.

Given the arguments and findings in the paper, the question that arises is why all firms do not have *DRIs* on their board. There are a number of reasons why this might be the case. First of all, the board may fear leakage of strategic information from the firm to interested parties through *DRIs*. Secondly, there is always the risk of being subject to antitrust scrutiny and lawsuits for having directors from firms in related industries especially when two firms with common directors are competitors at least in one line of business.[16] Finally, assuming that there is an optimal board size for every firm (e.g., Yermack, 1996; Coles, Daniel, and Naveen, 2008), boards are expected to be highly selective in appointing their members. Only firms with certain characteristics such as producers of differentiated products are likely to benefit from directors with expertise in related product markets more than they would from directors, say, with financial expertise or political connections.

This paper contributes particularly to the literature on incentive contracts: (i) pay-for-performance sensitivity (e.g., Jensen and Murphy, 1990; Yermack, 1995; Guay, 1999; Core and Guay, 1999; Aggarwal and Samwick, 1999a; Prendergast, 2000, 2002; Coles Daniel, and Naveen, 2006); (ii) CEO replacement decisions (e.g., Weisbach, 1988; Parrino, 1997; Huson, Parrino, and Starks, 2001; Kaplan and Minton, 2008; Jenter and Kanaan, 2010); (iii) pay for sector performance (e.g., Bertrand and Mullainathan, 2001; Garvey and Milbourn, 2006; Gopalan Milbourn, and Song, 2010). It introduces an important factor that affects the design of

[15] Instrumental variables that I employ are the supply of *DRIs* within 100 miles of the county of the firm's headquarters, the average pair-wise correlation of the firm's industry returns with its supplier and customer industry returns, the number of supply chain industries and the industry median value of the respective *DRI* measure (calculation excludes the firm itself). There is no a priori reason for any of these variables to be related to stock-based compensation decisions of the firm.

[16] The Clayton Antitrust Act of 1914 prohibits interlocking directorates between rival companies. A salient example for concerns about antitrust scrutiny as well as leakage of information is the case of Google and Apple. Eric Schmidt, CEO of Google, and Arthur Levinson, former CEO of Genentech, were the common directors of the two companies in 2009 when the companies came under antitrust scrutiny. Besides, in response to critics of Mr. Schmidt's directorship at Apple, Google noted that he recused himself from board meetings when Apple's board discussed mobile phones – a business line for both companies. The following article on NY Times provides more detail on this case: http://www.nytimes.com/2009/05/05/technology/companies/05apple.html?src=sch.

incentive contracts – presence of directors who can bring sector-related information.[17] The broader contribution is to the literature on the role of directors.[18] The primary focus of theoretical and empirical studies on boards has been on board structure and how it relates to firm value (e.g. Hermalin and Weisbach, 1998; Raheja, 2005; Boone, Field, Karpoff, and Raheja, 2007; Adams and Ferreira, 2007; Harris and Raviv, 2008; Coles, Daniel, and Naveen, 2008; Linck, Netter, and Yang, 2008; Duchin, Matsusaka, and Ozbas, 2010). This paper complements the work of Dass, Kini, Nanda, Onal, and Wang (2011) in that both studies emphasize a novel characteristic of boards—the presence of *DRIs*—which is driven by the economic needs of the firm. In addition to documenting that *DRIs* lead to higher firm value, they find that firms with *DRIs* do not experience a decline in value following a sales shock which implies that their management are better informed about these shocks. This result can be interpreted as a direct evidence of the information role of *DRIs*.

The board is, in general, assumed to serve a dual role: monitoring and advising. This study contributes to the literature on both fronts. The most related strand of literature studies the interaction between different governance mechanisms. Stock-based compensation can be viewed as a mechanism through which boards can delegate monitoring to investors (e.g. Holmstrom and Tirole, 1993; Garvey and Swan, 2002). Cai, Liu, and Qian (2009) show that firms facing a greater information asymmetry substitute incentive compensation and exposure to the market for corporate control for direct board monitoring. This paper suggests that firms can also appoint directors with informational advantages to allow for more internal monitoring. The analysis on the choice of sector exposure, on the other hand, is related more to the advisory role of directors.[19] Outside directors are commonly assumed to rely heavily on inside directors for information (e.g., Raheja, 2005; Adams and Ferreira, 2007; Harris and Raviv, 2008). Inside directors, however, have incentive to conceal their private information if they are concerned

[17] Edmans and Gabaix (2009) provide a review of recent theoretical papers that propose some real-life complexities as the reason for seemingly low pay-for-performance sensitivities. *DRIs* can be considered as an additional real-life factor that can explain a lower *PPS* than would otherwise be required, particularly for firms with certain characteristics such as producers of differentiated products.

[18] Hermalin and Weisbach (2003), Becht, Bolton, and Roell (2003) and Adams, Hermalin, and Weisbach (2009) provide surveys of this literature.

[19] The recent spark of research on the advisory role of boards is not surprising given the findings in a number of survey studies such as Mace (1971), Lorsh and MacIver (1989), Demb and Neubauer (1992) and Adams (2009) that the majority of directors consider themselves as advisers rather than monitors.

about retaining their positions in the firm. Hence, unless outside directors are "friendly" or there are other sources of information such as accurate analyst forecasts (Duchin, Matsusaka, and Ozbas, 2010); outside directors are not likely to advise effectively. This paper is an attempt to show that certain types of outside directors are less dependent on inside directors, analysts, or investors for information. Finally, this paper contributes to the literature that links product markets to corporate finance (e.g., Fee and Thomas, 2004; Kale and Shahrur, 2007; Shenoy, 2010). It suggests that greater access to information about product markets affects the design of incentive contracts significantly.

The rest of the paper is organized as follows. In section 2, I lay out the theoretical background and develop hypotheses to be tested. Section 3 describes the data and discusses some of the summary statistics. Empirical analyses and results are provided in Section 4. Finally, section 5 concludes the paper.

2. Theoretical Background and Hypothesis Development

Optimal contracting theory suggests that the agent's compensation should be linked to an observable performance measure to induce the agent to choose the optimal set of actions from the principal's point of view.[20] Furthermore, the strength of this link, coined pay-for-performance sensitivity (*PPS*), should be based on the level uncertainty in the monitoring environment faced by the principal (Prendergast, 2000; 2002).[21] In certain environments, the principal can acquire information readily and monitor actions at a low cost. This alleviates the need for performance-based compensation. In uncertain environments, on the other hand, the cost of monitoring (and advising) is likely to exceed the cost of introducing incentives into the agent's compensation.

Extensions to these arguments can be built on possible information channels available to the board in the context where the board is the principal and the CEO is the agent. The increased amount and quality of information available to the board will enhance its ability to deal with uncertainties. Along these lines, Duchin, Matsusaka, and Ozbas, (2010) take analyst forecasts as a mechanism that expand the information set of directors, while Alam, Chen, Ciccotello, and

[20] See e.g. Mirrlees (1976), Shavell (1979), Holmstrom (1979, 1982).
[21] Prendergast (1999) surveys the evidence on the tradeoff between uncertainty and incentives.

Ryan (2010) consider geographical proximity of directors to the firm headquarters as a proxy for having access to sources of soft information. Stock markets, on the other hand, can also constitute an important source of information not only for managers (e.g., Chen, Goldstein, and Jiang, 2007), but also for the board if stock-based compensation is thought of as a means for the board to utilize the information generated in stock markets. Consequently, the board's reliance on stock-based compensation is expected to be stronger (weaker) when the stock price is more (less) informative (e.g. Holmstrom and Tirole, 1993; Garvey and Swan, 2002; Kang and Liu, 2008; Ferreira, Ferreira, and Raposo, 2011).[22]

In this study, I examine the impact on stock-based compensation of a mechanism that can lead to informational advantages for the board: having directors with greater involvement in the firm's operating environment. Specifically, a director who at the same time holds another directorship or an executive position in a related industry, i.e., an upstream (supplier) or downstream (customer) industry, is argued to produce soft information that is useful in monitoring and advising activities of the board. Boards with directors from related industries (*DRIs*) can, then, substitute its information about product markets for that in stock prices. Hence, *DRIs* are expected to be associated with lower stock-based incentives. Furthermore, information about related industries is more relevant for firms with greater reliance on these industries and for firms with stock prices that contain too much noise. Thus, if there is a negative relationship between *DRIs* and *PPS*, it is more likely to be the case for such firms. These arguments lay the ground for the *Information Hypothesis* and its following implications.

Information Hypothesis:

1. *DRIs are associated with a lower sensitivity of CEO pay to the stock price (PPS).*
2. *DRIs are more negatively related to PPS for firms with tighter economic link to customer/supplier industries and for firms with lower stock price informativeness than otherwise.*

[22] See, also, Paul (1992), Kim and Suh (1993), Goldman and Slezak (2006), Bolton, Scheinkman, and Xiong (2006) for potential costs of stock-based compensation.

Lower *PPS* can also mean that *DRIs* are dependent on the incumbent CEO and help him reduce his exposure to stock markets. Some *DRIs* have trading relationships with the CEO and to protect such relationships, they may provide convincing arguments in support of lower *PPS*. Other *DRIs* may also act in the best interest of the CEO with the expectation of future business relationships. Another channel that the CEO can control a *DRI* is through his influence over that *DRI*'s employment opportunities within the supply chain of the firm. Under these scenarios, *DRIs* are expected to act as agents of the CEO rather than shareholders and, in particular, help the CEO extract a compensation contract with a higher level of compensation and lower sensitivity to the stock price. The hypothesis based on these arguments is referred to as the *Conflict-of-Interests Hypothesis*.

To test the *Conflict-of-Interests Hypothesis*, one can investigate the degree of a *DRI*'s dependence on the CEO and whether that is related to the level of *PPS*. More specifically, according to the *Conflict-of-Interests Hypothesis, DRIs* who are under greater CEO control are expected to reduce *PPS* more than otherwise. Secondly, the CEO can use the help of *DRIs* to justify a higher level of compensation. Hence, the related implication is that CEOs of firms with *DRIs* receive a higher level of compensation. Furthermore, if the CEO, in collaboration with the *DRIs*, is able to foresee the direction of the stock price, the *Conflict-of-Interests Hypothesis* implies that *DRIs* should have a more negative effect on *PPS* when the stock price is heading downward. A final approach that I use to understand the relationship between *DRIs* and stock-based incentives focuses on *DRIs* from active customers and suppliers of the firm. This exercise is based on the assumption that directors from supplier or customer firms have stronger incentives to favor the CEO to maintain their business relationship with him. Hence, the *Conflict-of-Interests Hypothesis* predicts that *DRIs* from active suppliers or customers are associated with a lower *PPS* than *DRIs* from firms with no trading relationship with the firm. A summary of the implications of the *Conflict-of-Interests Hypothesis* that are based on the preceding arguments is as follows.

Conflict-of-Interests Hypothesis:

1. *DRIs under CEO control are associated with a lower PPS than independent DRIs.*
2. *DRIs are associated with a higher level of CEO compensation.*

3. *DRIs are associated with a higher sensitivity of CEO pay to positive stock returns and lower sensitivity to negative stock returns.*

4. *DRIs from active customer or supplier firms of the firm are associated with a lower PPS than the rest of the DRIs.*

The *Information Hypothesis*, on the other hand, predicts an equally lower sensitivity to positive stock returns. It entails no heterogeneity with respect to *PPS* based on the independence of *DRIs* or their business ties with the firm. Finally, it has no implication regarding the level of compensation.

The analysis, thus far, has abstracted away from the possibility that the CEO is replaced by force. The board can, however, also choose to delegate CEO replacement decisions to stock markets to the extent it is uninformed about CEO actions. The empirical implications for the sensitivity of CEO turnovers to stock returns follow directly from the arguments on *PPS*. A lower sensitivity is expected for both the *Information Hypothesis* and the *Conflict-of-Interests Hypothesis*. Thus, to explain the motivation behind lower sensitivity of CEO turnovers to stock returns, I derive similar testable implications for each hypothesis. For example, the *Conflict-of-Interests Hypothesis* predicts the effect of dependent *DRIs* on the sensitivity of CEO turnovers to stock returns to be more negative than that of the independent ones.

Optimal contracting theory also suggests that the agent should not be compensated for factors that they have no control over such as exogenous shocks to the market or the industry as these factors only introduce more risk into the risk-averse agent's compensation without giving him any additional incentive (e.g., Holmstrom, 1979; Diamond and Verrecchia, 1982). Accordingly, if such common factors are observable, then one should find no relationship between these factors and the agent's compensation. Empirical evidence is largely inconsistent with this prediction (see e.g. Murphy, 1985; Janakiraman, Lambert, and Larcker, 1992; Gibbons and Murphy, 1990; Bertrand and Mullainathan, 2001; Garvey and Milbourn; 2006). Bertrand and Mullainathan (2001) conduct three experiments all of which yield support for compensation for observable exogenous factors, i.e., "luck". They observe that CEO compensation is significantly and positively related to the following proxies of luck: (i) oil prices in the oil industry; (ii) exchange rates for firms in the traded goods sector; (iii) year-to-year differences in the average

sector performance. It is important to note that all of these exogenous factors are related to input or output product markets or both, which are argued to be the areas of expertise for *DRIs*.

Empirical studies on pay for sector performance that followed provide explanations that are consistent with optimal contracting theory. Gopalan, Milbourn, and Song (2010), among others,[23] point to another potential role that *DRIs* can play. They model and show that CEOs that have the ability to select the degree of exposure to the firm's sector are also those who are paid for sector performance. With her pay tied to sector performance, the CEO has the incentive to exert the effort to choose the optimal sector exposure from shareholder's perspective. In this context, managers and directors can be said to face an information gap with the input and/or output product markets. Assuming that *DRIs* help bridge that information gap, boards with *DRIs* are likely to advise and evaluate more effectively the choice of sector exposure. Thus, the extent of pay for sector performance (*PSP*) is expected to be less with *DRIs* on the board. Under the *Uncertainty Hypothesis*, it is also expected that the relationship between *DRIs* and *PSP* be stronger when the firm's primary sector involves greater information challenges about its product markets such as high-tech or differentiated industries.

Information Hypothesis:

3. *DRIs are associated with less pay for sector performance and this effect is stronger for firms facing greater information challenges about their primary sector.*

Alternative explanations for pay for sector performance have also been suggested. Bertrand and Mullainathan (2001) show that the CEOs that control the board are paid for luck, consistent with the skimming model (Bertrand and Mullainathan, 2000) or the rent extraction hypothesis (Bebchuk, Fried, and Walker, 2002; Bebchuk and Fried, 2003). As pointed out by Garvey and Milbourn (2006), however, this evidence does not necessarily indicate that the CEO has captured the pay-setting process. The link between CEO pay and luck leads not only to a reward for the CEO in a period of sector growth, i.e., when "luck is up", but also penalizes him

[23] Himmelberg and Hubbard (2000), Oyer (2004) and Rajgopal, Shevlin and Zamora (2006) argue that the reason for not filtering sector performance from compensation is to retain the incumbent CEO; Aggarwal and Samwick (1999b) suggest that it restricts the intensity of competition in concentrated industries; Garvey and Milbourn (2003) considers the possibility that wealthy CEOs can filter sector performance from their pay on their own through hedging.

during sector downturns, i.e., when "luck is down". Skimming/rent-extraction model is supported only if the CEO pay is at least partly immune to sector downturns, which is indeed what Garvey and Milbourn document.

Gopalan, Milbourn, and Song, on the other hand, reconcile asymmetric benchmarking as well with optimal contracting theory. They suggest that the reason for asymmetry is that CEOs have a greater incentive to avoid wealth losses during sector downturns than they do to gain from good times in the sector. Following Garvey and Milbourn (2006) and Gopalan Milbourn, and Song (2010), I also investigate the asymmetry in sensitivity of CEO pay to sector performance. According to the *Information Hypothesis,* boards with *DRIs* reduce the sensitivity both for positive and negative sector performance. On the contrary, the *Conflict-of-Interests Hypothesis* predicts that boards with *DRIs* reinforce asymmetric benchmarking in favor of the CEO.

Conflict-of-Interests Hypothesis:

5. *Boards with DRIs are associated with a lower sensitivity to negative sector performance and higher sensitivity to positive sector performance.*

In general, the purpose of this paper is to investigate directors with more than one position in a given supply chain and whether they are associated with the type of incentive design that is more in line with their potential role to fill information gaps (i.e., the *Information Hypothesis*) or with potential conflict of interests with shareholders due to these directors' business ties with the incumbent CEO (i.e., the *Conflict-of-Interests Hypothesis*) or both. A summary of all the implications of these non-mutually exclusive hypotheses is presented in Table 1.

3. Data Description

The data on executives and directors are drawn from *Compact Disclosure* CDs for the period of 1993-2005. This dataset lists all the executives and directors who are employed by publicly-traded companies identified by ticker symbols. Each executive or director is assigned a unique identifier using an algorithm described in Appendix A of Dass, Kini, Nanda, Onal, and

Wang (2011). I obtain the primary SIC codes corresponding to each ticker by merging the data from *Compact Disclosure* with *Compustat*. Firms with non-positive sales or assets are excluded to eliminate potentially erratic data.

Matching a director's appointments as an executive or a director with his all other appointments in a given year allows me to identify his industry affiliations that are in the same supply chain. Whenever four-digit SIC codes of a pair of firms that a director is associated with are vertical related, I identify that director as a director from related industries (*DRI*) for both firms. Vertical relationships between industries are measured using the benchmark input-output (I-O) tables published by the Bureau of Economic Analysis every five years. The board data from 1993 to 1996 are matched with the *Use* table from 1992 using the concordance table for SIC codes and I-O codes. The data for the periods of 1997-2001 and 2002-2005 are matched with the *Use* tables from 1997 and 2002 respectively, using the respective concordance tables for NAICS codes and I-O codes. A director is considered to be from related industries if at least one of the other industries that he is affiliated with either uses a significant amount of the output of the firm's own industry and/or supplies a significant amount of the input of the firm's own industry.

Formally, for a given pair of industries, *industry i* and *j*, suppose that the proportion of the output of *industry i* used by *industry j* is *a%* of the total output of *industry i* and the proportion of the use of *industry j*'s output by *industry i* is *b%* of the total use of *industry i*. If the sum of *a%* and *b%* is at least 1% (5%), then *industry j* is identified as vertically related to *industry i* at the 1% (5%) threshold. After identifying industries in the same supply chain, I identify directors from related industries as those who are affiliated with industries in the firm's supply chain. The affiliation may either be in the form of a directorship or an executive position. Having identified directors from related industries, I first construct dummy variables that equal one if the firm has at least one director from related industries (*DRI)* on its board. I refer to these variables as dummy *DRI Measures*. In addition, I construct variables that are basically proportion of *DRIs* on the board. Similar to Dass, Kini, Nanda, Onal, and Wang (2011), I construct a number of *DRI Measures* to capture different degrees or types of supply chain relationships. The main measure is based only on the outside directors who are executives or

directors of other firms in the firm's supply chain.[24] This measure is scaled by the number of outside directors on the board. I also construct measures based on inside as well as outside directors from related industries and these measures are scaled by the board size. All measures are constructed for both the 1% and 5% vertical-relatedness thresholds.

The data on directors are matched with the data on CEO compensation from *ExecuComp*,[25] leading to a sample of 19,616 firm-year observations. Panel A in Table 2 presents descriptive statistics on dummy scores for directors from related industries. The mean gives the percent of firm-year observations with at least one director from related industries defined by the respective criteria. $DumDRI_{OUT}$, for example, equals one if the firm has at least one outside director who is an executive or a director of another firm in its upstream or downstream industries based on the vertical-relatedness threshold of 1%. 56% of firm-year observations involve directors from related industries fitting this category. $DumDRI_{OUT,\ 5\%}$, on the other hand, is based on the vertical-relatedness threshold of 5%. About 24% of firm-year observations involve outside directors from related industries identified using the 5% vertical-relatedness threshold. As the definition of *DRIs* is broadened, the percent of firm-years with *DRIs* also increases.

I present statistics on proportional *DRI Measure*s in Panel B. The mean for proportional scores is naturally small because a large number of firm-year observations have boards with no directors from related industries and thereby will have a score of zero for most of the definitions of *DRI*. The mean for DRI_{OUT} which is defined as the proportion of outside directors from related industries based on the 1% vertical-relatedness threshold is 10.7%. For the sample that has non-zero DRI_{OUT}, however, the mean (median) is 19% (17%). This suggests that for the sample of firms with *DRIs*, about two out of ten directors are from related industries. Not surprisingly, the figures for both dummy and proportional *DRI Measures* are larger than those in Dass, Kini, Nanda, Onal, and Wang (2011), as firms covered in *ExecuComp* are typically larger than the *Compact Disclosure* universe and, as such, are more likely to appoint *DRIs*. Table 3 presents the

[24] Formally, each director seat in related industries is assigned a score of 0.5 whereas each executive position is assigned a score of 1 because the latter imply greater involvement in the corresponding related industry. These scores are then summed and limited to a maximum of 1 for each director. Finally, the measure for the firm is the sum of the scores assigned to its directors.

[25] CEOs are identified based on two variables, CEOANN and BECAMECEO on *ExecuComp*.

top and bottom ten industries in the distribution of the dummy and proportional scores for outside directors by 48 Fama-French industry categories (Fama and French, 1997).

Table 4 lists the descriptive statistics for the variables that are used in the following empirical analyses.[26] All unbounded variables are winsorized at 1% and 99% and all dollar values are converted into 1992 dollars. Panel A contains information on CEO compensation. Total direct compensation (*TDC*) and its components are drawn from *ExecuComp*. Mean (Median) *TDC* is $3.24 million ($1.69 million). The sensitivity of CEO pay to the stock price, *PPS* is defined as the dollar change in CEO wealth for a 1% change in the stock price following Guay (1999), Core and Guay (1999) and Coles, Daniel, and Naveen (2006).[27] Option values are based on the Black and Scholes (1973) formula modified to account for dividends (Merton, 1973). The sensitivity of previously granted option and share values to the stock price is computed using the approximation method detailed in Core and Guay (2002). The mean (median) *PPS* is $431,670 ($123,490). Furthermore, for firms with *DRIs*, both the mean ($458,850) and the median ($136,495) *PPS* are significantly higher than the mean ($396,812) and the median (107,400) *PPS* for firms without *DRIs*. However, to understand the direct relationship between *PPS* and *DRIs*, one needs to control for other factors that determine *PPS*.

Panel B provides summary statistics on a number of CEO and governance characteristics. Board size, proportion of outside directors and CEO-Chairman duality are drawn from *Compact Disclosure*. The mean (median) board size is 9.4 (9). The mean (median) proportion of outside directors is 72% (75%). Occurrences where CEO is also the Chairman constitute about 60% of the dataset. CEO tenure, age and ownership are drawn from *ExecuComp*. Mean (median) CEO tenure is 7.3 (5) years. CEO Age has a mean (median) of 55.7 (56). The mean (median) percent of shares owned by the CEO is 3.1% (0.4%). Finally, the data on institutional ownership are drawn from CDA/Spectrum. The mean (median) of percent of shares owned by institutions (*Inst_Ownership*) is 60.8% (63.1%). Finally, *Inst_Concentration* is the ratio of number of shares owned by top ten institutions to total number of shares owned by all institutions. The fewer the number of institutions that command all institutional ownership is, the more powerful each one

[26] Definitions of all variables are provided in Appendix A.

[27] The results outlined in the following section are qualitatively similar when I instead use the change in CEO wealth for a $1000 increase in firm value, used for example by Jensen and Murphy (1990) and Yermack (1995) among others.

of them is expected to be as suggested by Hartzell and Starks (2003). The mean (median) *Inst_Concentration* is 0.58 (0.56). Other firm characteristics used as control variables are listed in Panel C. *Market Value*, i.e., market value of equity, has a mean (median) of about $4.3 ($1) billion. Annual percentage return (after dividends reinvested) has a mean (median) of 22% (12%). *R&D Intensity* defined as the ratio of R&D expenditures to total assets captures the innovativeness of the firm and has a mean of 4%. *Luck* and *Skill* are estimated following Garvey and Milbourn (2006). *Luck* (*Skill*) is defined as the market value of the firm at the beginning of the year multiplied by the predicted value (residual) from the regression of firm stock returns on the equal-weighted and value-weighted industry returns and year effects. *Luck* has a mean (median) of about $1.4 ($0.17) billion, while *Skill* has a mean (median) of about $1 ($0.07) billion. *Tobin's Q* is used as a proxy for growth opportunities and has a mean (median) of 1.67 (1.2). *PIN* is the yearly mean of the quarterly estimates of probability of informed trading used in Brown, Hillegeist, and Lo (2004) and estimated based on the market microstructure model of Easley, Kiefer, and O'hara (1997).[28] Both mean and median *PIN* is about 0.15. *Multi-Segment* is a dummy variable that equals one if the firm is multi-divisional. Its mean is 0.39. *Firm Volatility* is the standard deviation of monthly stock returns over the past five years. The mean (median) firm volatility is 0.43 (0.37). Market share is based on sales and has a mean (median) of 11% (4%). Book leverage has a mean (median) of 23% (21%).

Among industry characteristics, differentiated industries (*Differentiated_Ind*) are identified based on Rauch's (1999) classification except that the four-digit SIC industries that are not included in his dataset are assigned the classification of their respective three-digit SIC industries. Three-digit SIC industries, on the other hand, are classified as differentiated (non-differentiated) if at least one (none) of the four-digit SIC industries with the same three-digit SIC code is differentiated. Based on this modified definition, 37% of the sample involves a differentiated industry. Industry concentration is captured by the sale-based Herfindahl-Hirshman Index (*HHI*). The mean (median) *HHI* is 20% (15%). Industry homogeneity is estimated following Parrino (1997). Specifically, the partial correlation of each firm's stock returns with its four-digit SIC industry returns is calculated and averaged across all the firms in

[28] *PIN* measures the probability that the trading activity for a given stock and period is based on private information.

that industry. The mean (median) industry homogeneity is 18% (16%). Proportion of vertically-integrated firms in the industry, *Prop_Integrated* has a mean (median) of 10% (5%) at the 1% relatedness threshold. Supply of potential *DRIs* is based on the sample of all directors and executives in *Compact Disclosure*. *DRI Supply* is the number of all directors and executives of firms that are in the firm's supply chain and headquarters of which are located within a radius of 100 miles of the firm's headquarter. It has a mean (median) of 698 (388) at the 1% vertical-relatedness threshold and 190 (70) at the 5% vertical-relatedness threshold. Average pair-wise correlation between a given industry and its related industries has a mean (median) of 47% (50%) at the 1% (5%) vertical-relatedness threshold.

4. Empirical Analysis

In this section, I provide a thorough empirical analysis of the relationship between directors from related industries and incentive contracts for CEOs. I study particularly three incentive mechanisms: sensitivity of CEO pay to the stock price (*PPS*), sensitivity of forced CEO turnovers to stock returns and sensitivity of CEO pay to sector performance (*PSP*). CEO pay is argued to be tied to the stock price to the extent the board lacks the information and ability to evaluate and guide CEO actions. The sensitivity of CEO replacements to stock returns is also likely to be designed in a similar fashion. Pay for sector performance, on the other hand, arises due to the need to give the CEO incentive to overcome the informational challenges or gaps in the choice of exposure to the primary sector of the firm.

If *DRIs* have advantage in acquiring information, they can help bridge the information gaps that the board and the CEO are facing. This, in turn, implies that *PPS* and *PSP* will be utilized to a lesser extent in the presence of *DRIs*. However, it is possible that common factors drive the need for *DRIs* as well as the degree of use of stock-based incentive mechanisms. I employ the Heckman treatment effects model to account for this endogeneity problem. Specifically, I use a model of the determinants of *DRI* appointments in the first stage and, how *DRIs* affect stock-based compensation or replacements in the second stage. I also use the instrumental variables approach for which I use instruments that are based on the determinants of

a firm's decision to have *DRI*s on its board. The following section discusses the determinants of *DRI* appointments.

4.1. Determinants of Directors from Related Industries

Under what circumstances, do firms appoint a director from a related industry? In this section, I address this question by drawing on the economic factors employed by Dass et al. (2011) that are likely to influence a firm's decision to appoint a director from related industries. *DRIs* are argued to help bridge the information gap with supplier and customer industries and the gap for firms in innovative industries is expected to be deeper. Therefore, a positive relationship between the degree of innovativeness in the firm/industry and the likelihood of appointing *DRIs* is predicted. Innovativeness is a multidimensional concept and can be measured by a number of different variables. Investment in research and development (*R&D Intensity*) is perhaps the most obvious measure of innovativeness. In addition, the productivity of *R&D* activity that can be captured by the number of patents and citations received on those patents can also be considered as a dimension of innovativeness. Furthermore, it is crucial for firms in industries that produce differentiated products à la Rauch (1999) to anticipate industry conditions and take measures to ensure the success of their businesses. On the contrary, firms in homogeneous industries are less likely to experience significant changes in demand or supply conditions. Overall, I predict the likelihood of having *DRIs* on board to be positively related to proxies for innovativeness – i.e., R&D intensity, the number of patents and citations, and being in differentiated industries, and negatively related to Parrino's (1997) measure of industry homogeneity (*Ind_Homogeneity*).

The need for *DRIs* is likely to be less if alternative sources of information such as informative stock prices are available. To test this possibility, I employ two measures of the quality of information contained in stock prices: probability of informed trading (*PIN*) (e.g., Brown, Hillegeist, and Lo, 2004) and price non-synchronicity (e.g., Chen, Goldstein, and Jiang, 2008). The information that *DRIs* can bring is expected to be more relevant when the firm's own industry follows its supplier or customer industries closely in economic upturns and downturns. Thus, I construct the average pair-wise correlation between the firm's own industry and its supplier and customer industries (*Ind_Correlation*) and expect it to increase the likelihood of *DRI* appointments. I also include a number of other firm and industry characteristics that are

expected to affect the appointments of *DRIs*. Larger and multidivisional firms, firms with higher market share and firms in concentrated industries (low *HHI*) are likely to be the firms that need and appoint *DRIs*. Managers of larger and multidivisional firms are expected to face greater information challenges and, thus, can benefit more from *DRIs*. Firms with lower leverage are less likely to experience financial distress and offer safer director seats to *DRIs*. Firms with higher market share and those in concentrated industries are more concerned about maintaining their market power. Therefore, they need to follow developments in their related product markets more closely and having *DRIs* on the board is one way to facilitate that.

Appointing a *DRI* is not the only way to have access to information about supplier or customer industries. Vertical integration is possibly a better but more costly way. The propensity of vertical integration in an industry can be viewed as an indicator of the need for bridging information gaps with supplier or customer industries in that industry. To account for this possibility, I include the proportion of integrated firms in the industry (*Prop_Integrated*) as a determinant of *DRI*s. Other variables that are expected to affect the likelihood of *DRI* appointments are the supply of potential directors from related industries, board characteristics such as board size, CEO-Chairman duality and the proportion of outside directors (*Prop_Outside*). Putting all these explanatory variables for *DRI* appointments together leads to the following specification:

$$\begin{aligned} DRI\ Measure_{it} = {} & \beta_0 + \beta_1 Innovativeness_{i(k)t} + \beta_2 PIN_{it} + \beta_3 Ind\_Corr_{kt} + \\ & \beta_4 Ind\_Homogeneity_{kt} + \beta_5 Market\ Share_{it} + \beta_6 HHI_{kt} + \beta_7 Prop\_Integ_{kt} + \\ & \beta_8 Ln(MarketValue_{it}) + \beta_9 Multi\text{-}Segment_{it} + \beta_{10} Book\ Leverage_{it} + \\ & \beta_{11}\ CEO\text{-}Chairman\ Duality_{it} + \beta_{12} Ln(Board\_Size)_{it} + \beta_{13} Prop\_Outside_{it} + \\ & \beta_{14} Ln(DRI\ Supply)_{kt} + Year\ Dummies + \varepsilon_{it} \end{aligned} \quad (1)$$

The subscripts in Specification (1) and those in the following sections refer to firm *i*, industry *k* and year *t*. *DRI Measure* is either the dummy variable that equals one in the presence of *DRIs* and zero otherwise, or the proportion of *DRIs* on the board. For the dummy variable, I use the Probit model whereas for the proportion of *DRIs*, I use either the OLS or the Tobit models to estimate Specification (1). The results for *DRI Measure*s that are based on outside directors who hold executive positions or directorships in the firm's supply chain are presented

in Table 5. All columns use *R&D Intensity* as the measure of innovativeness but results are similar with the other measures such as number of patents granted to the firm. Most of the coefficient estimates have the predicted signs and several of them are statistically significant. The coefficients on *R&D Intensity*, *Ind_Correlation*, *HHI* and *Ln(Market Value)* are significantly positive, while the coefficient on *PIN* is significantly negative.

The impact of these variables on the *DRI Measure* is also economically significant. To describe a few, in Column (1), for a one standard deviation increase in *R&D Intensity*, *Ln(Market Value)* and *Ln(DRI Supply)* around their mean, the probability of having a *DRI* increases by about 2.57%, 3.36% and 9.66% respectively. A one standard deviation increase in *PIN* around its mean is associated with a 1.58% decrease in the probability of having a DRI. Only the coefficient on *Multi-Segment* does not have the predicted sign and is statistically significant. The possible explanation which follows from Gopalan, Milbourn, and Song (2010) is that multi-segment firms have more flexibility to move their investment out of the current primary industry. Hence, a multi-segment firm needs a *DRI* who is associated with its current primary industry less than a single-segment firm which does not have the flexibility to move out of its current industry at least in the short term. Consistent with this explanation, in unreported results, I observe that the *DRI Measures* based on all the segments of the firm are significantly positively related to being a multi-segment firm. Having described the conceptual model for *DRI* appointments, I now turn to the question of how *DRIs* influence the design of incentive contracts.

4.2. Sensitivity of CEO Pay to the Stock Price (PPS)

This section presents the empirical analysis of the impact of directors from related industries (*DRIs*) on the sensitivity of CEO pay to the stock price (*PPS*). First, I describe the empirical specifications to be employed. Following Guay (1999) and Core and Guay (1999), I define the dependent variable, i.e., *PPS*, as the change in the dollar value of option and stock holdings of the CEO for a 1% change in the stock price. As suggested by Baker and Hall (2004), if one is interested in examining the actions of CEO that affect percentage returns (e.g., setting the firm strategy) rather than dollar returns (e.g., buying a corporate jet), the *PPS* measure based

on the percentage change in the stock price is more relevant. Thus, the way *PPS* is measured is chosen accordingly to account for the likelihood that *DRIs*' role pertains to strategic decisions.[29]

The specification used to examine the relationship between *PPS* and directors from related industries (*DRIs*) is as follows:

$$PPS_{it} = \beta_0 + \beta_1 DRI\ Measure_{it} + \beta_2\ Ln(Market\ Value_{it}) + \beta_3 Tobin's\ Q_{it} + \beta_4 Firm\ Volatility_{it} + \beta_5 Ln(CEO\ Tenure)_{it} + \beta_6 Cash\ Flow_{it} + \beta_7 PIN_{it} + \beta_8 Inst\_Holding_{it} + \beta_9 Inst\_Concentration_{it} + Year\ and\ Industry\ Dummies + \varepsilon_{it} \quad (2)$$

DRI Measure is the main explanatory variable and stands for either the dummy variable that equals one if the firm has at least one *DRI* on its board or the proportion *DRIs* on the board.[30] The *Information Hypothesis* predicts that the coefficient of *DRI Measure* is negative and significant. Sample selection criteria and control variables follow Core and Guay (1999) with additions of some variables that have been shown to affect *PPS*. Firm size has commonly been used as a control for CEO talent, difficulty of monitoring and CEO wealth (e.g., Demsetz and Lehn, 1985; Smith and Watts, 1992; Himmelberg, Hubbard, and Palia, 1999; Baker and Hall, 2004).[31] Hence, it is predicted to be positively related to *PPS*. I use the natural logarithm of market value of equity as a proxy for firm size.[32] *Tobin's Q* is employed to control for growth opportunities which can be regarded as another proxy for the difficulty of monitoring actions (e.g., Smith and Watts, 1992). *Firm Volatility* is used as a proxy for the uncertainty in the environment and thus is expected to be positively related to *PPS* (e.g., Demsetz and Lehn, 1985; Core and Guay, 1999). *CEO Tenure* is used as a proxy for CEO wealth and risk aversion (e.g., Guay, 1999). It also controls for potential horizon problems (Dechow and Sloan, 1991), weaker career (Gibbons and Murphy, 1992) or reputational concerns (Milbourn, 2003) that arise as CEOs approach retirement. CEO tenure has also been used as a measure of CEO entrenchment (e.g., Harford and Li, 2007). I control for the need for higher incentives due to the free cash flow

[29] Similar results are obtained using the alternative measure of *PPS*.
[30] It is chosen to be contemporaneous with *PPS* to capture how incentives are set for the period that a *DRI* is on the board. However, taking one-year lag of *DRI Measures* relative to *PPS* yields similar results.
[31] CEO wealth captures CEO risk aversion. Wealthier CEOs are projected to be less risk averse.
[32] The relationship between *DRI Measures* and *PPS* is not affected by using other proxies for firm size such as total assets or sales.

problem (e.g., Jensen, 1986; Himmelberg, Hubbard, and Palia, 1999) by including *Cash Flow* which is measured as the sum of income before extraordinary items, depreciation and amortization scaled by total assets. Following Hartzell and Starks (2003) and Kang and Liu (2008), I control for the impact of institutional investors on *PPS* using two variables: percent of shares held by institutions and the concentration of institutional ownership. To the extent that it reduces liquidity, institutional ownership is likely to mitigate informativeness of stock prices and, as such, is expected to reduce *PPS* (Holmstrom and Tirole, 1993). Consistent with this prediction, Kang and Liu (2008) find a negative relationship between institutional ownership and *PPS*. The concentration of institutional ownership, on the other hand, is expected to capture the influence of institutions on incentive design. Kang and Liu also document a strong positive relationship between stock price informativeness and *PPS*. Therefore, I include *PIN* in all *PPS* regressions to control for stock price informativeness. In all specifications, I include year and Fama-French industry dummies (Fama and French, 1997).[33] I exclude finance and utility firms as boards of these firms may not have full control over the pay-setting process. Reported t-statistics are robust and account for clusters at the firm level. Heckman t-statistics are based on 100 bootstrap replications.

The results from the estimation of Specification (2) are presented in Table 6. In Panel A, *DRI Measures* in Columns (1) – (4) are dummy variables that equal one if at least one of the outside directors of the firm is from a related industry. The scores in Columns (5) – (8) are the respective proportional scores. In Columns (1), (2), (5) and (6), related industries are identified using the vertical-relatedness threshold of 1%, whereas in Columns (3), (4), (7) and (8) they are identified using the 5% vertical-relatedness threshold. Columns (1), (3), (5) and (7) contain the OLS results. Except for Column (1), the coefficient on *DRI Measure* is significantly related to *PPS* in all columns. In Columns (2) and (4), I use the Heckman treatment effects model to account for potential endogeneity problems. The coefficient of *DRI Measure* is negative and significant in both columns. Moreover, the effect of *DRIs* on *PPS* is economically more significant after controlling for endogeneity. In Columns (2) and (4), the change in CEO wealth for a 1% change in the firm's stock price is smaller by $155,000 and $227,000, respectively, for

[33] Controlling for four-digit SIC industry fixed effects yield qualitatively similar inferences.

firms with *DRIs*. In Columns (6) and (8), I estimate a system of two equations simultaneously using 2SLS. In one equation, *PPS* is modeled using Specification (2), whereas the other equation models *DRI* appointments using the explanatory variables from Table 5 for the respective *DRI Measure*. Proportional *DRI Measure*s are found to be negatively related to *PPS* and this relationship is also both statistically and economically significant.[34] In Column (6), increasing DRI_{OUT} by one standard deviation leads to a decline in *PPS* by about $77,142, while in Column (8), increasing $DRI_{OUT,\ 5\%}$ by one standard deviation reduces *PPS* by about $108,570. These results are consistent with both the *Information* and the *Conflict-of-Interests Hypotheses*. Coefficient estimates of other variables are consistent with the findings of studies using similar specifications.[35]

Panel B employs instrumental variables to correct for potential endogeneity biases. Instruments are largely drawn from the determinants of *DRIs*: *Ln(DRI_Supply), Ln(NumofSCInd), Ind_Correlation* and *Ind_Median_DRI*. *DRI_Supply* measures availability of *DRIs* in the geographical area of the firm. *NumofSCInd* is the number supply-chain industries of the primary sector of the firm. This variable is also a measure of availability of *DRIs*. *Ind_Correlation* gauges the degree to which the firm's own industry returns move with the returns in customer and supplier industries. Finally, *Ind_Median_DRI* is defined as the median value of the respective *DRI* measure in the firm's four-digit SIC industry and captures the tendency in the industry to appoint a *DRI*. The calculation of this variable excludes the firm itself. As can be seen in Table 5, these variables are among the determinants of *DRIs* with the most explanatory power. More importantly, there is no a priori reason to expect these instruments to be correlated with *PPS*. Last, but not the least, these instruments pass the standard relevance and validity tests that ensure their quality as instruments. Using instrumental variables

[34] Results from the *DRI* regression suggest that firms with higher *PPS* are less likely to appoint directors from related industries. These results can be furnished upon request.

[35] Core and Guay (1999), Hartzell and Starks (2003) and Kang and Liu (2008), for example, find similar results on firm size, CEO tenure, firm volatility, *PIN*, institutional ownership and concentration of institutional ownership. Using the specifications from Aggarwal and Samwick (1999a) leads to qualitatively similar findings on the effect of *DRIs* on *PPS*. I also find a negative tradeoff between uncertainty and incentives. This suggests that the uncertainty captured by the volatility measure in specification (2) and that captured by the cumulative distribution function of the variance of dollar stock returns are different in nature. As pointed out by Prendergast (2002), a positive tradeoff between uncertainty and incentives is plausible.

also allows for controlling for firm fixed effects.[36] Similar to other board characteristics, *DRI Measures* remain largely stable over time and, therefore, capturing their impact on *PPS* is not feasible after controlling for firm fixed effects.[37] Instrumental variables that I employ, however, are industry characteristics with enough time variation. It is for this reason that the negative impact of *DRIs* on *PPS* prevails at conventional significance levels even after controlling for firm fixed effects, as seen in Panel B of Table 6.

4.2.1. Sensitivity of CEO Pay to the Stock Price (PPS) in Different Industry and Information Environments

In this section, I investigate whether the negative relationship between directors from related industries is stronger for firms with greater dependence on customer/supplier industries and firms with less informative stock prices. The information that *DRIs* can provide is more relevant if the firm's actions and performance are more sensitive to the developments in the customer and supplier industries. Firms that produce differentiated products (e.g., electronic equipment) fit this description well because they are more likely to face competitive disadvantages than firms producing homogenous products (e.g., tobacco) if they do not act preemptively on the changes in customer and supplier industries. Thus, the need for *PPS* is expected to be alleviated by *DRIs* particularly in differentiated industries. The evidence presented in Columns (1) and (2) of Table 7 is consistent with this prediction. *PPS* is found to be significantly higher for firms that produce differentiated products only when they don't have a *DRI* on their board. To put it differently, CEOs in differentiated industries do not seem to be given additional incentives to acquire information about related industries when a director on the board is already equipped with that information.

Firms also differ in the quality of sources of information available to them. Such heterogeneities across firms are expected to have implications for stock-based incentives. Stock markets are indeed one of the main sources of information available to the board as well the management. Chen, Goldstein, and Jiang (2007), for example, suggest that the management base

[36] An alternative specification uses a dummy variable that equals one for firms that add a *DRI*. The coefficient of that variable is negative and significant implying that addition of a *DRI* on the board leads to a reduction in *PPS*.
[37] Of firms that have a *DRI* on their board in year *t*, 82%, 75% and 70% continue to have a *DRI* in year *t+1*, *t+2* and *t+3*, respectively.

their investment decisions particularly on informative stock returns. Kang and Liu (2008) find that *PPS* is lowered when the stock price becomes less informative. In Table 6, the positive and significant coefficient on *PIN* is consistent with this result. In Columns (3) and (4) of Table 7, I define *Low_PIN* as a dummy variable that equals one if the firm's *PIN* is less than the median value of *PIN* in the firm's four-digit SIC industry. I, then, examine the low-*PIN* firms with and without *DRIs* separately and find that lower *PPS* is adopted only by firms with *DRIs*. This finding suggests that to reduce stock-based incentives, boards need an alternative source of information to base their monitoring or advisory activities on. When such an alternative is absent, the board seems to maintain the same level of *PPS*, regardless of the informativeness of the stock price.[38]

4.2.2. Sensitivity of CEO Pay to the Stock Price (PPS) and Information Hypothesis versus Conflict-of-Interests Hypothesis

In this section, I attempt to run a horse race between the *Information Hypothesis* and the alternative explanation for lower *PPS*, i.e., the *Conflict-of-Interests Hypothesis*. Although, as a proxy for CEO entrenchment, *CEO Tenure* is controlled for in all specifications,[39] there are possibly other avenues that *DRIs* may be in conflict with shareholders. If appointing directors from supplier or customer industries is solely part of an existing or prospective deal between the incumbent CEO and the sending firms, *DRIs* are likely to act in the best interest of the incumbent CEO. Moreover, if CEOs who engage in such deals also tend to exert suboptimal effort and perform poorly, they prefer to be given contracts with a low sensitivity to the stock price. To that end, *DRIs* can help them extract such contracts. Therefore, additional tests are required to understand what might be driving the negative relationship between *DRIs* and *PPS*.

First, I identify *DRIs* who are more likely to be under CEO control. I draw data on director independence and tenure from the *IRRC* (now *RiskMetrics*) database and match them with the directors from *Compact Disclosure*. This allows me to identify outside *DRIs* who are

[38] Using an alternative specification that focuses on firms with *DRIs*, it is found that firms in differentiated industries or those with low stock price informativeness are more likely to lower their *PPS*. This, again, suggests that boards with *DRIs* substitute information from its members for stock-based compensation when it is optimal to do so.

[39] In unreported regressions, I also control for other proxies for CEO power such as CEO-Chairman duality or board size find similar results.

classified as independent[40] and those who are non-co-opted, i.e., appointed after the incumbent CEO assumed the CEO's post (Coles, Daniel and Naveen, 2010). I find 2207 firm-year observations over the period of 1996-2005 that involve at least one independent *DRI* and 475 firm-year observations over the period of 1998-2005 that involve at least one non-co-opted *DRI*. Dependent or co-opted *DRIs* are more likely to be in conflict with shareholders. Hence, if the *Conflict-of-Interests Hypothesis* is valid, dependent or co-opted *DRIs* are expected to lower *PPS* more than the independent or non-co-opted *DRIs*. The evidence presented in Table 8 is not consistent with this prediction. Firms with independent or non-co-opted *DRIs* are more likely to have significantly lower *PPS* than firms with no *DRIs*.

In the second test, I consider the relationship between *DRIs* and the level of CEO compensation. According to the *Conflict-of-Interests Hypothesis*, *DRIs* can help the CEO receive a higher level of compensation. In Table 9, this implication is tested for both the level of compensation (in Columns (1) and (2)) and the change in the level of compensation (in Columns (3) and (4)). I find no significant relationship between *DRIs* and either the level or the change in the level of CEO compensation.[41] Next, I analyze the sensitivity of CEO pay to positive returns separately from its sensitivity to negative returns. If *DRIs* help reduce *PPS* to the advantage of the CEO, then it is expected to be the case only when the stock price is headed downward. Otherwise, the sensitivity is expected to be lower regardless of the possible direction of the stock price. It is important to note that this test is based on the assumption that the CEO, possibly in collaboration with the *DRIs*, has the ability to foresee the direction of the stock price. The empirical results from this test are presented in Table 10. *Positive_Return* is a dummy variable that equals one if the stock return is positive, while *Negative_Return* is a dummy variable that equals one if the stock return is negative. The coefficients on the interactions of these dummy variables with the respective *DRI Measure* illustrate whether *DRIs* are associated with an asymmetric sensitivity of CEO pay to performance or not. In none of the columns of Table 10,

[40] The *IRRC* database defines independent outside directors as those who are not former employees of the company, providers of professional services to the company, customers or suppliers of the company, or family members of an employee.

[41] In unreported regressions, firms that add a *DRI* on their board are also not found to have any significant increase in CEO compensation.

the sensitivity of CEO pay to negative returns is significantly lower than its sensitivity to positive returns.

In the final test, I argue that if lower *PPS* is the outcome of a tacit agreement between the CEO and *DRIs* at the expense of shareholders, then directors who are representatives of customer or supplier firms that already have an ongoing trading relationship with the incumbent CEO are in greater conflict with shareholders. Hence, the *Conflict-of-Interests Hypothesis* predicts that directors from customers and suppliers are expected to extract an even lower *PPS* for the CEO. I identify such directors using the data on customers provided in the *Compustat* segment tapes.[42] After matching the director data with customer and supplier firms, I find only 465 firm-year observations with at least one director from a customer or supplier firm. This implies that appointing directors from supplier and customer firms is not common practice possibly due to the fear from antitrust lawsuits by competitors or leakage of strategic information to competitors.

The multivariate results regarding directors from customers or suppliers are presented in Table 11. The main explanatory variables are a dummy variable that equals one if the firm has at least one director from its actual customer or supplier firms (*Firm DRI*) and the dummy *DRI Measure* that excludes directors from actual customer and supplier firms (*Industry DRI*). Under the conflict-of-interests hypothesis, *Firm DRI* is predicted to have a larger negative effect on *PPS* than *Industry DRI*. In none of the columns, however, the coefficient of *Firm DRI* is negative and significant. The coefficient of *Industry DRI*, on the other hand, is negative and significant particularly after controlling for selection. Overall, the negative relationship between *DRIs* and *PPS* does not seem to be due to potential conflicts between *DRIs* and shareholders.

4.2.3 Sensitivity of CEO Pay to the Stock Price (PPS) and Compensation Committee Membership

This section investigates whether being on the compensation committee as a *DRI* is necessary to have an influence over the design of stock-based compensation. *DRIs* who serve on the compensation committee are identified using the *IRRC* database. The evidence on the

[42] As public firms are required to report only those of their customers that contribute a minimum of 10% to their total sales, the data do not cover all the customers. This also results in an asymmetric match between suppliers and customers as inverting the data to identify suppliers leads to many suppliers matched to relatively fewer large customers.

importance of compensation committee membership for *DRIs* is provided in Table 12. *Comp_Comm DRI* is a dummy variable that equals one if at least one outside director is both a *DRI* and serves on the compensation committee. *Non_Comp_Comm DRI* is a dummy variable that equals one if the firm has at least one outside *DRI* on the board but none of them serve on the compensation committee. Coefficients on both variables are negative and significant in Columns (2) through (4). Hence, regardless of whether they serve or not on the compensation committee, the flow of information from *DRIs* is still reflected in CEO incentives.

4.3 Sensitivity of CEO Turnovers to Stock Returns

Replacing CEOs when necessary is another crucial duty of directors. I explore how *DRIs* affect such replacement decisions in this section. More specifically, I examine whether *DRIs* rely less on stock markets also in CEO replacement decisions. Of all CEO turnovers identified for *ExecuComp* firms between 1993 and 2005 (1389 observations), forced turnovers are determined based on the announcements on *Lexis-Nexis* and *Factiva* and the criteria from Huson, Parrino, and Starks (2001). That is, a turnover is classified as forced if: (i) the announcement states that the CEO was ousted or departed due to unspecified policy changes; (ii) for CEOs under the age of 60, the announcement does not state that the CEO died, had poor health, or accepted another position within the firm or elsewhere; or (iii) the announcement states that the CEO is retiring but departure takes place within six months of the announcement. The cases where the CEO is also the chairman and steps down only from the CEO position are not classified forced. This whole process leads to 323 forced turnovers which constitute about 23% of all turnovers and is close to the 21% reported in Hazarika, Karpoff, and Nahata (2009) – out of 1895 turnovers over 1992-2004, and 24% of Jenter and Kanaan (2010) – out of 1,590 turnovers over 1993-2001. After merging CEO turnovers with the data from *Compact Disclosure*, 275 forced turnovers remain. Of those, 171 turnovers or 62% are executed by boards with outside *DRIs* based on the 1% vertical-relatedness threshold.

The results on the sensitivity of forced CEO turnovers to stock returns are presented in Table 13. In all columns of Panel A and Panel B, related industries are identified using the 1% vertical-relatedness threshold. In both panels, Columns (1), (3) and (5) use the Logit model for estimation, and Columns (2), (4) and (6) use the Heckman treatment effects model to

additionally control for potential selection biases. *Mkt_Adj_Return* is defined as the cumulative market-adjusted return over the twelve months prior to the firm's fiscal year end. Control variables are drawn from the literature on CEO turnovers and consist of industry-adjusted return on assets (*Ind_Adj_ROA*), *Ln(Market Value)*, *CEO-Chairman Duality*, a dummy variable that equals one if the CEO is 65 or older (*CEO Age>=65*), percent of shares owned by the CEO (*CEO_Percent_Owned)* and, finally, a dummy variable that equals one if the proportion of outside directors is greater than 50% (*Outsider_Controlled*) along with year and industry dummies. Industry adjustments and industry dummies are based on the Fama-French industry categories (Fama and French, 1997).

In all columns of Panel A and Panel B, recent market-adjusted stock performance is significantly negatively related to forced CEO turnovers. In Panel A, the impact of *Mkt_Adj_Return* on forced turnovers is analyzed separately for the subsample of firms with *DRIs* (*DRI Measure=1*) and the subsample without *DRIs* (*DRI Measure=0*). In Columns (1) and (2), the relationship between all *DRIs* and the sensitivity of forced turnovers to stock returns is investigated. The coefficient of *Mkt_Adj_Return x DRI Measure=1* is smaller in magnitude than the coefficient of *Mkt_Adj_Return x DRI Measure=0*. Both coefficients are negative and statistically significant. In Columns (3) through (6), the *DRI Measure* is based on directors who are identified as independent or non-co-opted previously using the *IRRC* database. The economic magnitude of the sensitivity of CEO turnovers to market-adjusted stock returns becomes smaller in the presence of independent and non-co-opted *DRIs* on the board. The sensitivity further becomes statistically insignificant when a non-co-opted *DRI* is serving on the board. Furthermore, the coefficient of *DRI Measure* is, generally, positive and statistically significant, especially for potentially more independent *DRIs*. These findings altogether indicate that, as a factor that leads to forced CEO replacements, recent stock performance seem to lose some of its importance when there are independent or non-co-opted *DRIs* on the board. *DRIs* are, at the same time, associated with a higher likelihood of forced turnovers. This implies that lower stock-based incentives are combined with a higher likelihood of turnovers that is based on the private information of directors from related industries. It is also possibly due to the larger network of

these directors in related industries that constitutes a pool of potential candidates to replace the incumbent CEO.

Panel B uses an alternative specification to investigate the sensitivity of forced CEO turnovers to the recent stock performance. This specification includes the market-adjusted stock performance by itself along with its interaction with the *DRI* measures. In all columns, the coefficient of the interaction term is positive but statistically insignificant. *DRIs* continue to have a positive effect on the likelihood of forced turnovers and this effect is statistically significant when *DRIs* are more likely to be independent.

Finally, in unreported regressions, I examine the sensitivity of all CEO turnovers to market-wide returns, industry-specific returns and firm-specific returns, following Kaplan and Minton (2008). The specification used in this analysis is an extension of the main specification of Kaplan and Minton:

$$\begin{aligned} CEO\ Turnover_{it} = {} & \beta_0 + \beta_1\, Mkt\_Return_{it}\ x\ DRI\ Measure_{it}=1 + \beta_2\, Mkt\_Return_{it}\ x\ DRI\ Measure_{it}=0 + \\ & \beta_3\, Ind\_Return_{it}\ x\ DRI\ Measure_{it}=1 + \beta_4\, Ind\_Return_{it}\ x\ DRI\ Measure_{it}=0 + \\ & \beta_5\, Firm\_Return_{it}\ x\ DRI\ Measure_{it}=1 + \beta_6\, Firm\_Return_{it}\ x\ DRI\ Measure_{it}=0 + \\ & \beta_7\, DRI\ Measure_{it} + \beta_8\, \Delta(ROA)_{it-1,\,t} + \beta_9\, CEO\ Age>=65_{it} + \varepsilon_{it} \end{aligned} \quad (3)$$

The dependent variable in Specification (3) is a dummy variable that equals one if firm *i* has a routine or non-routine CEO replacement in year *t*. *Mkt_Return* is defined as the cumulative equal-weighted market return over the last twelve months relative to the firm's fiscal year end. *Ind_Return* is defined as the cumulative equal-weighted industry return over the twelve months prior to the firm's fiscal year end minus *Mkt_Return*. *Firm_Return* is defined as firm *i*'s cumulative return over the twelve months prior to the firm's fiscal year end minus *Ind_Return*. $\Delta(ROA)_{it-1,\,t}$ is the change in firm *i*'s operating performance (*ROA*) between year *t-1* and year *t*. I use the Logit model to estimate Specification (3) and find that CEO turnovers are significantly negatively related to both systematic and idiosyncratic stock performance, consistent with Kaplan and Minton (2008). Furthermore, the economic magnitude of the effect of market-wide and industry-wide stock returns tends to be smaller while that of firm-specific stock returns tends

to be greater for firms with *DRIs* than it is for other firms. These differences, however, are, in general, statistically insignificant and do not substantiate for forced CEO turnovers.

Overall, it can be inferred from this subsection that the impact of *DRIs* on CEO replacements is weaker than their impact on stock-based pay. In other words, at times when the stock market signals a need for replacing the incumbent CEO, boards with *DRIs* tend to act in line with this signal.

4.4. The Sensitivity of CEO Pay to Sector Performance

The empirical specifications and the explanatory variables that I use to study pay for sector performance (*PSP*) broadly follow Bertrand and Mullainathan (2001), Garvey and Milbourn (2006) and Gopalan et al. (2010). Consistent with these studies, I also drop the observations that have a fiscal year end other than December to have a peer group of CEOs performing over the same period. Furthermore, in all specifications, I control for year and CEO fixed-effects. I also restrict the sample to firms with the same CEO from the previous year. The dependent variable is total direct compensation (*TDC*) which is defined as the sum of salary, bonus, other annual compensation, long-term incentive payouts, total value of restricted stock granted, total value of stock options granted and all other compensation. The empirical specification to be estimated is as follows:

$$TDC_{it} = \beta_0 + \beta_1 Luck_{it}\, xDRI\ Measure_{it} + \beta_2 Skill_{it}\, xDRI\ Measure_{it} + \beta_3 DRI\ Measure_{it} + \beta_4 Luck_{it} + \beta_5 Skill_{it} + \beta_6 (Luck_{it}\, xCDF\_Variance\_Luck_{it}) + \beta_7 (Skill_{it}\, xCDF\_Variance\_Skill_{it}) + \beta_8 CDF\_Variance\_Luck_{it} + \beta_9 CDF\_Variance\_Skill_{it} + \beta_{10} Ln(CEO\ Tenure)_{it} + Year\ and\ CEO\ Dummies + \varepsilon_{it} \quad (4)$$

In Specification (4), the firm's stock performance is separated into "luck" (sector-driven) and "skill" (firm-specific). *Luck* is the market value of the firm at the beginning of the year multiplied by the predicted value obtained from the regression of firm stock returns on the equal-weighted and value-weighted industry returns and year effects. *Skill* is the market value of the firm at the beginning of the year multiplied by the residual from the same regression. Industry is defined based on the two-digit SIC industry codes. Following Aggarwal and Samwick (1999a),

Luck and *Skill* are interacted with the cumulative distribution function of their variances, respectively, to account for the heterogeneity in the sensitivity of CEO pay to luck and skill across firms. To see the relationship between *DRIs* and *PSP*, *Luck* is interacted with *DRI Measure*. The *Information Hypothesis* predicts that the coefficient of the interaction between *Luck* and *DRI Measure* is negative and significant.

The results from the estimation of Specification (3) are presented in Table 14. In Column (1) and (2), the OLS and Heckman results for the full sample are provided respectively. Consistent with the *Information Hypothesis*, the interaction between *Luck* and *DRI Measure* is negative, although the coefficient in the Heckman model is not statistically significant at conventional levels. If *DRIs* have an advisory role in setting the sector exposure, then it will more likely show up in environments with bigger information gaps about product markets and challenges for information acquisition. To test this possibility, I classify firms in four-digit SIC industries with a positive median value for *R&D Intensity* to be in such environments. The reason for the choice of an industry characteristic is to avoid potential endogeneity problems associated with firm characteristics.[43] In Columns (3) and (4), Specification (3) is estimated for the subsample of firms in industries that have a median *R&D Intensity* of zero. The coefficient of *Luck x DRI Measure* is statistically insignificant suggesting that *DRIs* are ineffective in environments where information is possibly more accessible for every executive or director. In Columns (5) and (6), the subsample of firms in industries with a positive median value for *R&D Intensity* is considered. Consistent with the *Information Hypothesis*, the coefficient of *Luck x DRI Measure* is negative and statistically significant. In words, *DRIs* reduce the need for *PSP* in industries with potentially greater information challenges.[44] This implies that boards with *DRIs* provide information and advice to the CEO on the choice of sector exposure, particularly when the CEO needs it. In unreported regressions, I also find that the negative effect of *DRIs* on *PSP* to hold only in differentiated industries, another proxy for the dependence of firms on

[43]Using firm-level R&D or proxies for growth opportunities such as market-to-book ratio instead yields qualitatively similar results.

[44] To the extent that R&D activities relates to the flexibility of the firm to select its exposure to its primary sector, this finding can also be interpreted in light of the flexibility argument of Gopalan, Milbourn, and Song (2010). That is, it is possible that *DRIs* play an effective role that is reflected by a lower *PSP*, when the firm has the flexibility to choose its sector exposure.

information about product markets. The evidence documented in this section is, thus, consistent with earlier findings and the *Information Hypothesis*.

4.4.1. Asymmetric Sensitivity of CEO Pay to Sector Performance

The evidence that *DRIs* reduce pay for sector performance can also be explained with the conflict-of-interests hypothesis. Therefore, in this section, I examine the relationship between *DRIs* and the asymmetry in pay for sector performance for which the *Conflict-of-Interests Hypothesis* and the *Information Hypothesis* have different implications.

To that end, I estimate the following extension of Specification (4), which is a modified version of the one that Garvey and Milbourn (2006) use.

$$TDC_{it} = \beta_0 + \beta_1 LuckisUp_{it}\, xLuck_{it} + \beta_2 LuckisUp_{it}\, xLuck_{it}\, xDRI\ Measure_{it} + \beta_3 DRI\ Measure_{it} + \beta_4 Luck_{it} +$$
$$\beta_5 Skill_{it} + \beta_6 (Luck_{it}\, xCDF\_Variance\_Luck_{it}) + \beta_7 (Skill_{it}\, xCDF\_Variance\_Skill_{it}) +$$
$$\beta_8 CDF\_Variance\_Luck_{it} + \beta_9 CDF\_Variance\_Skill_{it} + \beta_{10}\ Ln(CEO\ Tenure)_{it} +$$
$$Year\ and\ CEO\ Dummies + \varepsilon_{it} \qquad (5)$$

Garvey and Milbourn (2006) find that pay for sector performance is significantly greater when the sector performs well, i.e., when *Luck* is positive. In Specification (4), I define *LuckisUp* as a dummy variable that equals one if *Luck* is positive and zero otherwise. The *Information Hypothesis* predicts that the coefficient on the three-way interaction between *Luck*, *LuckisUp* and *DRI Measure* is negative. In other words, since boards with *DRIs* play a role in the choice of sector exposure, the need to tie CEO pay to sector performance is less regardless of the direction of sector performance. Contrarily, the conflict-of-interests hypothesis predicts a positive coefficient. The results on asymmetric benchmarking are presented in Table 15. Consistent with the *Information Hypothesis*, *DRIs* reduce the sensitivity of CEO pay to sector performance when it is positive. In addition, as can be seen in Columns (5) and (6), the relationship between *DRIs* and *PSP* is both economically and statistically stronger for firms that are expected to be in greater need for the information and advice that *DRIs* can provide.

4.4.2 Additional Robustness Checks

Controlling for CEO characteristics that have been used as proxies for CEO talent or outside opportunities (e.g. Oyer, 2004) or hedging opportunities (Garvey and Milbourn, 2003) such as firm size or CEO age do not affect my inferences on pay for sector performance. Finally, controlling for industry characteristics such as industry concentration (Aggarwal and Samwick, 1999b) as measured by Herfindahl-Hirschman Index (*HHI*) do not lead to any difference in my inferences. It is important to note that in all these cases, I add not only the control variables themselves but also their interactions with *Luck* to the specifications for *PSP*. Finally, defining *Luck* and *Skill* based on the four-digit SIC industry code yields qualitatively similar results.

5. Conclusion

In this paper, I examine the role of directors from related industries in the design of stock-based incentive compensation. Directors who have multiple significant roles in economically-connected industries are argued to have informational advantages due to their greater involvement in the firm's operating environment. Such informational advantages are predicted to optimally reduce the need to delegate board functions to stock markets. The empirical evidence in the paper is consistent with this prediction. Directors from related industries are associated with a lower sensitivity of CEO pay to the stock price particularly for firms with greater dependence on related industries and those with less informative stock prices. Lower sensitivity of CEO pay to the stock price can also be explained with potential conflict of interests between directors from related industries and shareholders. However, this explanation is not supported empirically. For example, of directors from related industries, those who are classified as independent from CEO are more likely to substitute board monitoring and advising for stock-based compensation. The results on the sensitivity of CEO turnovers to stock returns and the sensitivity of CEO pay to sector performance also attach an information role to directors from related industries. Overall, the empirical analysis in this paper indicates that boards with expertise in related industries are less likely to delegate their functions to stock markets and this policy seems consistent with the optimal contracting theory. More generally, this paper is an attempt to show that there exist potential heterogeneities among directors in terms of their

capacity to acquire and process information that can be useful in monitoring and advising. These heterogeneities have implications for the compensation policy as well as other policies of the firm.

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Appendix A: Definition of Variables

Variable	Source	Definition
*Proportional Scores for Directors from Related Industries(DRI)**		
DRI_{OUT} ($DRI_{OUT, 5\%}$)	Compact Disclosure	Proportion of outside directors from industries in the supply chain of the primary segment of the firm on the board. Supply chain is identified based on the vertical-relatedness threshold of 1% (5%). Vertical-relatedness coefficients are obtained from the input/output tables published every five years by the Bureau of Economic Analysis.
* *The corresponding dummy scores equal 1 if the proportional score is greater than zero and the notation for dummy scores are* $DumDRI_{OUT}$ and $DumDRI_{OUT, 5\%}$., respectively.		
Compensation Variables		
Cash Compensation	ExecuComp	Sum of salary and bonus
Option Grants	ExecuComp	Black-Scholes value of options granted in the current fiscal year
Restricted Stock Grants	ExecuComp	Value of restricted stock granted in the current fiscal year
TDC	ExecuComp	Sum of salary, bonus, other annual compensation, long-term incentive payouts, grant-date value of restricted stock and grant-date value of stock options and other compensation
PPS	ExecuComp	Change in the value of CEO's portfolio of stock and option holdings for a 1% change in stock price
CEO and Governance-Related Characteristics		
Board Size	Compact Disclosure	Number of directors on the board
Prop_Outside	Compact Disclosure	Proportion of Outside Directors on the board
CEO-Chairman Duality	Compact Disclosure	Indicator that equals 1 if the CEO is also the chairman
CEO Tenure	ExecuComp	Number of years in CEO position
CEO Age	ExecuComp	CEO age
Inst_Ownership	CDA/ Spectrum	Proportion of all outstanding shares owned by institutions
Inst_Concentration	CDA/ Spectrum	Ratio of total number of shares owned by top ten institutions to all shares owned by institutions
Other Firm Characteristics		
Market Value	Compustat	Market value of equity

R&D Intensity	Compustat	Ratio of research and development expenditures to total assets (Data46/ Data6)
PIN	Stephen Brown	Yearly mean of quarterly estimates of Stephen Brown
Book Debt	Compustat	Sum of long-term debt (Data 9) and debt in current liabilities (Data 34)
Book Leverage	Compustat	Book debt scaled by total assets
Tobin's Q	Compustat	Sum of market value of equity (Data 25 times Data 199) and book debt scaled by total assets
Firm Volatility	ExecuComp	Standard deviation of monthly stock returns over the past five years
Cash Flow	Compustat	Income before extraordinary items (Data 18) plus amortization and depreciation (Data 14) scaled by total assets
Annual Return	ExecuComp	Annual percentage returns (Dividends reinvested)
Luck	ExecuComp	Predicted value from the regression of annual percentage returns on value-weighted and equal-weighted four-digit or two-digit SIC industry returns and year effects, multiplied by the market value in the beginning of the year
Skill	ExecuComp	Residual from the regression of annual percentage returns on value-weighted and equal-weighted four-digit or two-digit SIC industry returns and year effects, multiplied by the market value in the beginning of the year
Industry Characteristics		
HHI	Compustat	Sum of square of the market shares of firms in the same four-digit industry industry
Ind_Correlation	CRSP	Correlation between the firm's industry returns and returns of related industries (monthly or daily)
DRI_Supply	Compact Disclosure	Number of potential *DRIs* within a radius of 100 miles of the headquarters of the firm
Ind_Homogeneity	CRSP	Average of partial correlation coefficients between monthly stock returns of all firms in the same 4-digit SIC code and monthly industry returns
Prop_Integrated	Compustat	Proportion of firms in the 4-digit SIC industry that have at least one secondary segment that is vertically related to its primary segment in a given
NumofSCInd	BEA	Number of supply-chain industries of the firm's four-digit SIC industry
Ind_Median_DRI	Compact Disclosure	Median value of the respective *DRI* measure in the four-digit SIC industry of the firm (calculation excludes the firm itself)

Table 1: Implications of Information and Conflict-of-Interests Hypotheses

Hypotheses	Information Hypothesis	Conflict-of-Interests Hypothesis
Sensitivity of CEO Pay to the Stock Price (PPS)		
The effect of *DRIs* on *PPS*	Negative effect	Negative effect
The effect of *DRIs* on *PPS* in differentiated industries	Larger negative effect	No prediction
The effect of *DRIs* on *PPS* for firms with low stock price informativeness	Larger negative effect	No prediction
The effect of dependent (co-opted) *DRIs* on *PPS* relative to the effect of independent (non-co-opted) *DRIs*	Equal negative effect	Larger negative effect
The effect of directors from actual customer/supplier firms relative to the rest of *DRIs* on *PPS*	Equal negative effect	Larger negative effect
The effect of *DRIs* on the sensitivity of pay to positive performance versus negative performance	Equal negative effect	Positive or smaller negative effect
Level of Compensation		
The effect of *DRIs* on the level of compensation	No prediction	Positive effect
Sensitivity of Forced CEO Turnovers to Stock Returns		
The effect of *DRIs* on the sensitivity of forced CEO turnovers to stock returns	Negative effect	Negative effect
The effect of dependent (co-opted) *DRIs* on the sensitivity of involuntary CEO replacements to returns relative to the effect of independent (non-co-opted) *DRIs*	Equal negative effect	Larger negative effect
Sensitivity of CEO Pay to Sector Performance (PSP)		
The effect of *DRIs* on *PSP*	Negative effect	Negative effect
The effect of *DRIs* on the sensitivity of pay to positive sector performance versus negative sector performance	Equal negative effect	Positive or smaller negative effect
The effect of *DRIs* on *PSP* for firms with strategic flexibility to change exposure to the sector	Larger negative effect	No prediction

Table 2: Descriptive Statistics on Directors from Related Industries

This table presents descriptive statistics on dummy variables for outside directors from related industries (DRI_{OUT}) in Panel A and proportion of directors from related industries among outside directors in Panel B. The sample period is 1993-2005. Definitions of all variables are provided in Appendix A.

Panel A: Dummy DRI Measures						
	Obs	*Mean*	*Median*	*25%*	*75%*	*Std Dev*
$DumDRI_{OUT}$	19,616	0.562	1.000	0.000	1.000	0.496
$DumDRI_{OUT,\ 5\%}$	19,616	0.236	0.000	0.000	0.000	0.425
Panel B: Proportional DRI Measures						
	Obs	*Mean*	*Median*	*25%*	*75%*	*Std Dev*
DRI_{OUT}	19,616	0.107	0.063	0.000	0.167	0.138
$DRI_{OUT\ ,\ 5\%}$	19,616	0.033	0.000	0.000	0.000	0.077
Non-Zero DRI_{OUT}	11,024	0.191	0.167	0.091	0.250	0.133
Non-Zero $DRI_{OUT\ ,\ 5\%}$	4,632	0.139	0.100	0.063	0.167	0.103

Table 3: Distribution of Directors from Related Industries (*DRIs)* by Fama-French Industries

This table presents the top and the bottom ten Fama and French (1997) industries in the distribution of outside *DRIs* identified based on the 1% vertical-relatedness threshold. The sample period is 1993-2005. Definitions of all variables are provided in Appendix A.

Dummy DRI Measure ($DumDRI_{OUT}$)				*Proportional DRI Measure* (DRI_{OUT})			
Rank	*Industry*	*Obs*	*Mean*	*Rank*	*Industry*	*Obs*	*Mean*
1	Real Estate	3	100.00%	1	Computers	791	17.82%
2	Rubber and Plastic Products	116	71.55%	2	Candy and Soda	45	16.68%
3	Computers	791	70.54%	3	Rubber and Plastic Products	116	16.14%
4	Business Supplies	431	70.30%	4	Business Services	1,737	15.23%
5	Chemicals	585	69.40%	5	Pharmaceutical Products	709	14.94%
6	Candy and Soda	45	68.89%	6	Real Estate	3	13.59%
7	Pharmaceutical Products	709	67.28%	7	Electronic Equipment	1,206	13.53%
8	Business Services	1,737	64.77%	8	Chemicals	585	13.43%
9	Insurance	865	64.62%	9	Business Supplies	431	12.72%
10	Aircraft	105	63.81%	10	Electrical Equipment	202	12.71%
39	Miscellaneous	99	41.41%	39	Textiles	163	5.94%
40	Healthcare	299	41.14%	40	Miscellaneous	99	5.53%
41	Printing and Publishing	275	39.27%	41	Printing and Publishing	275	5.53%
42	Precious Metals	101	38.61%	42	Shipbuilding, Railroad Eq	44	5.35%
43	Apparel	306	36.27%	43	Apparel	306	4.27%
44	Defense	53	35.85%	44	Agriculture	67	3.95%
45	Entertainment	187	34.22%	45	Precious Metals	101	3.74%
46	Alcoholic Beverages	68	33.82%	46	Alcoholic Beverages	68	3.23%
47	Agriculture	67	23.88%	47	Defense	53	2.78%
48	Tobacco Products	19	5.26%	48	Tobacco Products	19	0.24%

Table 4: Descriptive Statistics on Firm and Industry Characteristics

This table presents descriptive statistics on the firm and industry characteristics employed in the following empirical analyses. The sample period is 1993-2005. All unbounded variables are winsorized at 1% and 99%. All dollar values are in 1992 constant dollars. Definitions of all variables are provided in Appendix A.

CEO Compensation ($000s)	*N*	*Mean*	*Median*	*Min*	*25%*	*75%*	*Max*	*Std Dev*
Salary	19,616	497.19	459.14	0.00	316.88	645.26	1,409.56	247.40
Bonus	19,616	533.65	290.60	0.00	66.86	655.90	5,028.67	788.92
Option Grants	19,391	1,516.14	453.20	0.00	0.00	1,548.51	19,541.93	2,998.22
Restricted Stock Grants	19,616	362.61	0.00	0.00	0.00	0.00	7,799.77	1,163.24
Total Direct Compensation	19,391	3,244.70	1,692.04	142.00	844.81	3,649.15	27,610.46	4,445.94
PPS	19,580	431.68	123.49	0.00	35.73	356.86	7,396.89	1,009.35
CEO and Governance Characteristics								
Board Size	19,616	9.38	9.00	1.00	7.00	11.00	19.00	3.32
Prop_Outside	19,616	0.72	0.75	0.00	0.67	0.85	1.00	0.19
CEO Tenure	18,153	7.25	5.00	0.00	2.00	10.00	38.00	7.37
CEO Age	18,179	55.73	56.00	39.00	51.00	61.00	77.00	7.47
CEO-Chairman Duality	19,616	0.60	1.00	0.00	0.00	1.00	1.00	0.49
CEO Ownership	18,577	0.03	0.00	0.00	0.00	0.02	1.00	0.08
Inst_Ownership (%)	17,461	60.75	63.10	0.00	45.95	77.90	100.00	22.90
Inst_Concentration	17,461	0.58	0.56	0.21	0.48	0.66	1.00	0.14
Other Firm Characteristics								
Market Value ($ millions)	19,598	4,254.49	1,014.18	21.63	388.56	3,240.34	71,429.45	10,111.30
Annual Return	19,616	0.22	0.12	-0.78	-0.12	0.39	2.71	0.61
R&D Intensity	19,573	0.04	0.00	0.00	0.00	0.03	0.85	0.10
Luck ($ millions)	12,811	1,409.81	170.66	-1,532.14	24.86	726.65	38,920.12	4,658.13
Skill ($ millions)	12,811	-1,001.08	-66.59	-38,583.075	-458.16	89.73	6,589.7	4,704.68
Tobin's Q	19,572	1.67	1.20	0.15	0.82	1.96	8.92	1.50
PIN	18,229	0.15	0.15	0.00	0.11	0.19	0.93	0.06
Multi-Segment	19,573	0.39	0.00	0.00	0.00	1.00	1.00	0.49
Book Leverage	19,572	0.23	0.21	0.00	0.06	0.34	0.85	0.18
Firm Volatility	18,815	0.43	0.37	0.14	0.28	0.53	1.23	0.22
Market Share	19,573	0.11	0.04	0.00	0.01	0.14	1.00	0.18
Industry Characteristics								
Differentiated_Ind	19,573	0.37	0.00	0.00	0.00	1.00	1.00	0.48
HHI	19,573	0.20	0.15	0.02	0.08	0.26	1.00	0.16
Ind_Homogeneity	19,540	0.18	0.16	-0.46	0.09	0.24	0.75	0.11
Prop_Integrated	19,559	0.10	0.05	0.00	0.00	0.15	1.00	0.13
Prop_Integrated$_{5\%}$	19,559	0.06	0.01	0.00	0.00	0.08	1.00	0.11
DRI Supply	19,616	698.14	388.00	0.00	134.00	904.00	4,081.00	845.90
DRI Supply$_{5\%}$	19,616	189.97	70.00	0.00	8.00	239.00	1,551.00	294.70
Ind_Correlation	18,230	0.47	0.49	-0.11	0.39	0.58	1.00	0.14
Ind_Correlation $_{5\%}$	17,038	0.50	0.51	-0.11	0.40	0.60	1.00	0.17

Table 5: Determinants of Directors from Related Industries (*DRIs*)

This table presents evidence on the characteristics of firms that appoint *DRIs*. Related industries are identified using the vertical-relatedness threshold of 1% in Columns (1) and (2) and the vertical-relatedness threshold of 5% in Columns (3) and (4). Vertical-relatedness thresholds are obtained from the input/output tables published every five years by the Bureau of Economic Analysis. Columns (1) and (3) report the Probit results for the *DRI Measures* $DumDRI_{OUT}$ and $DumDRI_{OUT,\ 5\%}$. $DumDRI_{OUT}$ ($DumDRI_{OUT,\ 5\%}$) is a dummy variable that equals one if the firm has at least one outside director from a related industry of its primary segment based on the vertical-relatedness threshold of 1% (5%). Columns (2) and (4) report the OLS results for the corresponding proportional scores DRI_{OUT} and $DRI_{OUT,\ 5\%}$. *Ind_Correlation*, *Prop_Integrated* and *DRI_Supply* are defined based on the vertical-relatedness threshold used for the dependent variable in the respective column. Definitions of dependent as well as independent variables are provided in Appendix A. The sample used for estimation excludes financial and utility firms and is from 1993 to 2005. All specifications include year dummies. The coefficients of the year dummies are suppressed for brevity. Robust t-statistics that account for clusters at the firm level are reported in brackets; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	$DumDRI_{OUT}$	DRI_{OUT}	$DumDRI_{OUT,\ 5\%}$	$DRI_{OUT,\ 5\%}$
	(1)	(2)	(3)	(4)
	Probit	OLS	Probit	OLS
R&D Intensity	0.613***	0.088***	1.029***	0.096***
	[3.04]	[3.55]	[5.86]	[5.20]
Ind_Correlation	0.329**	0.056***	0.555***	0.021***
	[2.01]	[3.23]	[3.79]	[2.68]
PIN	-0.681*	-0.054	-0.541	-0.047**
	[-1.95]	[-1.54]	[-1.35]	[-2.12]
Ind_Homogeneity	-0.137	-0.007	-0.083	-0.003
	[-0.74]	[-0.41]	[-0.41]	[-0.29]
HHI	0.224	0.011	0.270	0.017*
	[1.56]	[0.69]	[1.56]	[1.90]
Market Share	-0.091	-0.028*	-0.015	-0.009
	[-0.65]	[-1.88]	[-0.09]	[-0.99]
Prop_Integrated	0.215	0.012	0.434**	0.005
	[1.44]	[0.73]	[2.37]	[0.49]
Ln(Market Value)	0.055***	0.009***	0.013	0.000
	[3.37]	[4.59]	[0.70]	[0.33]
Book Leverage	0.140	0.020	0.096	0.004
	[1.28]	[1.54]	[0.78]	[0.58]
Multi-Segment	-0.123***	-0.012***	-0.027	-0.005**
	[-3.09]	[-3.02]	[-0.58]	[-2.04]
Prop_Outside	1.731***	0.098***	1.317***	0.032***
	[14.00]	[6.69]	[9.54]	[4.86]
CEO-Chairman Duality	-0.003	-0.004	0.037	-0.001
	[-0.10]	[-1.05]	[0.99]	[-0.33]
Ln(Board Size)	0.679***	0.002	0.488***	-0.000
	[10.74]	[0.21]	[6.89]	[-0.04]
Ln(DRI Supply)	0.152***	0.017***	0.208***	0.009***
	[12.12]	[13.15]	[17.63]	[15.18]
Constant	-4.079***	-0.171***	-4.098***	-0.036***
	[-17.09]	[-7.78]	[-17.07]	[-3.11]
Year Dummies	*yes*	*yes*	*yes*	*yes*
Observations	14,251	14,251	13,228	13,228
(Pseudo) R2	0.119	0.094	0.137	0.105

Table 6: Effect of Directors from Related Industries (*DRIs*) on the Sensitivity of CEO Pay to the Stock Price (*PPS*)

This table presents evidence on the effect of *DRIs* on the sensitivity of CEO pay to the stock price (*PPS*). The dependent variable in all columns is *PPS* (in $ millions) which is defined as the change in CEO wealth for a 1% change in stock price. Columns (1)-(4) use the dummy *DRI Measure*s while Columns (5)-(8) use the proportional *DRI Measure*s. In Columns (1), (2), (5) and (6), related industries are identified using the vertical-relatedness threshold of 1%, while Columns (3), (4), (7) and (8) use the vertical-relatedness threshold of 5%. $DumDRI_{OUT}$ ($DumDRI_{OUT,\ 5\%}$) is a dummy variable that equals one if the firm has at least one outside director from a related industry of its primary segment based on the vertical-relatedness threshold of 1% (5%). DRI_{OUT} ($DRI_{OUT,\ 5\%}$) is the corresponding proportional score. In Columns (2) and (4) of Panel A, the potential endogeneity problem is controlled for using the Heckman treatment effects model where the first-stage regression is identical to the respective Probit regression in Table 4. In Columns (6) and (8) of Panel A, *PPS* is estimated simultaneously with the respective proportional *DRI Measure* using the 2SLS model, to control for potential simultaneity bias. In Panel B, *Ln(DRI_Supply), Ln(NumofSCInd), Ind_Correlation and Ind_Median_DRI* are used as instrumental variables to control for the selection biases. Definitions of all variables are provided in Appendix A. The sample used for estimation excludes financial and utility firms and is from 1993 to 2005. All specifications in Panel A include year and the Fama-French industry dummies (Fama and French, 1997). All specifications in Panel B control for year and firm dummies. The coefficients of the year and industry or firm dummies are suppressed for brevity. Robust t-statistics clustered at the firm level are reported in square brackets in both panels. Heckman t-statistics are based on 100 bootstrap replications; *** p<0.01, ** p<0.05, * p<0.1.

Panel A: Using the Heckman treatment effects model and simultaneous estimation to control for potential endogeneity and simultaneity biases

Dependent Variable:	*PPS*							
DRI Measure:	$DumDRI_{OUT}$		$DumDRI_{OUT,\ 5\%}$		DRI_{OUT}		$DRI_{OUT,\ 5\%}$	
	(1) OLS	(2) Heckman	(3) OLS	(4) Heckman	(5) OLS	(6) Simultaneous-2SLS	(7) OLS	(8) Simultaneous-2SLS
DRI Measure	-0.004	-0.155**	-0.077***	-0.227**	-0.102	-0.559**	-0.251**	-1.410***
	[-0.15]	[-2.26]	[-3.43]	[-2.36]	[-1.33]	[-2.00]	[-2.29]	[-3.13]
Ln(Market Value)	0.279***	0.293***	0.281***	0.291***	0.280***	0.292***	0.279***	0.285***
	[11.20]	[11.44]	[11.08]	[11.06]	[11.08]	[31.31]	[11.04]	[31.69]
Tobin's Q	0.075***	0.076***	0.075***	0.078***	0.075***	0.076***	0.076***	0.081***
	[4.76]	[5.57]	[4.73]	[4.79]	[4.75]	[12.74]	[4.79]	[13.24]
Firm Volatility	0.181**	0.177**	0.180**	0.187**	0.184**	0.204***	0.182**	0.203***
	[2.36]	[2.34]	[2.35]	[2.25]	[2.42]	[3.96]	[2.38]	[3.89]
Ln(CEO Tenure)	0.212***	0.213***	0.210***	0.218***	0.211***	0.212***	0.211***	0.219***
	[8.88]	[10.02]	[8.94]	[7.79]	[8.94]	[24.94]	[8.97]	[24.94]
PIN	0.512**	0.475**	0.498**	0.533**	0.506**	0.486***	0.496**	0.492**
	[2.05]	[2.01]	[1.99]	[2.02]	[2.02]	[2.64]	[1.99]	[2.56]
Cash Flow	-0.070	-0.099	-0.080	-0.098	-0.074	-0.099	-0.076	-0.090
	[-0.63]	[-0.81]	[-0.73]	[-0.74]	[-0.67]	[-1.18]	[-0.69]	[-1.04]
Inst_Percent	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	[-4.39]	[-4.85]	[-4.36]	[-3.96]	[-4.40]	[-9.85]	[-4.42]	[-8.68]
Inst_Concentration	0.594***	0.622***	0.593***	0.613***	0.593***	0.622***	0.594***	0.614***
	[4.16]	[4.24]	[4.16]	[4.28]	[4.15]	[7.96]	[4.16]	[7.55]
Lambda		0.101***		0.089				
		[2.61]		[1.51]				

Constant	-2.658***	-1.988***	-2.663***	-2.283***	-2.655***	-2.507***	-2.653***	-2.545***
	[-8.98]	[-6.46]	[-9.06]	[-7.85]	[-9.01]	[-10.31]	[-9.04]	[-10.32]
Year Dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Industry Dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Observations	12,085	11,548	12,085	10,762	12,085	11,548	12,085	10,762
R-squared	0.262	0.265	0.263	0.268	0.262	0.260	0.263	0.258

Panel B: Using instrumental variables to control for endogeneity and controlling for firm fixed effects

Dependent Variable:	*PPS*			
DRI Measure:	*DumDRI$_{OUT}$*	*DRI$_{OUT}$*	*DumDRI$_{OUT, 5\%}$*	*DRI$_{OUT, 5\%}$*
	(1)	(2)	(3)	(4)
	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS
DRI Measure	-0.314*	-1.165*	-0.428**	-3.175**
	[-1.91]	[-1.93]	[-1.97]	[-2.31]
Ln(Market Value)	0.321***	0.316***	0.318***	0.297***
	[8.76]	[8.45]	[8.51]	[8.06]
Tobin's Q	0.077***	0.078***	0.075***	0.077***
	[3.80]	[3.79]	[3.61]	[3.57]
Firm Volatility	-0.112	-0.143	-0.140	-0.194
	[-0.77]	[-0.99]	[-0.90]	[-1.19]
Ln(CEO Tenure)	0.128***	0.129***	0.129***	0.129***
	[5.79]	[5.89]	[5.60]	[5.55]
PIN	0.146	0.170	0.114	-0.034
	[0.56]	[0.65]	[0.43]	[-0.12]
Cash Flow	-0.227***	-0.214**	-0.202**	-0.112
	[-2.66]	[-2.48]	[-2.25]	[-1.01]
Inst_Percent	-0.002**	-0.002**	-0.001*	-0.002**
	[-2.21]	[-2.25]	[-1.90]	[-2.03]
Inst_Concentration	0.570***	0.553***	0.574***	0.556***
	[5.36]	[5.17]	[5.20]	[4.99]
Year Dummies	*yes*	*yes*	*yes*	*yes*
Firm Dummies	*yes*	*yes*	*yes*	*yes*
Observations	11,356	11,356	10,624	10,624
Hansen *J* p-value	0.951	0.993	0.975	0.880

Sargan C p-value	0.035	0.044	0.063	0.020
Kleibergen-Paap F-Statistic	17.74***	18.74***	27.18***	18.07***
First-Stage Results (Only Instruments):				
Ln(DRI_Supply)	0.049***	0.012***	0.041***	0.005***
	[5.89]	[5.25]	[8.18]	[5.80]
Ln(NumofSCInd)	0.103***	0.034***		
	[3.78]	[5.08]		
Ind_Correlation	0.049	0.013	-0.025	0.004
	[0.85]	[0.81]	[0.42]	[0.34]
Ind_Median_DRI			0.065***	0.130***
			[3.49]	[4.30]

Table 7: Effect of Directors from Related Industries (*DRIs*) on the Sensitivity of CEO Pay to the Stock Price (*PPS*) in Different Industry and Information Environments

This table presents evidence on the effect of *DRIs* on *PPS* for firms operating in differentiated industries and firms with a low probability of informed trading (*PIN*). The dependent variable in all columns is *PPS* (in $ millions) which is defined as the change in CEO wealth for a 1% change in stock price. *Differentiated_Ind* is a dummy variable that equals one if the firm's four-digit SIC industry produces differentiated products. Industries producing differentiated products are identified based on the Rauch (1999) classification. *Low_PIN* is a dummy variable that equals one if the firm's *PIN* is less than the median value of *PIN* in the firm's four-digit SIC industry. In all columns, related industries are identified using the vertical-relatedness threshold of 1%. $DumDRI_{OUT}=1$ is a dummy variable that equals one if the firm has at least one outside director from related industries. $DumDRI_{OUT}=0$ is a dummy variable that equals one if the firm does not have any outside director from its related industries. In Columns (2) and (4), the Heckman treatment effects model is used to control for the potential endogeneity problem. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of the table. Definitions of all variables are provided in Appendix A. The sample used for estimation excludes financial and utility firms and is from 1993 to 2005. All specifications include year and Fama-French industry dummies (Fama and French, 1997). Robust t-statistics clustered at the firm level are reported in square brackets. Heckman t-statistics are based on 100 bootstrap replications; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	*PPS*			
	(1) OLS	(2) Heckman	(3) OLS	(4) Heckman
Differentiated_Ind x $DumDRI_{OUT}=1$ (β_1)	0.011	0.012		
	[0.22]	[0.26]		
Differentiated_Ind x $DumDRI_{OUT}=0$ (β_2)	0.113**	0.122**		
	[2.16]	[2.50]		
Low_PIN x $DumDRI_{OUT}=1$ (β_1)			-0.079***	-0.076***
			[-2.72]	[-2.88]
Low_PIN x $DumDRI_{OUT}=0$ (β_2)			-0.025	-0.028
			[-0.85]	[-0.87]
$DumDRI_{OUT}$	0.042	-0.108	0.023	-0.134**
	[1.12]	[-1.40]	[1.06]	[-1.99]
Ln(Market Value)	0.278***	0.292***	0.276***	0.291***
	[11.22]	[11.49]	[11.53]	[11.66]
Tobin's Q	0.076***	0.077***	0.076***	0.076***
	[4.82]	[5.65]	[4.76]	[5.55]
Firm Volatility	0.186**	0.182**	0.176**	0.173**
	[2.42]	[2.40]	[2.35]	[2.35]
Ln(CEO Tenure)	0.211***	0.213***	0.211***	0.213***
	[8.91]	[10.02]	[8.86]	[10.01]
PIN	0.506**	0.467**		
	[2.03]	[1.99]		
Cash Flow	-0.073	-0.103	-0.058	-0.090
	[-0.67]	[-0.85]	[-0.52]	[-0.74]
Inst_Percent	-0.004***	-0.004***	-0.004***	-0.004***
	[-4.35]	[-4.77]	[-4.44]	[-4.88]
Inst_Concentration	0.592***	0.619***	0.610***	0.636***
	[4.17]	[4.24]	[4.30]	[4.39]
Lambda		0.103***		0.103***
		[2.69]		[2.65]
Constant	-2.683***	-2.018***	-2.539***	-1.889***
	[-8.93]	[-6.54]	[-9.36]	[-6.55]

Year Dummies	*yes*	*yes*	*yes*	*yes*
Industry Dummies	*yes*	*yes*	*yes*	*yes*
Observations	12,085	11,548	12,085	11,548
R-squared	0.263	0.266	0.263	0.265
Differences between coefficients				
$\beta_1 - \beta_2$	-0.102**	-0.110**	-0.054	-0.048
	[4.75]	[5.88]	[2.05]	[1.27]

Table 8: Effect of Independent and Non-Co-opted Directors from Related Industries (*DRIs*) on the Sensitivity of CEO Pay to the Stock Price (*PPS*)

This table evidence on the effect of independent or non-co-opted *DRIs* on *PPS*. The dependent variable in all columns is *PPS* (in $ millions) which is defined as the change in CEO wealth for a 1% change in stock price. In all columns, related industries are identified using the vertical-relatedness threshold of 1%. $DumDRI_{OUT}$ is a dummy variable that equals one if the firm has at least one outside director from a related industry of its primary segment. *Independent DRI* is a dummy variable that equals one if at least one outside *DRI* of the firm is identified as independent in the *IRRC* database. *Dependent DRI* is a dummy variable that equals one if none of the outside *DRIs* of the firm are identified as independent. *Non-Co-opted DRI* is a dummy variable that equals one if at least one outside *DRI* of the firm has been appointed before the incumbent CEO. *Co-opted DRI* is a dummy variable that equals one if all *DRIs* of the firm have been appointed during the tenure of the incumbent CEO in the firm. In Columns (2) and (4), the Heckman treatment effects model is used to control for the potential endogeneity problem. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of the table. Definitions of all variables are provided in Appendix A. The sample used for estimation excludes financial and utility firms and is from 1993 to 2005. All specifications include year and Fama-French industry dummies (Fama and French, 1997). Robust t-statistics clustered at the firm level are reported in square brackets. Heckman t-statistics are based on 100 bootstrap replications; *** p<0.01, ** p<0.05, * p<0.1.

DRI classifications in all columns are defined based on $DumDRI_{OUT}$.

Dependent Variable:	*PPS*			
	(1) OLS	(2) Heckman	(3) OLS	(4) Heckman
Independent DRI (β_1)	-0.036***	-0.067***		
	[-2.98]	[-4.51]		
Dependent DRI (β_2)	0.022	-0.049		
	[0.48]	[-0.99]		
Non-Co-opted DRI (β_1)			-0.211***	-0.376***
			[-4.09]	[-3.61]
Co-opted DRI (β_2)			0.005	-0.167*
			[0.16]	[-1.85]
Ln(Market Value)	0.316***	0.327***	0.324***	0.340***
	[10.53]	[10.13]	[10.50]	[10.86]
Tobin's Q	0.092***	0.092***	0.087***	0.087***
	[4.03]	[4.10]	[3.57]	[3.47]
Firm Volatility	0.243**	0.226**	0.231**	0.208**
	[2.43]	[1.98]	[2.17]	[1.99]
Ln(CEO Tenure)	0.240***	0.244***	0.245***	0.246***
	[8.32]	[8.67]	[8.22]	[8.51]
PIN	0.930***	0.892**	1.096***	1.008**
	[2.64]	[2.42]	[2.85]	[2.52]
Cash Flow	-0.072	-0.109	-0.024	-0.087
	[-0.46]	[-0.77]	[-0.14]	[-0.57]
Inst_Percent	-0.006***	-0.006***	-0.007***	-0.007***
	[-4.46]	[-4.50]	[-4.67]	[-5.09]
Inst_Concentration	0.587***	0.620***	0.539***	0.591***
	[3.10]	[3.13]	[2.59]	[2.76]
Lambda		0.065***		0.109**
		[2.89]		[2.07]
Constant	-3.339***	-2.229***	-3.318***	-2.175***
	[-9.03]	[-5.36]	[-8.53]	[-4.53]

Year Dummies	*yes*	*yes*	*yes*	*yes*
Industry Dummies	*yes*	*yes*	*yes*	*yes*
Observations	8,287	7,997	6,955	6,736
R-squared	0.283	0.287	0.292	0.295
Differences between coefficients				
$\beta_1 - \beta_2$	-0.058	-0.018	-0.216***	-0.209***
	[1.64]	[0.16]	[14.75]	[13.82]

Table 9: Effect of Directors from Related Industries (*DRIs*) on the Level of CEO Compensation

This table presents evidence on the effect of *DRIs* on the level and the change in the level of CEO compensation. The dependent variable in Columns (1) and (2) is *TDC* (in $ millions) which is defined as the sum of salary, bonus, other annual compensation, long-term incentive payouts, grant-date value of restricted stock, grant-date value of stock and other compensation. The dependent variable in Columns (3) and (4) is *Δ(TDC)*, the change in *TDC*. In all columns, related industries are identified using the vertical-relatedness threshold of 1%. $DumDRI_{OUT}$ is a dummy variable that equals one if the firm has at least one outside director from a related industry of its primary segment. In Columns (2) and (4), the Heckman treatment effects model is used to control for the potential endogeneity problem. Definitions of all variables are provided in Appendix A. The sample used for estimation excludes financial and utility firms and is from 1993 to 2005. All specifications include year and Fama-French industry dummies (Fama and French, 1997). Robust t-statistics clustered at the firm level are reported in square brackets. Heckman t-statistics are based on 100 bootstrap replications; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	*TDC*		*Δ(TDC)*	
	(1)	(2)	(3)	(4)
	OLS	Heckman	OLS	Heckman
$DumDRI_{OUT}$	0.014	-0.171	0.046	-0.129
	[0.16]	[-0.59]	[0.76]	[-0.67]
Ln(Market Value)	1.858***	1.869***	0.147***	0.151***
	[22.23]	[21.75]	[3.56]	[3.79]
Tobin's Q	-0.073	-0.066	0.178***	0.179***
	[-1.36]	[-1.27]	[5.91]	[5.17]
Firm Volatility	2.914***	2.930***	0.158	0.150
	[8.63]	[9.71]	[0.81]	[0.73]
Ln(CEO Tenure)	-0.022	-0.032	0.059*	0.047
	[-0.39]	[-0.51]	[1.90]	[1.38]
PIN	-0.557	-0.607	1.909**	1.625*
	[-0.47]	[-0.53]	[2.18]	[1.75]
Cash Flow	-1.383***	-1.370***	0.498	0.543
	[-3.27]	[-2.85]	[1.43]	[1.58]
Inst_Percent	-0.003	-0.003	0.000	-0.000
	[-0.87]	[-0.96]	[0.29]	[-0.20]
Inst_Concentration	3.005***	3.012***	-0.212	-0.185
	[6.23]	[6.43]	[-0.85]	[-0.77]
Lambda		0.133		0.114
		[0.72]		[0.96]
Constant	-13.700***	-11.761***	0.683	-1.724***
	[-9.41]	[-12.83]	[0.67]	[-3.19]
Year Dummies	*yes*	*yes*	*yes*	*yes*
Industry Dummies	*yes*	*yes*	*yes*	*yes*
Observations	12,003	11,470	11,421	10,919
R-squared	0.357	0.357	0.026	0.026

Table 10: Effect of Directors from Related Industries (*DRIs*) on the Sensitivity of CEO Pay to Positive and Negative Stock Returns

This table presents evidence on the effect of *DRIs* on the sensitivity of CEO pay to positive versus negative returns, separately. The dependent variable in all columns is *PPS* (in $ millions) which is defined as the change in CEO wealth for a 1% change in stock price. In Columns (1) and (2), related industries are identified using the vertical-relatedness threshold of 1% while Columns (3) and (4) use the vertical-relatedness threshold of 5%. $DumDRI_{OUT}$ ($DumDRI_{OUT,\ 5\%}$) equals one if the firm has at least one outside director from a related industry of its primary segment based on the vertical-relatedness threshold of 1% (5%). *Positive_Return* is a dummy variable that equals one if the stock return is positive, whereas *Negative_Return* is a dummy variable that equals one if the stock return is negative. In Columns (2) and (4), the Heckman treatment effects model is used to control for the potential endogeneity problem. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of the table. Definitions of all variables are provided in Appendix A. The sample used for estimation excludes financial and utility firms and is from 1993 to 2005. All specifications include year and Fama-French industry dummies (Fama and French, 1997). Robust t-statistics clustered at the firm level are reported in square brackets. Heckman t-statistics are based on 100 bootstrap replications; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	*PPS*			
DRI Measure:	$DumDRI_{OUT}$		$DumDRI_{OUT,\ 5\%}$	
	(1) OLS	(2) Heckman	(3) OLS	(4) Heckman
Positive_Return x DRI Measure (β_1)	0.008	-0.141**	-0.084***	-0.232***
	[0.28]	[-2.28]	[-3.32]	[-2.60]
Negative_ Return x DRI Measure (β_2)	-0.020	-0.166***	-0.063***	-0.199**
	[-0.87]	[-2.75]	[-2.70]	[-2.21]
Ln(Market Value)	0.279***	0.292***	0.281***	0.291***
	[11.14]	[11.61]	[11.04]	[10.28]
Tobin's Q	0.075***	0.076***	0.076***	0.080***
	[4.64]	[4.58]	[4.72]	[4.59]
Firm Volatility	0.181**	0.177**	0.178**	0.185**
	[2.33]	[2.41]	[2.30]	[2.25]
Ln(CEO Tenure)	0.213***	0.214***	0.211***	0.219***
	[8.86]	[9.13]	[8.91]	[8.13]
PIN	0.493*	0.461*	0.511**	0.552**
	[1.94]	[1.77]	[2.03]	[2.11]
Cash Flow	-0.083	-0.110	-0.086	-0.100
	[-0.73]	[-1.04]	[-0.77]	[-0.89]
Inst_Percent	-0.004***	-0.004***	-0.004***	-0.004***
	[-4.40]	[-4.41]	[-4.36]	[-4.52]
Inst_Concentration	0.596***	0.622***	0.586***	0.601***
	[4.15]	[3.80]	[4.11]	[4.38]
Lambda		0.099***		0.085
		[2.86]		[1.46]
Constant	-3.121***	-1.989***	-3.141***	-2.298***
	[-9.80]	[-5.70]	[-9.80]	[-7.85]
Year Dummies	*yes*	*yes*	*yes*	*yes*
Industry Dummies	*yes*	*yes*	*yes*	*yes*
Observations	12,032	11,496	12,032	10,712
R-squared	0.262	0.265	0.263	0.268
Differences between coefficients				
$\beta_1 - \beta_2$	0.028	0.025	-0.021	-0.033
	[1.86]	[1.60]	[0.99]	[2.13]

Table 11: Effect of Directors from Supplier or Customer Firms on the Sensitivity of CEO Pay to the Stock Price (*PPS*)

This tables presents evidence on the effect of directors from customer or supplier firms on *PPS*. The dependent variable in all columns is *PPS* (in $ millions) which is defined as the change in CEO wealth for a 1% change in stock price. In Columns (1) and (2), related industries are identified using the vertical-relatedness threshold of 1% while Columns (3) and (4) use the vertical-relatedness threshold of 5%. $DumDRI_{OUT}$ ($DumDRI_{OUT,\ 5\%}$) is a dummy variable that equals one if the firm has at least one outside director from a related industry of its primary segment based on the vertical-relatedness threshold of 1% (5%). *Firm DRI* is a dummy variable that equals one if the firm has at least one director from its actual customer or supplier firms. There are 465 firm-year observations that involve such directors. *Industry DRI* is a dummy variable that equals one if the firm does not have any business relationship with its *DRIs*. In Columns (2) and (4), the Heckman treatment effects model is used to control for the potential endogeneity problem. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of the table. Definitions of all variables are provided in Appendix A. The sample used for estimation excludes financial and utility firms and is from 1993 to 2005. All specifications include year and Fama-French industry dummies (Fama and French, 1997). Robust t-statistics clustered at the firm level are reported in square brackets. Heckman t-statistics are based on 100 bootstrap replications; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	*PPS*			
DRI Measure:	$DumDRI_{OUT}$		$DumDRI_{OUT,\ 5\%}$	
	(1)	(2)	(3)	(4)
	OLS	Heckman	OLS	Heckman
Industry DRI (β_1)	-0.001	-0.158**	-0.071***	-0.235**
	[-0.05]	[-2.31]	[-3.14]	[-2.41]
Firm DRI (β_2)	0.113	-0.069	0.093	-0.075
	[1.03]	[-0.56]	[0.84]	[-0.54]
Ln(Market Value)	0.278***	0.293***	0.280***	0.291***
	[11.13]	[11.42]	[11.00]	[10.99]
Tobin's Q	0.076***	0.076***	0.075***	0.079***
	[4.79]	[5.59]	[4.75]	[4.80]
Firm Volatility	0.177**	0.174**	0.176**	0.182**
	[2.31]	[2.29]	[2.29]	[2.19]
Ln(CEO Tenure)	0.212***	0.213***	0.211***	0.218***
	[8.89]	[10.01]	[8.95]	[7.79]
PIN	0.505**	0.473**	0.491*	0.527**
	[2.01]	[1.99]	[1.95]	[1.98]
Cash Flow	-0.070	-0.101	-0.080	-0.103
	[-0.63]	[-0.83]	[-0.73]	[-0.78]
Inst_Percent	-0.004***	-0.004***	-0.004***	-0.004***
	[-4.39]	[-4.84]	[-4.36]	[-3.97]
Inst_Concentration	0.595***	0.623***	0.594***	0.613***
	[4.18]	[4.25]	[4.18]	[4.29]
Lambda		0.103***		0.098
		[2.66]		[1.63]
Constant	-2.654***	-1.985***	-2.657***	-2.280***
	[-8.94]	[-6.44]	[-9.02]	[-7.79]
Year Dummies	*yes*	*yes*	*yes*	*yes*
Industry Dummies	*yes*	*yes*	*yes*	*yes*
Observations	12,085	11,548	12,085	10,762
R-squared	0.262	0.265	0.263	0.268

Differences between coefficients				
$\beta_1 - \beta_2$	-0.114	-0.089	-0.164	-0.160
	[1.11]	[0.75]	[2.28]	[1.89]

Table 12: Directors from Related Industries (*DRIs*) on the Compensation Committee and the Sensitivity of CEO Pay to the Stock Price (*PPS*)

This table presents evidence on the effect of *DRIs* sitting on the compensation committee on *PPS*. The dependent variable in all columns is *PPS* (in $ millions) which is defined as the change in CEO wealth for a 1% change in stock price. In Columns (1) and (2), related industries are identified using the vertical-relatedness threshold of 1% while Columns (3) and (4) use the vertical-relatedness threshold of 5%. $DumDRI_{OUT}$ ($DumDRI_{OUT,\ 5\%}$) equals one if the firm has at least one outside director from a related industry of its primary segment based on the vertical-relatedness threshold of 1% (5%). *DRIs* on the compensation committee are identified using the *IRRC* database. *Comp_Comm DRI* is a dummy variable that equals one if at least of the outside *DRIs* of the firm serves on the compensation committee. *Non_Comp_Comm DRI* is dummy variable that equals one if the firm has at least one outside *DRI* and none of them serves on the firm's compensation committee. In Columns (1) and (2), related industries are identified based on the vertical-relatedness threshold of 1% while in Columns (3) and (4) the vertical-relatedness threshold of 5% is used. In Columns (2) and (4), the Heckman treatment effects model is used to control for the potential endogeneity problem. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of the table. Definitions of all variables are provided in Appendix A. The sample used for estimation excludes financial and utility firms and is from 1993 to 2005. All specifications include year and Fama-French industry dummies (Fama and French, 1997). Robust t-statistics clustered at the firm level are reported in square brackets. Heckman t-statistics are based on 100 bootstrap replications; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	*PPS*			
DRI Measure:	$DumDRI_{OUT}$		$DumDRI_{OUT,\ 5\%}$	
	(1) OLS	(2) Heckman	(3) OLS	(4) Heckman
Comp_Comm DRI (β_1)	-0.035	-0.214**	-0.109***	-0.541**
	[-1.04]	[-2.35]	[-3.12]	[-2.56]
Non_Comp_Comm DRI (β_2)	0.024	-0.155*	-0.080**	-0.505**
	[0.56]	[-1.65]	[-2.07]	[-2.41]
Ln(Market Value)	0.323***	0.339***	0.323***	0.331***
	[10.47]	[10.84]	[10.37]	[10.34]
Tobin's Q	0.088***	0.087***	0.087***	0.091***
	[3.55]	[3.46]	[3.55]	[3.49]
Firm Volatility	0.238**	0.215**	0.233**	0.194*
	[2.23]	[2.03]	[2.17]	[1.69]
Ln(CEO Tenure)	0.250***	0.251***	0.249***	0.250***
	[8.37]	[8.68]	[8.37]	[8.29]
PIN	1.108***	1.014**	1.080***	0.921**
	[2.87]	[2.54]	[2.79]	[2.29]
Cash Flow	-0.026	-0.090	-0.037	-0.139
	[-0.15]	[-0.59]	[-0.22]	[-0.74]
Inst_Percent	-0.007***	-0.007***	-0.007***	-0.006***
	[-4.63]	[-5.04]	[-4.59]	[-5.01]
Inst_Concentration	0.537**	0.588***	0.532**	0.556**
	[2.57]	[2.71]	[2.54]	[2.57]
Lambda		0.114**		0.253**
		[2.16]		[2.00]
Constant	-3.323***	-2.187***	-3.310***	-2.490***
	[-8.52]	[-4.53]	[-8.45]	[-6.71]
Year Dummies	*yes*	*yes*	*yes*	*yes*
Industry Dummies	*yes*	*yes*	*yes*	*yes*
Observations	6,955	6,736	6,955	6,418
R-squared	0.290	0.294	0.291	0.298

Differences between coefficients				
$\beta_1 - \beta_2$	-0.059	-0.059	-0.029	-0.036
	[2.33]	[2.46]	[0.58]	[0.65]

Table 13: Effect of Directors from Related Industries (*DRIs*) on the Sensitivity of Forced CEO Turnovers to Stock Returns

This table presents evidence on the effect of *DRIs* on the sensitivity of forced CEO turnovers to stock returns. The dependent variable in both Panel A and Panel B, *Forced CEO Turnover* is a dummy variable that equals one if the incumbent CEO departs involuntarily. In both panels, all columns use the vertical-relatedness threshold of 1% to identify related industries. $DumDRI_{OUT}$ is a dummy variable that equals one if the firm has at least one outside director from a related industry of its primary segment. *Independent DRI* is a dummy variable that equals one if at least one outside *DRI* of the firm is identified as independent in the *IRRC* database. *Non-Co-opted DRI* is a dummy variable that equals one if at least one outside *DRI* of the firm has been appointed before the incumbent CEO. *Mkt_Adj_Return* is the cumulative market-adjusted return over the twelve months prior to the fiscal year end. Definitions of all variables are provided in Appendix A. In both panels, Columns (2), (4) and (6) use the Heckman treatment effects model to control for the potential endogeneity problems. The sample used for estimation excludes financial and utility firms and is from 1993 to 2005. All specifications include year and Fama-French industry dummies (Fama and French, 1997). Robust t-statistics clustered at the firm level are reported in square brackets; *** p<0.01, ** p<0.05, * p<0.1.

Panel A: Specifications with the interaction of market-adjusted stock returns with the DRI Measure=1 and DRI Measure=0.

Dependent Variable:	*Forced CEO Turnover*					
DRI Measure:	$DumDRI_{OUT}$		*Independent DRI*		*Non-Co-opted DRI*	
	(1)	(2)	(3)	(4)	(5)	(6)
	Logit	Heckman	Logit	Heckman	Logit	Heckman
Mkt_Adj_Return x DRI Measure=1	-0.741***	-0.725***	-0.336***	-0.310**	-0.147	-0.459
	[-3.13]	[-3.03]	[-2.77]	[-2.48]	[-0.23]	[-0.65]
Mkt_Adj_Return x DRI Measure=0	-0.907**	-0.920**	-0.913***	-0.950***	-0.911***	-0.924***
	[-2.56]	[-2.49]	[-2.90]	[-2.92]	[-3.42]	[-3.36]
DRI Measure	0.242	-0.370	0.144**	0.106	1.059***	1.106***
	[1.31]	[-0.64]	[2.08]	[1.27]	[2.91]	[3.05]
Ind_Adj_ROA	-0.982***	-0.940***	-2.460***	-2.706***	-2.414***	-2.727***
	[-3.07]	[-2.69]	[-3.91]	[-3.94]	[-3.58]	[-3.86]
Ln(Market Value)	-0.098*	-0.078	-0.055	-0.055	0.003	0.004
	[-1.67]	[-1.19]	[-0.74]	[-0.67]	[0.04]	[0.04]
CEO-Chairman Duality	-0.355**	-0.285*	-0.509**	-0.457**	-0.546**	-0.565**
	[-2.19]	[-1.68]	[-2.56]	[-2.22]	[-2.51]	[-2.45]
CEO Age>=65	0.966***	0.953***	1.175***	1.161***	1.235***	1.247***
	[3.99]	[3.84]	[4.32]	[4.13]	[4.07]	[4.04]
CEO_Percent_Owned	-3.154	-2.925	-2.225	-2.059	-2.073	-1.881
	[-1.49]	[-1.37]	[-1.08]	[-1.01]	[-0.88]	[-0.82]
Outsider_Controlled	0.416	0.554	0.183	0.101	0.365	0.231
	[1.30]	[1.57]	[0.51]	[0.28]	[0.82]	[0.53]
Lambda		0.410		0.198		0.094
		[1.14]		[1.32]		[0.97]
Constant	-5.567***	-5.525***	-5.088***	-5.111***	-5.469***	-5.511***
	[-4.62]	[-4.60]	[-3.89]	[-3.79]	[-3.84]	[-3.72]
Year Dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Industry Dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Observations	12,898	11,853	8,653	8,031	6,921	6,447
Pseudo R2	0.070	0.067	0.105	0.107	0.101	0.107

Panel B: Specifications with the interaction of the market-adjusted stock return with the DRI measure.

Dependent Variable:	*Forced CEO Turnover*					
DRI Measure:	*$DumDRI_{OUT}$*		*Independent DRI*		*Non-Co-opted DRI*	
	(1)	(2)	(3)	(4)	(5)	(6)
	Logit	Heckman	Logit	Heckman	Logit	Heckman
Mkt_Adj_Return x DRI Measure	0.166	0.194	0.032	0.092	0.765	0.466
	[0.41]	[0.47]	[0.22]	[0.61]	[1.11]	[0.62]
Mkt_Adj_Return	-0.907**	-0.920**	-0.913***	-0.997***	-0.911***	-0.924***
	[-2.56]	[-2.49]	[-3.12]	[-3.26]	[-3.42]	[-3.36]
DRI Measure	0.242	-0.370	0.156**	0.127	1.059***	1.106***
	[1.31]	[-0.64]	[2.29]	[1.56]	[2.91]	[3.05]
Ind_Adj_ROA	-0.982***	-0.940***	-2.422***	-2.697***	-2.414***	-2.727***
	[-3.07]	[-2.69]	[-3.84]	[-3.95]	[-3.58]	[-3.86]
Ln(Market Value)	-0.098*	-0.078	-0.048	-0.043	0.003	0.004
	[-1.67]	[-1.19]	[-0.65]	[-0.52]	[0.04]	[0.04]
CEO-Chairman Duality	-0.355**	-0.285*	-0.509**	-0.464**	-0.546**	-0.565**
	[-2.19]	[-1.68]	[-2.57]	[-2.27]	[-2.51]	[-2.45]
CEO Age>=65	0.966***	0.953***	1.183***	1.174***	1.235***	1.247***
	[3.99]	[3.84]	[4.40]	[4.22]	[4.07]	[4.04]
CEO_Percent_Owned	-3.154	-2.925	-2.178	-2.003	-2.073	-1.881
	[-1.49]	[-1.37]	[-1.07]	[-0.99]	[-0.88]	[-0.82]
Outsider_Controlled	0.416	0.554	0.174	0.081	0.365	0.231
	[1.30]	[1.57]	[0.49]	[0.23]	[0.82]	[0.53]
Lambda		0.410		0.172		0.094
		[1.14]		[1.13]		[0.97]
Constant	-5.567***	-5.525***	-5.136***	-5.176***	-5.469***	-5.511***
	[-4.62]	[-4.60]	[-3.93]	[-3.83]	[-3.84]	[-3.72]
Year Dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Industry Dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Observations	12,898	11,853	8,653	8,031	6,921	6,447
Pseudo R2	0.070	0.067	0.106	0.109	0.101	0.107

Table 14: Effect of Directors from Related Industries (*DRIs*) on the Sensitivity of CEO Pay to Sector Performance (*PSP*)

This table presents evidence on the effect of *DRIs* on *PSP*. The dependent variable in all columns is the CEO total direct compensation (*TDC*). In all columns, related industries are identified based on the vertical-relatedness threshold of 1%. $DumDRI_{OUT}$ is a dummy variable that equals one if the firm has at least one outside director from a related industry of its primary segment. *Luck* denotes sector performance and *Skill* denotes firm-specific performance estimated following Garvey and Milbourn (2006). All dollar values in the table are in $ millions. Columns (3) and (4) use the subsample of firms from industries with a median value for *R&D Intensity* (*Median_R&D*) that is zero, while Columns (5) and (6) use the subsample of firms from industries with a positive median value for *R&D Intensity*. *R&D Intensity* is defined as the ratio of research and development expenditures to total assets. In Columns (2), (4) and (6), the Heckman treatment effects model is used to control for the potential endogeneity problem. Definitions of all variables are provided in Appendix A. The sample used for estimation excludes firms with a fiscal year end other than December and firms that replaced their CEO from the previous year. The sample period is from 1993 to 2005. All specifications include year and CEO dummies. Robust t-statistics are reported in square brackets. Heckman t-statistics are based on 100 bootstrap replications; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	*TDC*					
Regression Sample:	*Full Sample*		*Median_R&D=0*		*Median_R&D>0*	
	(1) OLS	(2) Heckman	(3) OLS	(4) Heckman	(5) OLS	(6) Heckman
Luck	1.556***	1.418***	1.545***	1.439***	1.791***	1.526***
	[6.12]	[5.13]	[5.22]	[4.74]	[3.44]	[2.68]
Luck x $DumDRI_{OUT}$	-0.077*	-0.064	0.017	0.049	-0.145**	-0.131**
	[-1.66]	[-1.29]	[0.22]	[0.59]	[-2.52]	[-2.33]
Skill	0.999***	0.910***	1.262***	1.113***	0.654**	0.659**
	[4.72]	[4.40]	[4.53]	[3.56]	[2.16]	[2.07]
Skill x $DumDRI_{OUT}$	-0.018	-0.013	0.039	0.082	-0.017	-0.031
	[-0.42]	[-0.31]	[0.51]	[1.09]	[-0.31]	[-0.57]
$DumDRI_{OUT}$	113.693	118.645	67.062	-95.927	186.589	51.708
	[1.27]	[0.37]	[0.59]	[-0.23]	[1.22]	[0.07]
CDF_Variance_Luck x Luck	-1.485***	-1.351***	-1.564***	-1.488***	-1.670***	-1.403**
	[-5.58]	[-4.59]	[-4.92]	[-4.43]	[-3.10]	[-2.38]
CDF_Variance_Skill x Skill	-0.996***	-0.908***	-1.331***	-1.217***	-0.636**	-0.632**
	[-4.52]	[-4.22]	[-4.51]	[-3.56]	[-2.03]	[-1.99]
CDF_Variance_Luck	2,567.696	5,361.221	2,681.453	7,073.560	-2,885.532	-10,276.384
	[1.34]	[1.28]	[1.30]	[1.27]	[-0.33]	[-0.62]
CDF_Variance_Skill	526.383	-2,268.012	1,843.406	-2,888.693	2,810.570	9,200.975
	[0.28]	[-0.61]	[0.88]	[-0.55]	[0.37]	[0.77]
Ln(CEO Tenure)	-40.070	-53.593	-160.395	-249.015	203.560	285.797
	[-0.28]	[-0.32]	[-0.82]	[-1.21]	[0.89]	[1.20]
Lambda		13.709		152.800		58.262
		[0.06]		[0.58]		[0.13]
Constant	2,857.116***	2,872.764***	2,784.217***	3,278.143***	3,228.501***	3,587.836
	[4.12]	[3.24]	[2.70]	[3.08]	[3.49]	[1.21]

Year Dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
CEO Dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Observations	11,248	10,103	6,956	6,227	4,292	3,876
R-squared	0.076	0.075	0.084	0.087	0.079	0.073

Table 15: Effect of Directors from Related Industries (*DRIs*) on the Asymmetric Sensitivity of CEO Pay to Sector Performance (*PSP*)

This table presents evidence on the effect of *DRIs* on the asymmetry in *PSP*. The dependent variable in all columns is the CEO's total direct compensation (*TDC*). In all columns, related industries are identified based on the vertical-relatedness threshold of 1%. $DumDRI_{OUT}$ is a dummy variable that equals one if the firm has at least one outside director from a related industry of its primary segment. *Luck* denotes sector performance and *Skill* denotes firm-specific performance estimated following Garvey and Milbourn (2006). All dollar values in the table are in $ millions. *LuckisUp* is a dummy variable that equals one if *Luck* is positive. Columns (3) and (4) use the subsample of firms from industries with a median value for *R&D Intensity* (*Median_R&D*) that is zero, while Columns (5) and (6) use the subsample of firms from industries with a positive median value for *R&D Intensity*. *R&D Intensity* is defined as the ratio of research and development expenditures to total assets. In Columns (2), (4) and (6), the Heckman treatment effects model is used to control for the potential endogeneity problem. Definitions of all variables are provided in Appendix A. The sample used for estimation excludes firms with a fiscal year end other than December and firms that replaced the CEO from the previous year. The sample period is from 1993 to 2005. All specifications include year and CEO dummies. Robust t-statistics are reported in square brackets. Heckman t-statistics are based on 100 bootstrap replications; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	*TDC*					
Regression Sample:	*Full Sample*		*Median_R&D=0*		*Median_R&D>0*	
	(1) OLS	(2) Heckman	(3) OLS	(4) Heckman	(5) OLS	(6) Heckman
LuckisUp x Luck	1.378***	1.481***	1.286***	1.328***	1.644**	1.933***
	[4.23]	[4.45]	[3.37]	[3.07]	[2.29]	[2.67]
*LuckisUp*Luck x* $DumDRI_{OUT}$	-0.060**	-0.052*	-0.017	-0.024	-0.133***	-0.111**
	[-2.38]	[-1.88]	[-0.57]	[-0.70]	[-3.24]	[-2.37]
Luck	0.424	0.176	0.479	0.324	0.397	-0.125
	[1.16]	[0.44]	[1.13]	[0.67]	[0.46]	[-0.14]
Skill	1.132***	1.049***	1.405***	1.272***	0.734**	0.759**
	[5.47]	[5.29]	[5.08]	[4.08]	[2.44]	[2.44]
$DumDRI_{OUT}$	121.054	124.534	90.848	-69.956	188.081	105.862
	[1.37]	[0.39]	[0.81]	[-0.17]	[1.23]	[0.14]
CDF_Variance_Luck x Luck	-1.716***	-1.568***	-1.720***	-1.601***	-1.901***	-1.661***
	[-6.33]	[-5.28]	[-5.31]	[-4.91]	[-3.58]	[-2.87]
CDF_Variance_Skill x Skill	-1.131***	-1.043***	-1.421***	-1.285***	-0.717**	-0.739**
	[-5.13]	[-4.95]	[-4.76]	[-3.86]	[-2.28]	[-2.30]
CDF_Variance_Luck	2,381.662	4,957.371	2,403.443	6,450.635	-6,338.703	-2,820.651
	[1.23]	[1.24]	[1.19]	[1.17]	[-0.64]	[-0.19]
CDF_Variance_Skill	230.724	-2,461.220	1,781.165	-2,793.338	5,019.356	1,359.306
	[0.12]	[-0.70]	[0.85]	[-0.55]	[0.57]	[0.12]
Ln(CEO Tenure)	-34.839	-46.623	-146.989	-233.404	222.744	277.902
	[-0.25]	[-0.28]	[-0.76]	[-1.13]	[0.98]	[1.15]
Lambda		16.238		159.102		26.428
		[0.08]		[0.62]		[0.06]
Constant	2,995.885***	3,059.635***	2,806.868***	3,386.023***	3,743.703***	3,684.579
	[4.38]	[3.51]	[2.78]	[3.24]	[3.68]	[1.34]
Year Dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*

CEO Dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Observations	11,248	10,103	6,956	6,227	4,292	3,876
R-squared	0.081	0.081	0.090	0.093	0.084	0.079

Stock-Based CEO Compensation
Following Conglomerate Acquisitions

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Current Draft: July 2012

Abstract

I examine how stock-based incentive compensation for the CEO is designed following corporate acquisitions conditional on the economic nature of the acquisition. Large acquisitions represent significant changes in the economic environment of the firm. Furthermore, these changes are more likely to occur with conglomerate acquisitions. Accordingly, implications of the two mainstream theories of incentive compensation, i.e., efficient contracting theory and agency theory, are tested separately for conglomerate acquisitions. The empirical tests generally show that stock-based compensation is employed more intensely after conglomerate acquisitions than otherwise. Overall, the results documented in this paper seem consistent with the notion that greater economic uncertainties that are likely to follow conglomerate acquisitions induce the board to rely more heavily on stock-based incentives, an external monitoring mechanism.

JEL Classification: D8; J3; G3

Keywords: CEO Incentive Compensation; Stock-Based Compensation; Board of Directors; Monitoring; Conglomerate Acquisitions; Target Industry; Related Industries

[*] I am grateful to Mark Chen, Nishant Dass, Omesh Kini, Vikram Nanda and Chip Ryan for helpful comments and suggestions. I acknowledge financial support from Max Burns Fellowship. All remaining errors are mine. Contact information: Suite 1229, Department of Finance, Georgia State University 35 Broad St. Atlanta, GA 30303 Email: bonal1@gsu.edu Phone: (404) 413-7318.

Examining compensation contracts following important corporate events such as mergers and acquisitions can shed light on the dynamic nature of compensation contracts. Mergers and acquisitions can particularly be regarded as significant changes in the economic environment for the board as well as management, and are likely to lead to major shifts in the design of incentive compensation. It is reasonable to further argue that any such effect on incentive compensation is likely to be more prominent for conglomerate acquisitions. The rationale for this argument is that the contracting parties, i.e., the board and the CEO, remain in the same primary industry or its chain of economically-connected industries in the case of a related acquisition, whereas they enter a completely new and unrelated sector after a conglomerate acquisition. Therefore, in this paper, I conduct an empirical analysis of the possible effects of conglomerate acquisitions on CEO incentive compensation.

The implications of conglomerate acquisitions on incentive compensation are drawn from the two mainstream theories of executive compensation: the efficient contracting theory (e.g., Holmstrom, 1979; Prendergast, 2002) and the agency theory (e.g., Berle and Means, 1932; Jensen and Meckling, 1976; Bebchuk, Fried, and Walker, 2002; Bebchuk and Fried, 2003). The efficient contracting theory has two implications regarding the effect of acquisitions on incentive compensation. Firstly, it suggests that greater uncertainties in the post-acquisition contracting environment are expected to induce the board to rely more on incentive compensation (Prendergast, 2000; 2002). That is, the board is likely to delegate its monitoring and advisory functions to the stock market to a greater extent if the acquisition results in additional uncertainties that hinder the board's ability to conduct its pre-acquisition level of internal monitoring and advising.[2] This projection is formalized as the *Uncertainty Hypothesis*. As discussed earlier, the *Uncertainty Hypothesis* is expected to apply more to the case of unrelated acquisitions.

Another implication of the efficient contracting theory is based on a different dimension of uncertainty that can also impact the degree of stock-based CEO compensation: uncertainty about the stock price, i.e., stock volatility. The efficient contracting theory predicts a negative tradeoff

[2] In Onal (2012), I study a mechanism that is likely to mitigate the board's uncertainty about the economic environment: presence of directors with expertise in related industries of the firm (*DRIs*) on the board. As expected, *DRIs* are found to reduce the use of stock-based incentives. On the contrary, unrelated acquisitions are expected to increase the board's uncertainty about the economic environment and, thereby, the use of stock-based incentives.

between stock-based compensation and stock volatility. The rationale for this prediction is that if stock volatility rises, the risk-averse CEO requires a higher premium on stock-based compensation which makes it costlier for the firm and is expected to induce the board to reduce its reliance on this incentive mechanism. Thus, another channel through which acquisitions can trigger changes in the sensitivity of CEO pay to the stock price (*PPS*) is due to their impact on stock volatility. More specifically, if an acquisition is followed by a more stable stock price due to diversification effects, then stock-based incentives become less costly for the firm. Therefore, the board may employ more of this mechanism after the acquisition. This projection is also more likely to prevail for unrelated acquisitions because the related ones are less likely to provide such diversification benefits. These arguments and the prediction that follows are formalized as the *Diversification Hypothesis*.

The arguments and predictions under the efficient contracting theory abstract away from the possibility that CEOs have influence over their compensation arrangements. These arrangements are, therefore, likely to be based on the preferences of the CEO, rather than optimal contracting principles. Bebchuk and Fried (2003), for example, argue that the CEO has influence over the set of information that the board relies on to make compensation decisions. Acquisitions as well as other major corporate events, on the other hand, have been proposed and shown to be opportunities for the CEO to extract a compensation scheme that he favors, such as one with lower sensitivity to poor performance (Harford and Li, 2007). Following this line of reasoning, the greater economic uncertainty following unrelated acquisitions is likely to allow the CEO to more easily manipulate the information available to the board in order to reduce his exposure to the stock market. Consequently, the possible negative impact on *PPS* is expected to be stronger after unrelated acquisitions than otherwise. This prediction is referred to as the *Agency Hypothesis*.

Carrying out an empirical analysis over these non-mutually exclusive hypotheses and their implications requires classification of acquisitions as related and unrelated. The selection criteria used to identify acquisitions that are expected to have a significant and distinct impact on CEO compensation results in a sample of 465 acquisitions completed over the period of 1993-

2005.[3] Of these acquisitions, 194 are classified as horizontal, i.e., take place in the acquirer's four-digit SIC industry. Of the remaining 271, 51 (32) are classified as vertical, i.e., in the supply chain of the acquirer, at the 1% (5%) vertical-relatedness threshold.[4] Thus, there are a total of 245 (226) related acquisitions at the 1% (5%) vertical-relatedness threshold.

Having constructed the final sample of related and unrelated acquisitions, I argue that the board faces greater uncertainty in its monitoring/advising environment following unrelated acquisitions, but, at the same time, can expect a lower stock volatility due to potential diversification benefits of these acquisitions. Both of these two forces predict a positive relationship between unrelated acquisitions and *PPS*, while the *Agency Hypothesis* predicts the opposite. Thus, I first test whether *PPS* is higher or lower following unrelated acquisitions than otherwise, after controlling for other determinants of *PPS*. If it is higher, I conduct additional tests to illustrate whether it is lower post-acquisition stock volatility or greater uncertainty in the economic environment that is causing the increase. In the main test, I divide unrelated acquisitions into two groups based on their impact on stock volatility. The *Diversification Hypothesis* predicts a positive effect on *PPS* if the acquirer's stock becomes less volatile after an acquisition, whereas the *Uncertainty Hypothesis* does not predict a systematic relationship between stock volatility and *PPS*. I also conduct a secondary test based on the argument that the acquiring board is likely to adjust more easily to the post-acquisition environment if it has members with significant roles, i.e., executive positions or directorships, in the target industry or its supply chain. I refer to these directors as directors from related industries of the target (*DRTs*) and expect them to reduce potential post-acquisition uncertainties faced by the acquirer's board. This possibility is hinted on in the following excerpt from the popular book by Andrew R. Sorkin titled "Too Big To Fail".

[3] These criteria require that: (i) the deal is completed; (ii) the acquirer has zero ownership in the target prior to the acquisition and acquires at least 50% of the target's outstanding shares; (iii) the deal size is at least 10% of the market value of the acquirer's assets; (iv) two deals completed by the same acquirer do not overlap, i.e., there must be at least two years between the completion of the first deal and the announcement of the second (Harford and Li, 2007).; (v) the acquirer is listed on the *Compustat* database and has the compensation data available on *ExecuComp* database; (vi) the acquirer is not in financial or utility industries.

[4] Vertical relatedness is measured based on the input-output tables published by the Bureau of Economic Analysis in 1992, 1997 and 2002.

"Everyone in the group (of Goldman Sachs board members) had a view about (a possible merger with) AIG… They all looked to one particular board member for direction: Edward Liddy. As the chief executive of Allstate, the major auto and home insurer, Liddy was the one person in the room with actual experience in the insurance business."

Andrew R. Sorkin, "Too Big To Fail", Page 113.

Had the Goldman Sachs' board pursued a merger with AIG, Edward Liddy would have likely been pivotal in the board's adaptation to the post-merger environment and, thereby, reduce any need for additional stock-based incentives. In general, the *Uncertainty Hypothesis* predicts the intensity of stock-based incentives to be greatest following conglomerate acquisitions and in the absence of *DRTs* on the acquirer's board. The *Diversification Hypothesis*, on the other hand, attaches no role to such directors.

As argued earlier, the *Agency Hypothesis* predicts a negative relationship between *PPS* and acquisitions. This prediction, however, applies particularly to firms with powerful CEOs, i.e., weak boards. To test this implication, boards are classified as strong and weak based on three governance characteristics: (i) CEO tenure; (ii) CEO-Chairman duality; (iii) whether the majority of the board consists of co-opted directors or not (Coles, Daniel, and Naveen, 2010).[5] The *Agency Hypothesis* predicts any negative impact on *PPS* to be stronger for acquirers with weak boards.

The first set of results is based on the ordinary least squares model. These results are largely consistent with the *Uncertainty Hypothesis* and inconsistent with the other hypotheses proposed in the paper. Specifically, the relationship between acquisitions and the sensitivity of CEO pay to the stock price is, in general, insignificant. However, unrelated acquisitions are followed by a significant increase in *PPS*, while related acquisitions are not. These findings appear inconsistent with the *Agency Hypothesis*. Furthermore, the significant effect of unrelated acquisitions on *PPS* prevails primarily in the cases where the acquisition is accompanied by an increase in stock volatility and in the absence of *DRTs* on the acquirer's board. This evidence

[5] More specifically, firms whose CEOs have a tenure longer than the median value of CEO tenure in that year, whose CEO is also the chairman of the board, or with the majority of the directors who are co-opted, i.e., are appointed after the CEO assumed his post, are assumed to have weak boards, whereas the rest of the firms are assumed to have strong boards.

seems inconsistent with the *Diversification Hypothesis*. Finally, the increase in *PPS* prescribed by the efficient contracting theory seems to be implemented only by boards that are classified as strong. This implies that CEOs who are more likely to have control over their pay arrangements at least impede the enforcement of higher post-acquisition *PPS*.

The results described so far use the OLS model for estimation. Thus, they need to be interpreted with great caution simply because corporate acquisitions are most likely to be endogenous events especially when their effect on CEO compensation is being investigated. In other words, the observed and unobserved characteristics of the acquirer such as its governance structure may be driving both the acquisition decision and the post-acquisition compensation policy. The econometric challenge faced in correcting for potential endogeneity biases in this setup is that there are two stages that the acquirer goes through before finalizing the acquisition decision and setting the compensation policy afterwards. In the first stage, it chooses whether to make an acquisition or not and, in the second stage, it chooses whether to acquire a related or an unrelated target. The tests that involve interactions with unrelated acquisitions are further potentially contaminated if the interaction variable is also endogenously determined. For example, the results based on the interaction of unrelated acquisitions with board characteristics such as board strength or having *DRTs* on the board must be interpreted with extra caution.

I attempt to address concerns regarding such endogeneity problems partially by using a predictive model or instrumental variables for making unrelated acquisitions, at the expense of not controlling for the initial acquisition decision. The predictive model is used in the first stage of the Heckman treatment effects model where the second stage consists of the *PPS* regressions. The instrumental variables in a 2SLS setting are mostly drawn from the predictive model for unrelated acquisitions. To be specific, two or three of the following industry characteristics are used as instruments: (i) the natural logarithm of the number of related acquisitions in the firm's four-digit SIC industry; (ii) the average pair-wise correlation of equal-weighted monthly stock returns between the firm's four-digit SIC industry and its customer and supplier industries; and (iii) the total number of directors serving at related-industry firms that are located within one hundred miles of the firm's headquarter; (iv) the natural logarithm of the total number of firms in related industries; (v) the natural logarithm of the number of vertically-integrated firms in the firm's four-digit SIC industry. The results based on these instrumental variables and the

predictive model for unrelated acquisitions are always in the same direction as the main OLS results and are usually statistically significant.

A final modification to the *PPS* regressions is necessary to disentangle the effects of acquisitions on *PPS* and the changes in other determinants of *PPS* such as firm size. This is done by controlling for the change in the determinants of *PPS* instead of their levels, with the exception of CEO tenure.[6] After this modification, the overall impact of unrelated acquisitions on *PPS* remains positive but becomes statistically insignificant at conventional levels. However, unrelated acquisitions followed by greater stock volatility are associated with significantly higher *PPS*. Finally, the change in total direct compensation (*TDC1*) and its components around unrelated acquisitions are examined. The evidence on *TDC1* and its components is largely parallel to the evidence on *PPS*. *TDC1* is significantly higher only after unrelated acquisitions that increase stock volatility. Neither unrelated nor related acquisitions are found to have any effect on cash compensation, i.e., salary and bonuses. Overall, this paper suggests that the economic relatedness of the target to the acquirer is an important factor in shaping the post-acquisition incentive compensation. Formally, the empirical analyses yield support for the efficient contracting theory and, particularly, the notion that any shock to the economic environment that is accompanied by additional uncertainties such unrelated acquisitions induces provision of more stock-based compensation, i.e., more intense external monitoring.

This study contributes specifically to the literature on CEO compensation (e.g., Jensen and Murphy, 1990; Yermack, 1995; Guay, 1999; Core and Guay, 1999; Aggarwal and Samwick, 1999; Prendergast, 2000, 2002; Bebchuk, Fried, and Walker, 2002; Bebchuk and Fried, 2003; Coles, Daniel, and Naveen, 2006). It examines the implications of the efficient contracting theory and agency theory about the impact of significant changes in the economic environment on the design of compensation contracts. Thus, the paper is related most to the branch of the literature on the effects of corporate events, such as acquisitions, on compensation contracts (e.g., Datta, Iskandar-Datta, and Raman, 2001; Bliss and Rosen, 2001; Grinstein and Hribar, 2004; Harford and Li, 2007; Fich, Starks, and Yore, 2008). The focus in these papers has mostly been on the implications of agency problems on post-acquisition contracts. This paper is an

[6] CEO tenure is not differenced because the relationship between *PPS* and the change in CEO tenure is not meaningful.

attempt to illustrate that the economic nature of the event and the environment that follows are also important determinants of compensation contracts. The post-acquisition contract seems to be designed in accordance with the efficient contracting theory. In a related paper, Onal (2012), I examine incentive contracts when the board has members who are likely to be more informed about the existing contracting environment. This paper, on the other hand, focuses on significant changes to the environment and has a dynamic framework.

This paper also contributes to the literature on the role of corporate boards, surveyed extensively by Hermalin and Weisbach (2003), Becht, Bolton, and Roell (2003) and Adams, Hermalin, and Weisbach (2009). It explores the way that the acquirer's board designs CEO compensation which reflects the degree to which it delegates its monitoring and advisory role to the stock market following acquisitions. Another closely-related branch of the literature is that on the substitution of different governance mechanisms (e.g., Holmstrom and Tirole, 1993; Garvey and Swan, 2002; Cai, Liu, and Qian, 2009). I examine how the substitution of board monitoring with stock-based compensation is affected by related and unrelated acquisitions. Finally, this paper contributes to the literature on the interaction between product markets and corporate finance (e.g., Fee and Thomas, 2004; Kale and Shahrur, 2007). It suggests that greater uncertainty about product markets caused by unrelated acquisitions has ramifications for the design of incentive compensation.

The rest of the paper is organized as follows. In section 2, I lay out the theoretical background and describe the hypotheses to be tested. Section 3 describes the data and discusses some summary statistics. Section 4 presents and discusses the empirical results and finally section 5 concludes the paper.

2. Theoretical Background and Hypothesis Development

There are two mainstream theories of executive compensation contracts: efficient contracting theory and agency theory. In this section, I begin with developing the hypotheses and predictions based on the efficient contracting theory on incentive compensation following acquisitions. Prendergast (2000; 2002) suggests that an important factor in the design of an agent's incentive compensation is the uncertainty in the monitoring (and advising) environment faced by the principal. More specifically, it is more costly for the principal to monitor the agent

directly if the uncertainty in the environment is greater. Thus, the principal is expected to substitute incentive compensation for direct monitoring of the agent's actions to a greater extent. As exemplified by Prendergast, a US-based company is likely to give greater incentives to its division manager in Armenia than its division manager in Canada. The reason for this discrepancy is that the company is less knowledgeable about the economic and institutional environment in Armenia and the set of actions that is proper for the division manager in that environment. One source of uncertainty of the principal about the monitoring environment can, thus, be his geographical distance from the agent (e.g., Alam, Chen, Ciccotello, and Ryan, 2011).

Another reason for the principal to be highly uncertain about the optimality of the agent's actions can be the distance of the principal's industrial expertise to the industry of the agent. For example, managers of a division in the same sector as the firm's primary sector are likely to be given lower incentive compensation than managers of a division in an unrelated sector. By the same logic, when the firm invests in economically distant, i.e., unrelated, industries to the firm's primary industry, the difficulty for the board to monitor and judge CEO actions is likely to become greater. This, in turn, is expected to induce the board to employ stock-based incentives more intensely as an external monitoring mechanism. Formally, the sensitivity of CEO pay to the stock price is predicted to be higher for firms that make conglomerate acquisitions than those making related or no acquisitions. These arguments and the prediction that follows are referred to as the *Uncertainty Hypothesis*.

Uncertainty Hypothesis:

1a: CEO compensation is more sensitive to the stock price following acquisitions in unrelated sectors than otherwise.

Acquisitions in unrelated industries can, however, also make stock-based compensation less costly to the extent that they lead to lower uncertainty about the firm's stock price, i.e., lower stock volatility. This effect, too, is likely to induce the board to grant more stock-based compensation to the CEO after unrelated acquisitions. This idea is based on the diversification benefits of unrelated acquisitions and, hence, is coined the *Diversification Hypothesis*:

Diversification Hypothesis:

2a: CEO compensation is more sensitive to the stock price following unrelated acquisitions than otherwise.

If unrelated acquisitions are followed by higher stock-based incentives, it is not clear which of these two hypotheses can explain it better. To unravel the underlying factor that drives any positive impact on *PPS*, unrelated acquisitions that lead to lower stock volatility can be examined separately from those that lead to higher stock volatility. If stock-based compensation is higher only when the stock price becomes less volatile, then the *Diversification Hypothesis* is more likely to explain the increase in incentive compensation. Otherwise, the *Uncertainty Hypothesis* is more likely to hold.

Uncertainty Hypothesis:

1b: CEO compensation becomes more sensitive to the stock price following unrelated acquisitions than otherwise, regardless of the impact of these acquisitions on stock volatility.

Diversification Hypothesis:

2b: CEO compensation becomes more sensitive to the stock price for unrelated acquisitions that reduce stock volatility than otherwise.

The two hypotheses can further be tested by considering the possibility that boards are not equally distant in terms of their industrial expertise to the new, unrelated sector. Boards with members who hold significant other positions in the target industry or one of its supply-chain industries can be argued to face a lower degree of uncertainty about the target industry. Thus, the effect of greater uncertainty following unrelated acquisitions is expected to be mitigated by the information flow from directors about the new industry. I refer to such directors as directors from related industries of the target (*DRTs*) and formalize the respective implication as follows.

Uncertainty Hypothesis:

1c: For firms that execute unrelated acquisitions, post-acquisition CEO compensation is less sensitive to the stock price in the presence of DRTs on the board than otherwise.

Under the *Diversification Hypothesis*, on the other hand, incentive compensation becomes less costly after conglomerate acquisitions regardless of the composition of the board. Thus, *DRTs* are not expected to play a role in the design of incentive compensation.

Diversification Hypothesis:

2c: CEO compensation becomes more sensitive to the stock price following unrelated acquisitions regardless of the composition of the acquirer's board.

The scenarios and hypotheses developed so far are solely based on the efficient contracting theory and abstracts away from agency problems (e.g., Berle and Means, 1932; Jensen and Meckling, 1976). More recently, Bebchuk and Fried (2003) argue that CEOs generally can influence their compensation arrangements because they can control the set of information accessed by the board in making these arrangements. This ability of the CEO makes compensation contracts part of the agency problems in public corporations, rather a solution to them. In addition, corporate deals such as acquisitions have been shown to form a basis for CEOs to extract a contract that they prefer, such as one with a higher level of compensation that is at the same time more stable through lower sensitivity to stock performance (e.g., Harford and Li, 2007; Fich, Starks, and Yore, 2008). It can, therefore, be inferred from these papers that acquisitions provide the CEO greater flexibility to manipulate the information available to the board because of greater economic uncertainty facing the firm. Because these arguments are more likely to apply if a firm enters an economically distant sector, unrelated acquisitions are expected to be associated with a lower *PPS* and higher cash compensation.

Agency Hypothesis:

3a: CEO compensation becomes less sensitive to the stock price following unrelated acquisitions than otherwise.

3b: The CEO receives a higher level of cash compensation following unrelated acquisitions than otherwise.

3. Data Description

The data on mergers and acquisitions are drawn from the *SDC Platinum* database and spans 1993-2005. I use the following set of criteria to refine the sample of mergers or acquisitions to be examined in delineating the distinct effect of acquisitions on stock-based compensation: (i) the deal must be completed; (ii) the deal size must be at least 10% of the acquirer market value prior to the announcement; (iii) deals completed by the same acquirer in consecutive years must not overlap;[7] (iv) the acquirer must have zero ownership in the target prior to the acquisition and acquire at least 50% ownership in the target; (v) the acquirer must be listed on the *Compustat* and have the compensation data available on *ExecuComp*. In addition, the acquirers from financial and utility industries are excluded because these industries are regulated and the pay-setting process may be subject to limitations. These sample selection criteria lead to a sample of 465 acquisitions completed between 1993 and 2005. Consistent with other studies (e.g., Grinstein and Hribar, 2004), about two-thirds of these deals, i.e., 343 deals to be precise, are completed in the same year that they are announced. Most of the rest of the deals, i.e., 119 deals, close in the fiscal year that follows the announcement year.

Table 1 provides the distribution of these acquisitions by Fama-French industry categories (Fama and French, 1997). Among the industries with most frequent acquisition activity are Business Services with 71 and Electronic Equipment with 45 acquisitions. Classification of acquisitions as related and unrelated is based on four-digit SIC codes of the target and the acquirer. If the target and the acquirer have the same four-digit SIC codes, the acquisition is classified as a horizontal acquisition. If the target is in one of the supplier or customer industries of the acquirer's primary industry, the acquisition is classified as a vertical one. Customer and supplier industries are identified based on the Bureau of Economic Analysis' input-output (*IO*) tables that provide information on the trading activity between industries in the US. For every pair of *IO* codes, vertical-relatedness coefficients (*VRC*) are constructed. Specifically, for a given pair of industries, *industry i* and *j*, if the proportion of the output of *industry i* sold to *industry j* is *a%* and the proportion of the input of *industry i* bought from

[7] As defined by Harford and Li (2007), two deals completed by the same bidder do not overlap if the gap between the completion of the first deal and the announcement of the second one is at least two years.

industry j is *b%*, then the *VRC* between *industry i* and *industry j* is *a% + b%*. If this sum is at least 1% (5%), *industry i* and *industry j* are classified as vertically related at 1% (5%). The IO tables are updated every five years. Therefore, acquisitions completed in years from 1993 to 1996 are matched to the *VRCs* from 1992 using the concordance table for *IO* and *SIC* codes. Acquisitions completed between 1997 and 2001 and those between 2002 and 2005 are matched to the *VRCs* from 1997 and 2002, respectively, using the concordance tables for *NAICS* and *IO* codes for the respective year. Deals for which the acquirer's *VRC* with the target is at least 1% (5%) are then classified as vertical acquisitions at 1% (5%). This process results in classification of 194 deals as horizontally related. Among the remaining 271 deals, 51 (32) deals are classified as vertically related at the 1% (5%) vertical-relatedness threshold. Thus, the total number of related deals comes to 245 and 226 for the 1% and 5% vertical-relatedness thresholds, respectively. The distributions of horizontal and vertical acquisitions by Fama-French industries are also presented in Table 1. Table 2 provides the distribution of all deals as well as the horizontal and vertical ones by the completion year. Finally, Table 3 provides some of the deal characteristics such as the deal size to see if there are any systematic differences between related and unrelated deals. Related deals seem to be larger deals than the unrelated ones, although this difference is not statistically significant at conventional levels. Deal size relative to the acquirer's value of assets prior to the announcement year (*Deal-to-Acquirer*), however, is significantly higher for related acquisitions than unrelated ones. Other deal characteristics are largely similar across the two subsamples.

A relevant board characteristic in this paper is based on the possibility that the acquirer may have a director with expertise in the target industry on its board. Testing the empirical implications of this possibility requires identification of acquirers, if any, with such board members. The process used here follows directly from the classification of deals as related and unrelated. Formally, a director of the acquirer who is at the same time an executive or a director in an industry that has the same four-digit SIC code as the target industry is classified as horizontally related to the target. Similarly, a director who has such positions in an industry with which the target industry has a *VRC* of at least 1% (5%) is classified as vertically related to the target at 1% (5%). These directors of the acquirer are referred to as directors related to the target or shortly *DRTs*. As shown in Table 4, there are 55 (38) acquirers with at least one director who

is vertically-related at 1% (5%) and 24 acquirers with at least one director horizontally-related to the target. Due to the big overlap between these two groups, there are a total of 57 (42) acquirers with *DRTs* at the 1% (5%) vertical-relatedness threshold.

Table 5 provides descriptive statistics on variables used in the multivariate analyses. Dollar values are in constant 2005 dollars. All unbounded variables are winsorized at 1% and 99%. Total direct compensation (*TDC*) and its components are listed first. Mean (Median) *TDC* is $4.58 million ($2.40 million). The sensitivity of CEO pay to the stock price, *PPS* is defined as the dollar change in CEO wealth for a 1% change in stock prices following Guay (1999), Core and Guay (1999, 2002), and Coles, Daniel, and Naveen (2006). Option values are based on the Black and Scholes (1973) formula modified to account for dividends (Merton, 1973). The sensitivity of previously granted option and share values to stock prices is computed using the approximation method detailed in Core and Guay (2002). The mean (median) *PPS* is $579,480 ($190,940). *New_PPS* measure the sensitivity of the stocks and options granted in the current year. It has a mean (median) of $49,209 ($16,696).

Market value of equity, which can be considered as a proxy for firm size, has a mean (median) of about $5.64 ($1.25) billion. *Tobin's Q* is used as a proxy for growth opportunities and has a mean (median) of 1.91 (1.40). *PIN* is the yearly mean of the quarterly estimates of probability of informed trading used in Brown, Hillegeist and Lo (2004) and estimated based on the market microstructure model of Easley, Kiefer and O'hara (1997).[8] The mean (median) *PIN* is about 0.15 (0.15). *CEO Tenure*, the number of years since the incumbent CEO assumed the CEO position, has a mean (median) of 7.34 (5) years. *Stock Volatility* is the standard deviation of monthly stock returns over the past five years. It has a mean (median) of 0.45 (0.40). *Cash Flow* is defined as income before extraordinary items plus amortization and depreciation divided by total assets. Its mean (median) is 0.09 (0.10). Finally, the data on institutional ownership are drawn from CDA/Spectrum. The mean (median) of percent of shares owned by institutions (*Inst_Ownership*) is 66% (68%). Finally, *Inst_Concentration* is the ratio of number of shares owned by top ten institutions to total number of shares owned by all institutions. The fewer the number of institutions that command all institutional ownership is, the more powerful each one

[8] *PIN* is the probability that the trading activity on a given stock over a given period is based on private information of the traders.

of them is expected to be as suggested by Hartzell and Starks (2003). The mean (median) *Inst_Concentration* is 58% (56%).

Variables that are used as determinants of unrelated acquisitions are listed at the lower panel. *Ind_Related_Deals* stands for the number of related acquisitions made by firms in the firm's four-digit SIC industry in a given year. It has mean (median) of 10 (1). *RI_Correlation*, the average pair-wise correlation of equal-weighted monthly returns between the firm's four-digit SIC industry and its related industries over three years. It has a mean (median) of 0.45 (0.47). *RI_Direc_Supply* is the total number directors in the related-industry firms located within 100 miles with the firm's headquarters. There is a mean (median) of about 660 (348) such directors. Market share is based on the firm's sale and has a mean (median) of 0.12 (0.05). HHI is also based on sales and has a mean (median) of 0.21 (0.17). Book leverage is defined as long-term debt plus short-term debt divided by total assets. Its mean (median) is 0.22 (0.20). *Multi-Segment* has a mean of 0.38, meaning that about 38% of all firms in the sample have multiple divisions. At 61% of all firms, CEO also serves as the chairman of the board. Proportion of outside director serving on the board is 73%, on average. Finally, both the mean and the median of board size are 9.

4. Empirical Analysis

4.1. The Impact of Acquisitions on the Sensitivity of CEO Pay to the Stock Price

To examine the impact of all acquisitions on the sensitivity of CEO pay to the stock price (*PPS*), I use the following specification.

$$\Delta(PPS)_{it-1,\,t+1} \text{ (or } New\_PPS_{it+1}) = \beta_0 + \beta_1 Acq_t + \beta_2 Ln(Market\ Value_{it+1}) + \beta_3 Tobin's\ Q_{it+!} + \beta_4 Stock\ Volatility_{it+1} + \beta_5 Ln(CEO\ Tenure)_{it+1} + \beta_6 Cash\ Flow_{it+!} + \beta_7 PIN_{it+1} + \beta_8 Inst\_Ownership_{it+1} + \beta_9 Inst\_Concentration_{it+1} + Year\ and\ Industry\ Dummies + \varepsilon_{it} \quad (1)$$

This specification is estimated for all *ExecuComp* firms. The dependent variable is either the change in the portfolio of new and existing stock-based incentives of the CEO between year

t-1 and *t+1* ($\Delta(PPS)_{it-1,\ t+1}$) or the new grants of incentives (New_PPS_{it+1}) in year *t+1*.[9] *PPS* is formally measured as the sensitivity of CEO wealth to a 1% change in firm *i*'s stock price, following Core and Guay (1999, 2002) and Coles, Daniel, and Naveen (2006) among others. According to Baker and Hall (2004), this measure of incentives is related to CEO choices that affect percentage returns to the firm such as setting the firm's strategy and is found to apply better to the arguments made in this paper. In other words, uncertainties in the environment are expected to hinder the ability of the board to monitor or provide advice on strategic choices of the CEO.[10] The main explanatory variable, Acq_t is a dummy variable that equals one if firm *i* has executed an acquisition in year *t* and zero otherwise.

Other explanatory variables, measured in the fiscal year *t+1*, are drawn from the literature on the sensitivity of CEO pay to the stock price. *Market Value*, as a proxy for firm size, has been used to control for CEO talent, difficulty of monitoring and CEO wealth (e.g., Demsetz and Lehn, 1985; Smith and Watts, 1992; Himmelberg, Hubbard and Palia, 1999; Baker and Hall, 2004).[11] Hence, it is predicted to be positively related to *PPS*. *Tobin's Q* is employed to control for growth opportunities (e.g., Smith and Watts, 1992). *Stock Volatility* is argued by one strand of the literature to be correlated with the uncertainty in the environment and, thus, is expected to be positively related to *PPS* (e.g., Demsetz and Lehn, 1985; Core and Guay, 1999). However, it is a more direct measure of the uncertainty about the stock price which is expected to reduce the use of stock-based compensation as the CEO is assumed to be risk averse (e.g., Aggarwal and Samwick, 1999). Hence, its net effect on *PPS* is ambiguous and is found to be sensitive to the specification that is estimated.[12]

Ln(CEO Tenure) is used as a proxy for potential horizon problems (Dechow and Sloan, 1991), weaker career (Gibbons and Murphy, 1992) or reputational concerns (Milbourn, 2003) that arise as the CEO approaches retirement. To control for availability of cash flows for compensation or the need for higher incentives due to the free cash flow problem (e.g., Jensen,

[9] The main results and inferences in the paper are similar when the change in *PPS* between *t+1* and *t* (or *t+1* and *t-2*) is used as the dependent variable. $\Delta(PPS)_{it+1,\ t-1}$ is chosen to match the change in incentives for acquirers relative to the pre-acquisition year.

10 The alternative incentives measure, i.e., sensitivity of CEO pay to a $1,000 dollar change in firm value, is argued to be associated with CEO choices that affect dollar returns to the firm such as buying a corporate jet, as exemplified by Baker and Hall.

[11] CEO wealth captures CEO risk aversion. Wealthier CEOs are projected to be less risk averse.

[12] Prendergast (1999) provides a review of this literature.

1986), I include *Cash Flow* which is defined as the sum of income before extraordinary items, depreciation and amortization scaled by total assets. Following Hartzell and Starks (2003) and Kang and Liu (2008), I control for the impact of institutional investors on *PPS* using percent of institutional ownership and the concentration of institutional ownership in the firm. To the extent that it limits informed trading of the firm's stock, institutional ownership can mitigate informativeness of the stock price and reduce the reliance on *PPS* (Holmstrom and Tirole, 1993). Concentrated institutional ownership, on the other hand, is expected to capture the intensity of institutional investors' influence over the board and is likely to lead to higher *PPS*. Kang and Liu document that *PPS* is positively related to stock price informativeness. Therefore, I also include *PIN* in all *PPS* regressions to control for stock price informativeness. I exclude finance and utility firms as boards of these regulated firms may not have full control over the pay-setting process. Finally, I include year and 48 Fama-French industry dummies in all specifications.

The effect of (un-)relatedness of the acquirer to the target on *PPS* is examined using the following specification.

$$\Delta(PPS)_{it-1,\,t+1} \text{ (or } New\_PPS_{it+1}) = \beta_0 + \beta_1\, Unrelated\_Acq_{t,\,1\%\,(5\%)} + \beta_2\, Related\_Acq_{t,\,1\%\,(5\%)} + Control\ Variables + \varepsilon_{it} \quad (2)$$

$Unrelated\_Acq_{t,\,1\%\,(5\%)}$ is a dummy variable that equals one if the acquirer and the target have the same four-digit SIC code or if the target is vertically related to the acquirer at the 1% (5%) vertical relatedness threshold. $Related\_Acq_{t,\,1\%\,(5\%)}$ is a dummy variable that equals one if the acquirer and the target do not have the same four-digit SIC code and the target is not in the supply chain of the acquirer based on the 1% (5%) vertical relatedness threshold. The control variables consist of those listed in Specification (1).

The first set of results is presented in Table 6. As can be seen in Columns (1) of Panel A, acquisitions altogether do not have a significant effect on the change in the sensitivity of CEO pay to the stock price, consistent with Harford and Li (2007). In Columns (2) and (3) where acquirers in unrelated sectors are compared to the rest of the *ExecuComp* firms, unrelated acquisitions are found to be associated with a higher *PPS*, both at the 1% and 5% vertical-relatedness thresholds. In columns (4) and (5), it is seen that related acquisitions do not have a significant impact on the acquirer's incentive compensation policy. This implies that, unlike the

unrelated ones, related acquisitions do not cause major changes in the economic environment and, thus, do not require adjustments to stock-based incentives. At the bottom of the panel, it is also documented that unrelated acquisitions are followed by significantly higher stock-based incentives than related acquisitions. In Panel B, the dependent variable measures the sensitivity of new grants of stocks and options to the stock price and a similar pattern is observed. Overall, these results seem consistent with the efficient contracting theory and inconsistent with the *Agency Hypothesis*.

Coefficients of control variables are sometimes in different directions as found by related studies, due to the fact that dependent variables employed in this study are different. In Panel A, market value of equity, Tobin's Q, CEO tenure and *PIN* are positively related to the change in *PPS* as expected. Although *Stock Volatility* is positively related to the level of *PPS* (e.g., Core and Guay, 1999), it has a significantly negative effect on the change in *PPS*. This suggests that firms with greater uncertainty about their stock price tend to lower *PPS* over time, although the level of *PPS* still remains higher than that of firms with lower stock volatility. Other variables are not associated with a significant change in *PPS*. In Panel B, the effect of CEO tenure and cash flow on new incentives is different from their effects on the level of *PPS*. These findings imply that the extent to which new stocks and options are granted is lower after the CEO has accumulated significant ownership in the firm and when the firm generates larger cash flows with which more cash compensation can be paid.[13]

4.1.1. Uncertainty Hypothesis versus Diversification Hypothesis

In the previous section, it is documented that unrelated acquisitions are associated with a higher sensitivity of CEO pay to the stock price. This result, however, is consistent with both the *Uncertainty Hypothesis* and the *Diversification Hypothesis*. In this section, I attempt to unravel the main force driving the effect of unrelated acquisitions on incentive compensation. To that end, I first split unrelated acquisitions into two groups based their effect on stock volatility. One group of acquisitions lead to a higher post-acquisition stock volatility than pre-acquisition volatility and the other group lead a lower post-acquisition stock volatility than pre-acquisition volatility. Under the *Diversification Hypothesis*¸ the positive impact on *PPS* is expected to hold

[13] As will be seen in the results for cash compensation, cash compensation is positively related to cash flows.

for the group of acquisitions that lower stock volatility. The *Uncertainty Hypothesis*, on the other hand, predicts the opposite pattern to the extent that increased uncertainty in the environment dictates itself in higher stock volatility.

The following extension of Specification (1) is used to test whether the effect of unrelated acquisitions on *PPS* is due to lower or higher post-acquisition volatility.

$$\Delta(PPS)_{it-1,\,t+1} \text{ (or } New\_PPS_{it+1}) = \beta_0 + \beta_1 (Higher\ Volatility)_{it-1,\,t+1} \times Unrelated\_Acq_{t,\,1\%\,(5\%)} + \beta_2 (Lower\ Volatility)_{it-1,\,t+1} \times Unrelated\_Acq_{t,\,1\%\,(5\%)} + Control\ Variables + \varepsilon_{it} \quad (3)$$

In Specification (3), *Lower Volatility* is a dummy variable that equals one if post-acquisition stock volatility is lower than pre-acquisition volatility for unrelated acquisitions. *Higher Volatility* is a dummy variable that equals one if post-acquisition stock volatility is higher than or equal to its pre-acquisition value. Stock volatility, here, is defined as the annual standard deviation of the daily returns. *Control Variables* include the other explanatory variables in Specification (1). The results from estimation of Specification (3) are presented in Table 7. The coefficient of *Higher Volatility x Unrelated_Acq*$_{1\%\,(5\%)}$ is positive and significant while that of *Lower Volatility x Unrelated_Acq* $_{1\%\,(5\%)}$ is insignificant. This finding seems inconsistent with the *Diversification Hypothesis*. To the extent that annual stock volatility is correlated with the uncertainty in the contracting environment, it is consistent with the *Uncertainty Hypothesis*. In other words, greater uncertainty following unrelated acquisitions seems to induce the board of the acquirer to resort more to stock-based incentives.

The second approach used to test the *Uncertainty Hypothesis* against the *Diversification Hypothesis* focuses on the heterogeneity among acquirer board members in their familiarity with the target. Specifically, acquirer directors who hold executive positions or director seats in industries that are vertically or horizontally related to the target industry are argued to be more informed about the target. These directors, referred to as *DRTs* shortly, are expected to fill the information gap that causes the board's uncertainty to grow after entering a new and unrelated sector. Hence, under the *Uncertainty Hypothesis*, unrelated acquisitions are associated with greater need for *PPS* due to greater uncertainty, but this need is mitigated if there is a *DRT* on the

acquirer's board. The *Diversification Hypothesis*, on the other hand, does not attach a role to *DRTs*.

To test the effect of *DRTs* on *PPS*, the following specification is estimated.

$$\Delta(PPS)_{it-1,\,t+1} \text{ (or } New\_PPS_{it+1}) = \beta_0 + \beta_1\, DRT{=}0 \times Unrelated\_Acq_{t,\,1\%\,(5\%)} + \beta_2\, DRT{=}1 \times Unrelated\_Acq_{t,\,1\%\,(5\%)} + Control\ Variables + \varepsilon_{it} \quad (4)$$

The main explanatory variable in this specification, *DRT* is a dummy variable that equals one if the acquisition is an unrelated one and the acquirer has at least one director from industries that are horizontally or vertically related to the target industry. Other variables follow from the earlier specifications. Under the *Uncertainty Hypothesis*, acquirers with no *DRTs* are expected to account for the overall positive impact of unrelated acquisitions on *PPS*. The results presented in Table 8 seem consistent with the *Uncertainty Hypothesis* for the 1% vertical-relatedness threshold. Acquirers with no *DRTs* based on this threshold are the ones that have a significantly higher *PPS* than non-acquirers. This effect, however, is weaker for the 5% vertical-relatedness threshold possibly due to the inclusion of *DRTs* identified at the 1% relatedness threshold in the no-*DRT* group of acquirers. Another weakness in these results is that the coefficient of $DRT{=}1 \times Unrelated\_Acq_{t,\,1\%\,(5\%)}$, β_2 is larger in magnitude than the coefficient of $DRT{=}0 \times Unrelated\_Acq_{t,\,1\%\,(5\%)}$. This is most likely caused by a few outliers in the sample of unrelated acquisitions that involve *DRTs*.

4.1.2. Strong Boards versus Weak Boards

In this section, I explore the impact of unrelated acquisitions on incentive compensation conditional on the acquirer's board strength. For this purpose, I use various definitions to classify boards as strong and weak vis-à-vis the CEO. Using these classifications, I estimate the following extension of Specification (1) to examine the behavior of strong boards relative to weak boards around related and unrelated acquisitions.

$$\Delta(PPS)_{it-1,\,t+1} \text{ (or } New\_PPS_{it+1}) = \beta_0 + \beta_1\, Strong\ Board_{it+1}\ x\ Unrelated\_Acq_{t,\,1\%\,(5\%)} +$$

$$\beta_2\, Weak\ Board_{it+1}\ x\ Unrelated\_Acq_{t,\,1\%\,(5\%)} +$$

$$\beta_3\, Strong\ Board_{it+1} + Control\ Variables + \varepsilon_{it} \qquad (5)$$

Following Harford and Li (2007) and in line with Hermalin and Weisbach's (1998) model, *Strong Board*$_{it}$ is first defined as a dummy variable that equals one if *CEO Tenure* is below the median value of *CEO Tenure* in year *t*. *Weak Board*$_{it+1}$ is a dummy variable that equals one if the board is not strong, i.e., *Strong Board*$_{it+1}$ is equal to zero. The second classification is based on CEO-Chairman duality. This classification assumes that the board is weak, if the CEO is also the chairman of the board. The final classification follows Coles, Daniel, and Naveen (2010) and classifies boards with a majority of co-opted directors, i.e., those who are appointed after the CEO assumed the CEO post, as weak boards. Boards with a minority of co-opted directors, on the other hand, are classified as strong boards.

The results from estimation of Specification (5) are presented in Table 9. The interaction of unrelated acquisitions with *Strong Board*$_{it}$ is positively and significantly related to *PPS*, while that with *Weak Board*$_{it}$ is not, for all classifications of strong and weak boards. This implies that higher stock-based incentives following unrelated acquisitions are adopted mainly when the board is likely to have more control over compensation arrangements. Hence, it can be concluded that the role of boards in incentive design can only partly be explained by the managerial power theory and the uncertainty in the environment is another critical dimension that should be taken into account in compensation studies.

4.1.3. Controlling for Endogeneity with Instrumental Variables and the Heckman Treatment Effects Model

Although the inferences made in the previous sections provide insights on the relationship between acquisitions and stock-based compensation, they are based on OLS estimators and are subject to two-layered endogeneity problems associated with the events under consideration. The first layer involves the acquisition decision and the second layer involves the decision to acquire in related and unrelated sectors. The acquisition and the compensation policies of a given firm are likely to be determined simultaneously by observed and unobserved

factors. In this section, a step toward finer inferences is taken by utilizing two alternative estimation methods to at least account for the endogeneity problem in the second layer: (i) using instrumental variables for the choice of acquiring in unrelated sectors and the 2SLS model for estimation; (ii) constructing a model to predict acquisitions in unrelated sectors and using this model in the first stage of the Heckman treatment effects model.

The predictive model used for unrelated acquisitions is as follows:

$$\begin{aligned} Unrelated\_Acq_{it} = {} & \beta_0 + \beta_1 Ln(Ind\_Related\_Deals)_{it-1} + \beta_2 RI\_Correlation_{it-1} + \beta_3 Ln(RI\_Direc\_Supply)_{it-1} + \\ & \beta_4 (Tobin's\ Q/Ind\_Q)_{it-1} + \beta_5 Ln(Market\ Value)_{it-1} + \beta_6 Market\ Share_{it-1} + \beta_7 HHI_{it-1} + \\ & \beta_8 Book\ Leverage_{it-1} + \beta_9 Multi\text{-}Segment_{it-1} + \beta_{10} Chairman\text{-}CEO_{it-1} + \beta_8 Prop\_Outside_{it-1} + \\ & \beta_{10} Ln(Board\ Size)_{it-1} + Year\ and\ Industry\ Dummies + \varepsilon_{it} \end{aligned} \quad (6)$$

All explanatory variables in Specification (6) are measured with one year lag relative to the dependent variable $Unrelated\_Acq_{it}$. The first variable, *Ln(Ind_Rel_Deals)* is the natural logarithm of the number of related deals in the firm's four-digit SIC industry. If its competitors pursue vertical or horizontal integration due to an economic transformation in the industry, the firm will also be induced to pursue a related acquisition and forgo any opportunity in unrelated sectors. Hence, this variable is expected to be negatively related to unrelated acquisitions. *Ind_Correlation* is the average pair-wise correlation of equal-weighted monthly returns of the firm's four-digit SIC industry with its customer and supplier industries in year *t-1*. This variable is also likely to be negatively related to unrelated acquisitions because if the correlation is higher, that means the firm is more strongly connected to its related industries and a move outside its related industries may jeopardize the firm's competitiveness. *RI_Direc_Supply* is the total number, i.e., supply, of directors at related-industry firms that are located within one hundred miles of the firm's headquarter. Dass et al. (2011) find that firms are more likely to appoint directors from their related industries when the supply of these directors is greater. As board members, these directors may, then, have incentive to reduce the likelihood of unrelated acquisitions as their role on the boards of these firms as well as their future employment opportunities may suffer from such acquisitions. *RI_Direc_Supply* may also increase the likelihood of unrelated acquisitions, if having directors from related industries on the board is

treated as a means of obtaining information about related industries and/or mitigating coordination and contractual problems with these industries. In other words, it may serve as a low-cost alternative to a related acquisition. Thus, if the firm chooses to make an acquisition attempt, it is less likely to target a related sector from where it can appoint a director instead. Hence, the net effect of the supply of directors from related industries is ambiguous.

Tobin's Q/Ind_Q is the ratio of the firm's Tobin's Q to the average Tobin's Q in the firm's four-digit SIC industry, excluding the firm itself. If the firm's Q is higher than the average in its industry, it is more likely to invest in sectors where the firm didn't exhaust the growth opportunities. Thus, this variable is expected to be positively related to the likelihood of an unrelated acquisition. Firms with higher market share and those in concentrated industries are less likely to acquire in unrelated sectors. The rationale for this prediction is that competing in multiple sectors may put their competitive position in their primary sector in danger. Agency problems in the firm, such as CEO hubris (Roll, 1986), are also expected to affect acquisition decisions. Thus, a number of agency-related variables, namely the proportion of outside directors, CEO-Chairman duality and board size, are included in the model. As other firm characteristics that may affect the acquisition decision, I include firm size and leverage along with industry and year dummies to predict the likelihood of an unrelated acquisition. This specification is estimated using the Probit model and the results are presented in Panel A of Table 10. As expected, the number of related deals by competitors is negatively related to the likelihood of an unrelated acquisition. Stronger correlation with related industries also seems to deter the firm from expanding into unrelated sectors. The supply of directors in related industries is found to have a negative impact on unrelated acquisitions and, as discussed earlier, one possible explanation is that these directors deter the firm from unrelated acquisitions due to career concerns. Among other explanatory variables, only leverage has a significant effect on unrelated acquisitions. Firms with higher leverage are less likely to make an unrelated acquisition. This is possibly because these firms are already exposed to a greater risk than firms with lower leverage and they are not willing or able to take on additional potential uncertainties associated with such acquisitions.

Having constructed a model to predict unrelated acquisitions, I now either use certain variables from this model as instrumental variables in the 2SLS framework or include the whole

model in the first stage of the Heckman treatment effects model. Panel B of Table 10 provides the results on the second stage *PPS* regressions. In Columns (1) and (2), the 2SLS results are reported. Three instruments that can predict unrelated acquisitions are employed. $Ln(Ind\_Rel\_Deals)_{it-1}$ and $Ind\_Correlation_{it-1}$ are drawn from Specification (6). The third instrument, $Ln(Ind\_Rel\_Deals)_{it-1}$ is the natural logarithm of the number vertically integrated firms in the firm's four-digit SIC industry and is similar in spirit to $Ln(Ind\_Integrated)_{it-1}$. The extent to which the firms in an industry choose vertically integration is likely to indicate the severity of coordination and contracting problems with suppliers and customers of that industry. Thus, a firm in such an industry is less likely to choose an unrelated acquisition over a related one. These instruments pass the relevance and validity tests. There is also no a priori reason to expect these industry characteristics to have a direct impact on post-acquisition PPS. The coefficients of the instruments along with the respective t-statistics from the first stage are reported in the lower panels of the table. As expected, $Ln(Ind\_Rel\_Deals)_{it-1}$ and $Ind\_Correlation_{it-1}$ are negatively related to the likelihood of acquisitions in unrelated sectors. The coefficient of $Ln(Ind\_Integrated)_{it-1}$ has the expected sign, but it is statistically insignificant. The results from the second stage, presented in the upper panel, are similar to the OLS results. At both the 1% and the 5% vertical-relatedness thresholds, unrelated acquisitions are associated with a greater change in *PPS*. These results are significant at the 5% significance level.

The results from the Heckman treatment effects model are reported in Columns (3) and (4). The effect of unrelated acquisitions on *PPS* is significant at 10% using the 1% vertical-relatedness threshold, while it is insignificant at the 5% vertical-relatedness threshold. The inverse mills ratio, *Lambda* is negative in both columns, suggesting that the observed factors in the model predicting unrelated acquisitions at the same time reinforce a lower sensitivity of CEO pay to the stock price. However, the fact that it is insignificant in both columns possibly means that the model does not fully account for factors driving the acquisition decisions. Therefore, in the remaining analysis, I employ only the OLS and the 2SLS models. Overall, it can be concluded from this section that, after controlling for endogeneity biases to some extent, the evidence is still in the direction predicted under the efficient contracting theory, but somewhat weaker in terms of statistical significance.

4.1.3. Controlling for the Change in Control Variables

The specifications used in the previous sections use the level of control variables in the year that follows the acquisitions. These specifications, however, do not control for changes in the determinants of the sensitivity of CEO pay to the stock price (*PPS*). These changes are themselves likely to induce adjustments in *PPS*. To see if acquisitions have any effect over and beyond these effects, I estimate Specification (1) with the change in the determinants of *PPS* between *t-1* and *t+1* as control variables, with the exception of CEO tenure as the change in CEO tenure is not likely to have a meaningful relationship with *PPS*. The results from this estimation are presented in Table 11. The OLS results are reported in Panel A. In Columns (1) and (2), it is seen that the coefficient of unrelated acquisitions is still positive but becomes insignificant at conventional levels. In Columns (3) and (4), Specification (3) is estimated with the change in control variables and the results imply that the effect of an unrelated acquisition on incentive compensation materializes only when the acquisition causes a jump in stock volatility. This, again, seems consistent with the *Uncertainty Hypothesis* and inconsistent with the *Diversification Hypothesis*. In Panel B, the 2SLS model is used to correct for endogeneity problems. Differently from the earlier specifications used in these models, the control variables in the second stage are the changes in the determinants of *PPS*, except for *Ln(CEO Tenure)*. Similar to the OLS results reported in Panel A, the coefficient of *Unrelated_Acq* is positive but statistically insignificant at conventional levels.

4.2. The Impact of Acquisitions on the Level of CEO Compensation and Its Components

Inspecting the impact of unrelated acquisitions on the level of compensation can provide a more complete picture about the relationship between these acquisitions and compensation contracts. The empirical specification that will be employed is the same as Specifications (1) and its extensions, except that the dependent variable is the change in total direct compensation (*TDC1*), rather than *PPS*, between *t-1* and *t+1*. The corresponding results are presented in Table 12 and Table 13. In Column (1), I find that acquisitions are associated with significantly higher compensation, consistent with earlier studies (e.g., Bliss and Rosen, 2001). Columns (2) through (5) reveal that it is the unrelated acquisitions that form the basis for higher compensation.

The natural question that arises is whether the change in *TDC1* around acquisitions is in the form of cash, stock, or a combination of these two components of *TDC1*. Panel B provides the results on the investigation of this question. Columns (1) and (2) use the change in cash compensation as the dependent variable. The coefficient of *Unrelated_Acq* is negative but insignificant in both columns. In Columns (3) and (4), the dependent variable is the change in the stock-based component of *TDC1* and the CEO is found to experience a significant rise in this component of his total compensation around unrelated acquisitions. Elaborating further on this result, Columns (5) and (6) reveal that only the acquisitions that cause an increase in stock volatility are associated with a significantly higher stock-based compensation. Finally, in Panel C, I attempt to correct for endogeneity using the 2SLS models using *Ln(Ind_Rel_Deals)*, *RI_Direc_Supply* and *Ln(RI_Firms)* as instruments. The only new instrument, here, is *Ln(RI_Firms)* which is defined as the natural logarithm of the total number of firms in the firm's related industries. These instruments also pass the validity and relevance tests. The 2SLS results presented in Columns (1) and (2) are consistent with the OLS results and imply that unrelated acquisitions involve a rise in stock-based compensation and, thereby, total direct compensation.

The final set of results on total direct compensation is provided in Table 13. The only difference from the earlier regressions on *TDC1* is that I control for changes in the determinants of compensation, except for *Ln(CEO Tenure)*. Similar to the *PPS* results using the same set of control variables, the overall effect of unrelated acquisitions on *TDC1* and its stock component is mostly insignificant. However, it is positive and significant for those that increase the uncertainty about the firm's stock price. Overall, the results on *TDC1* and its components confirm those obtained on *PPS* and are generally consistent with the *Uncertainty Hypothesis.*

5. Conclusion

Studying incentive compensation policy in a dynamic framework can provide valuable insights. In this paper, I examine stock-based CEO compensation following significant acquisitions in unrelated sectors. Such an analysis is important for at least three reasons. Firstly, entry into completely new sectors can exacerbate the ability of the board to monitor and advise which, in turn, is likely to require adjustments to stock-based incentives given to the CEO. More specifically, the board, facing additional uncertainties in the new sector, may choose to delegate

its functions to stock investors to a greater extent by giving the CEO more stock-based compensation. Under this scenario, the effect of unrelated acquisitions on stock-based incentives is expected to be positive. Secondly, it is possible that after an unrelated acquisition, the firm's stock price becomes less volatile, making stock-based incentives less costly. Thus, under this second scenario, unrelated acquisitions that indeed reduce stock volatility are expected to be associated with a significant increase in stock-based incentives. Finally, CEOs may take advantage of unrelated acquisitions, i.e., significant shocks to the firm's economic environment, to enforce changes in their compensation scheme that they prefer. Because the CEO, as a risk-averse agent, prefers to reduce his exposure to the stock market, the relationship between stock-based incentives and unrelated acquisitions is likely to be negative. The net effect of unrelated acquisitions, then, is a pure empirical question. The paper presents evidence that seems consistent with the first scenario and inconsistent with the other two scenarios. Specifically, the sensitivity of CEO pay to the stock price is generally higher following unrelated acquisitions that increase stock volatility. In conclusion, this paper suggests that the effect of a corporate event on incentive compensation policy depends largely on the economic nature of the event and how it affects the contracting environment of the firm.

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Appendix A: Definition of Variables Used in the Empirical Analysis

Variable	Source	Definition
Acq	*SDC Platinum*	Dummy variable that equals one if the firm completed an acquisition in the preceding year.
Related_Acq	*SDC Platinum and BEA*	Dummy variable that equals one if the firm completed a horizontally- or vertically-related acquisition in the preceding year (at the 1% or 5% vertical-relatedness thresholds). The acquisition is horizontally-related if the target is in the same four-digit SIC code as the acquirer. Vertically-related targets are identified using the Input-Output tables published by the Bureau of Economic Analysis (BEA) every five years.
Unrelated_Acq	*SDC Platinum and BEA*	Dummy variable that equals one if the firm completed an unrelated acquisition in the preceding year.
DRT (Directors from Related Industries of the Target)	*Compact Disclosure and BEA*	Dummy variable that equals one if the firm completed an unrelated acquisition in the preceding year and has a director from the same four-digit SIC industry as the target industry or vertically-related industries of the target industry (at the 1% or 5% vertical-relatedness thresholds).
Compensation Variables		
Cash Compensation	*ExecuComp*	Sum of salary and bonus
Option Grants	*ExecuComp*	Black-Scholes value of options granted in the current fiscal year
Restricted Stock Grants	*ExecuComp*	Value of restricted stock granted in the current fiscal year
Total Direct Compensation (TDC1)	*ExecuComp*	Sum of salary, bonus, other annual compensation, long-term incentive payouts, grant-date value of restricted stock and grant-date value of stock options and other compensation
New_PPS	*ExecuComp*	Change in the value of CEO's portfolio of stock and option grants in the current year for a 1% change in stock price
PPS	*ExecuComp*	Change in the value of CEO's portfolio of all stock and option holdings for a 1% change in stock price
Other Firm and Industry Characteristics		
CEO Tenure	*ExecuComp*	Number of years in CEO position
Inst_Ownership	*CDA/ Spectrum*	Proportion of all outstanding shares owned by institutions
Inst_Concentration	*CDA/ Spectrum*	Ratio of total number of shares owned by top ten institutions to all shares owned by institutions
Firm Size	*Compustat*	Market value of equity
PIN	*Stephen Brown*	Yearly mean of quarterly estimates of Stephen Brown
Tobin's Q	*Compustat*	Sum of market value of equity (Data 25 times Data 199) and book debt scaled by total assets
Stock Volatility	*ExecuComp*	Standard deviation of monthly stock returns over the past five years
Cash Flow	*Compustat*	Income before extraordinary items (Data 18) plus amortization and depreciation (Data 14) scaled by total assets

Ind_Related_Deals	*SDC Platinum*	Natural logarithm of the number of related acquisitions made in the firm's four-digit SIC industry
RI_Correlation	*CRSP*	Average pair-wise correlation of equal-weighted stock returns of the firm's industry with its customer and supplier industries, calculated using monthly returns over three years
RI_Direc_Supply	*Compact Disclosure*	Number of directors at related-industry firms located within a radius of 100 miles of the headquarters of the firm
Market Share	*Compustat*	Ratio of firm sales to industry sales
HHI	*Compustat*	Sum of square of the market shares of all firms in the firm's four-digit SIC industry
Book Leverage	*Compustat*	Sum of long-term debt and debt in current liabilities divided by total assets
Multi-Segment	*Compustat*	Dummy variable that equals one if the firm has two or more segments
Chairman-CEO	*Compact Disclosure*	Dummy variable that equals 1 if the CEO is also the chairman of the board
Prop_Outside	*Compact Disclosure*	Proportion of Outside Directors on the board
Board Size	*Compact Disclosure*	Number of directors on the board
Deal Characteristics		
Deal Size ($millions)	*SDC Platinum*	Transaction value in 2005 dollars
Deal-to-Acquirer	*SDC Platinum*	Ratio of the transaction value to acquirer's market value in the fiscal year prior to the deal announcement (restricted to be at least 10%).
Percent_Acquired	*SDC Platinum*	Percent of shares that the bidder acquired
Tender Dummy	*SDC Platinum*	Dummy variable that equals one if the bid is a tender offer
Hostile Dummy	*SDC Platinum*	Dummy variable that equals one if the bid is unsolicited
Cash Dummy	*SDC Platinum*	Dummy variable that equals one if the means of payment is 100% cash
Stock Dummy	*SDC Platinum*	Dummy variable that equals one if the means of payment is 100% stock

Table 1: Distribution of the Final Sample of Acquisitions by Industry

This table presents the distribution of the final sample of all acquisitions together and the sample of horizontal and vertical acquisitions at the 1% and 5% vertical-relatedness thresholds separately by Fama-French industry categories (Fama and French, 1997). The sample period is from 1993 to 2005. The sample excludes financial and utility industries. Definitions of all variables are provided in Appendix A.

Industry Category	All Deals	Horizontal	Vertical at 1%	Vertical at 5%
Agriculture	1	0	0	0
Food Products	7	0	2	2
Alcoholic Beverages	2	2	0	0
Tobacco Products	1	0	0	0
Recreational Products	4	1	1	1
Entertainment	11	3	1	1
Printing and Publishing	9	4	1	1
Consumer Goods	4	1	0	0
Apparel	9	3	2	2
Healthcare	16	11	0	0
Medical Equipment	15	6	3	1
Pharmaceutical Products	14	4	1	1
Chemicals	14	4	1	0
Rubber and Plastic Products	1	0	1	0
Textiles	4	3	0	0
Construction Materials	9	1	0	0
Construction	10	4	0	0
Steel Works, Etc.	12	3	1	0
Fabricated Products	2	0	0	0
Machinery	26	9	1	1
Electrical Equipment	7	2	1	1
Miscellaneous	2	1	0	0
Automobiles and Trucks	5	1	0	0
Aircraft	2	1	0	0
Shipbuilding, Railroad	2	2	0	0
Defense	2	0	0	0
Precious Metals	2	2	0	0
Nonmetallic Mining	1	0	0	0
Petroleum and Natural Gas	25	20	2	1
Telecommunications	10	4	1	1
Personal Services	3	1	1	1
Business Services	71	32	11	6
Computers	29	12	5	5
Electronic Equipment	45	20	4	2
Measuring and Control	16	5	4	3
Business Supplies	8	2	1	0
Transportation	6	3	1	1
Wholesale	23	7	2	1
Retail	26	11	3	0
Restaurant, Hotel, Motel	9	9	0	0
Total	465	194	51	32

Table 2: Distribution of the Final Sample of Acquisitions by Year

This table presents the distribution of the final sample of all acquisitions together and the sample of horizontal and vertical acquisitions at the 1% and 5% vertical-relatedness thresholds separately by the effective year of the acquisitions. The sample period is from 1993 to 2005. The sample excludes financial and utility industries. Definitions of all variables are provided in Appendix A.

Effective Year	All Deals	Horizontal	Vertical at 1%	Vertical at 5%
1993	12	6	2	1
1994	40	19	1	0
1995	33	14	5	4
1996	48	21	4	3
1997	41	15	5	3
1998	39	12	5	2
1999	58	22	10	5
2000	47	20	4	2
2001	36	17	4	4
2002	22	8	3	2
2003	30	14	3	2
2004	46	17	5	4
2005	13	9	0	0

Table 3: Descriptive Statistics on Deal Characteristics

This table presents descriptive statistics on the deal characteristics of the final sample of acquisitions. The sample period is from 1993 to 2005. The sample excludes financial and utility industries. Definitions of all variables are provided in Appendix A. All unbounded variables are winsorized at 1% and 99%. All dollar values are in 2005 constant dollars.

All Acquisitions	*N*	*Mean*	*Median*	*Min*	*25%*	*75%*	*Max*	*Std Dev*
Deal Size ($millions)	465	1,801.82	268.45	13.77	103.47	1,053.44	44,724.11	5,463.55
Deal-to-Acquirer	465	0.42	0.27	0.11	0.17	0.51	1.99	0.38
Percent_Acquired	465	99.85	100.00	63.70	100.00	100.00	100.00	2.02
Tender Dummy	465	0.12	0.00	0.00	0.00	0.00	1.00	0.32
Hostile Dummy	465	0.02	0.00	0.00	0.00	0.00	1.00	0.15
Cash Dummy	465	0.17	0.00	0.00	0.00	0.00	1.00	0.37
Stock Dummy	465	0.33	0.00	0.00	0.00	1.00	1.00	0.47
Related Acquisitions	*N*	*Mean*	*Median*	*Min*	*25%*	*75%*	*Max*	*Std Dev*
Deal Size ($millions)	245	1,917.67	386.88	13.77	140.34	1,233.85	44,724.11	5,610.94
Deal-to-Acquirer	245	0.46	0.31	0.11	0.17	0.61	1.99	0.40
Percent_Acquired	245	99.78	100.00	63.70	100.00	100.00	100.00	2.58
Tender Dummy	245	0.14	0.00	0.00	0.00	0.00	1.00	0.34
Hostile Dummy	245	0.04	0.00	0.00	0.00	0.00	1.00	0.19
Cash Dummy	245	0.18	0.00	0.00	0.00	0.00	1.00	0.38
Stock Dummy	245	0.40	0.00	0.00	0.00	1.00	1.00	0.49
Unrelated Acquisitions	*N*	*Mean*	*Median*	*Min*	*25%*	*75%*	*Max*	*Std Dev*
Deal Size ($millions)	220	1,672.81	192.17	13.77	89.78	853.56	44,724.11	5,304.38
Deal-to-Acquirer	220	0.37	0.24	0.11	0.16	0.40	1.99	0.36
Percent_Acquired	220	99.93	100.00	84.00	100.00	100.00	100.00	1.08
Tender Dummy	220	0.10	0.00	0.00	0.00	0.00	1.00	0.30
Hostile Dummy	220	0.01	0.00	0.00	0.00	0.00	1.00	0.10
Cash Dummy	220	0.16	0.00	0.00	0.00	0.00	1.00	0.37
Stock Dummy	220	0.25	0.00	0.00	0.00	0.50	1.00	0.43

Table 4: Acquirer Directors from Related Industries of the Target (*DRTs*)

This table presents the number of cases where the acquirer has at least one board member from the same four-digit SIC industry as the target's primary sector or the supply-chain of the target's primary sector. Definitions of all variables are provided in Appendix A. The sample period is from 1993 to 2005.

	N
Acquirers with Directors from Customer or Supplier Industries of the Primary Sector of the Target (Vertically-Related) at 1% (5%)	55 (38)
Acquirers with Directors from the Primary Sector of the Target (Horizontally-Related)	24
Acquirers with Directors from either Vertically- or Horizontally-Related Industries of the Primary Sector of the Target at 1% (5%)	57 (42)

Table 5: Descriptive Statistics on the Variables Used in the Empirical Analysis

This table presents descriptive statistics on the variables employed in the following empirical analyses. The sample period is from 1993 to 2005. The sample excludes financial and utility industries. Definitions of all variables are provided in Appendix A. All unbounded variables are winsorized at 1% and 99%. All dollar values are in 2005 constant dollars.

Compensation Variables	*N*	*Mean*	*Median*	*Min*	*25%*	*75%*	*Max*	*Std Dev*
Salary ($000s)	12,454	685.49	624.82	0.00	437.50	879.43	1,947.19	341.36
Bonus ($000s)	12,454	689.51	393.54	0.00	93.55	882.21	7,033.61	967.74
Option Grants ($000s)	12,373	2,212.66	743.92	0.00	59.36	2,304.72	27,987.90	4,180.09
Restricted Stock Grants ($000s)	12,454	482.63	0.00	0.00	0.00	0.00	10,865.85	1,570.90
Total Direct Compensation ($000s)	12,373	4,483.99	2,404.53	200.41	1,214.64	5,148.75	38,883.61	6,001.08
New_PPS ($000s)	12,454	49.21	16.70	0.00	2.70	51.34	636.52	93.23
PPS ($000s)	12,454	579.48	190.94	0.00	68.96	512.10	10,690.83	1,294.80
Control Variables in PPS Regressions								
Market Value ($millions)	12,454	5,643.09	1,251.86	30.16	500.85	3,984.30	98,679.41	13,871.53
Tobin's Q	12,454	1.91	1.40	0.15	0.97	2.21	9.26	1.55
PIN	12,454	0.15	0.15	0.00	0.11	0.19	0.70	0.06
CEO Tenure (Years)	12,454	7.34	5.00	0.00	2.00	10.00	35.00	7.34
Stock Volatility	12,454	0.45	0.40	0.14	0.30	0.56	1.23	0.21
Cash Flow	12,454	0.09	0.10	-0.49	0.06	0.14	0.30	0.11
Inst_Ownership (%)	12,454	65.89	68.20	0.36	52.65	81.21	99.99	20.45
Inst_Concentration	12,454	0.58	0.56	0.24	0.47	0.66	1.00	0.14
Additional Variables used as Determinants of Unrelated Acquisitions								
Ind_Related_Deals	12,454	10.44	1.00	0.00	0.00	6.00	168.00	29.12
RI_Correlation	11,840	0.45	0.47	-0.10	0.37	0.54	0.73	0.12
RI_Direc_Supply	12,340	659.63	384.00	0.00	139.00	861.50	3,784.00	783.10
Market Share	12,398	0.12	0.05	0.00	0.01	0.16	1.00	0.18
HHI	12,454	0.21	0.17	0.03	0.09	0.28	1.00	0.16
Book Leverage	12,454	0.22	0.20	0.00	0.06	0.33	3.39	0.19
Multi-Segment	12,454	0.38	0.00	0.00	0.00	1.00	1.00	0.49
Chairman-CEO	12,340	0.61	1.00	0.00	0.00	1.00	1.00	0.49
Prop_Outside	12,340	0.73	0.75	0.00	0.67	0.85	1.00	0.17
Board Size	12,340	8.96	9.00	1.00	7.00	11.00	19.00	2.95

Table 6: The Effect of Acquisitions on the Sensitivity of CEO Pay to the Stock Price (*PPS*)

This table presents evidence on the effect of all, related and unrelated acquisitions on *PPS*. The sample period is from 1993 to 2005. The dependent variable in Panel A, $(\Delta PPS)_{t-1,\ t+1}$ is the change in the sensitivity of CEO to the stock price between year *t-1* and *t+1*. The dependent variable in Panel B, New_PPS_{t+1} is the sensitivity of stocks and options granted in year *t+1*. In both panels, Columns (2) and (5) use the 1% vertical-relatedness threshold, whereas Columns (3) and (6) use the 5% relatedness threshold. All columns use the OLS model for estimation. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of each panel. Definitions of all the independent variables are provided in Appendix A. Both panels include year and Fama-French industry dummies (Fama and French, 1997). Both panels exclude financial and utility industries. Robust t-statistics clustered at the firm level are reported in square brackets; *** p<0.01, ** p<0.05, * p<0.1.

Panel A: The dependent variable is based on all stocks and options of the CEO (*PPS*).

Dependent Variable:	$\Delta(PPS)_{t-1,\ t+1}$				
Vertical-Relatedness Threshold:		1%	5%	1%	5%
	(1)	(2)	(3)	(4)	(5)
Acq_t	0.052				
	[0.95]				
$Unrelated\_Acq_t$ (β_1)		0.175**	0.153**	0.174**	0.153**
		[2.10]	[1.98]	[2.09]	[1.97]
$Related\_Acq_t$ (β_2)				-0.053	-0.049
				[-0.74]	[-0.65]
$Ln(Market\ Value)_{t+1}$	0.062***	0.062***	0.062***	0.062***	0.062***
	[4.58]	[4.58]	[4.58]	[4.60]	[4.58]
$Tobin's\ Q_{t+1}$	0.091***	0.091***	0.091***	0.090***	0.091***
	[6.91]	[6.91]	[6.92]	[6.89]	[6.89]
PIN_{t+1}	0.972***	0.970***	0.968***	0.971***	0.968***
	[3.93]	[3.92]	[3.92]	[3.93]	[3.92]
$Ln(CEO\ Tenure)_{t+1}$	0.108***	0.108***	0.108***	0.108***	0.108***
	[8.41]	[8.42]	[8.42]	[8.43]	[8.42]
$Stock\ Volatility_{t+1}$	-0.107*	-0.105*	-0.106*	-0.105*	-0.106*
	[-1.81]	[-1.79]	[-1.81]	[-1.78]	[-1.80]
$Cash\ Flow_{t+1}$	-0.054	-0.052	-0.052	-0.053	-0.054
	[-0.58]	[-0.56]	[-0.56]	[-0.58]	[-0.58]
$Inst\_Ownership_{t+1}$	0.000	0.000	0.000	0.000	0.000
	[0.48]	[0.48]	[0.47]	[0.49]	[0.48]
$Inst\_Concentration_{t+1}$	-0.081	-0.079	-0.080	-0.080	-0.080
	[-0.83]	[-0.81]	[-0.82]	[-0.82]	[-0.82]
Constant	-0.526**	-0.529**	-0.526**	-0.530**	-0.527**
	[-2.06]	[-2.07]	[-2.06]	[-2.08]	[-2.07]
Year Dummies	*YES*	*YES*	*YES*	*YES*	*YES*
Industry Dummies	*YES*	*YES*	*YES*	*YES*	*YES*
Observations	9,546	9,546	9,546	9,546	9,546
R-squared	0.073	0.073	0.073	0.073	0.073
Differences between coefficients					
$\beta_1 - \beta_2$				0.227**	0.202*
				[4.23]	[3.43]

Panel B: The dependent variable is based on post-acquisition grants of stocks and options to the CEO.					
Dependent Variable:			New_PPS_{t+1}		
Vertical-Relatedness Threshold:		1%	5%	1%	5%
	(1)	(2)	(3)	(4)	(5)
Acq_t	0.010*				
	[1.82]				
$Unrelated\_Acq_t$ (β_1)		0.014*	0.013*	0.014*	0.013*
		[1.68]	[1.71]	[1.69]	[1.72]
$Related\_Acq_t$ (β_2)				0.005	0.005
				[0.81]	[0.76]
$Ln(Market\ Value)_{t+1}$	0.032***	0.032***	0.032***	0.032***	0.032***
	[18.44]	[18.41]	[18.41]	[18.43]	[18.43]
$Tobin's\ Q_{t+1}$	0.006***	0.006***	0.006***	0.006***	0.006***
	[4.61]	[4.59]	[4.60]	[4.60]	[4.60]
PIN_{t+1}	0.039	0.039	0.039	0.039	0.039
	[1.61]	[1.61]	[1.60]	[1.60]	[1.60]
$Ln(CEO\ Tenure)_{t+1}$	-0.002*	-0.002*	-0.002*	-0.002*	-0.002*
	[-1.89]	[-1.87]	[-1.87]	[-1.88]	[-1.88]
$Stock\ Volatility_{t+1}$	0.043***	0.043***	0.043***	0.043***	0.043***
	[6.58]	[6.60]	[6.59]	[6.60]	[6.59]
$Cash\ Flow_{t+1}$	-0.037***	-0.037***	-0.037***	-0.037***	-0.037***
	[-3.72]	[-3.73]	[-3.73]	[-3.71]	[-3.71]
$Inst\_Ownership_{t+1}$	0.000	0.000	0.000	0.000	0.000
	[1.27]	[1.28]	[1.28]	[1.27]	[1.27]
$Inst\_Concentration_{t+1}$	0.047***	0.047***	0.047***	0.047***	0.047***
	[4.55]	[4.55]	[4.55]	[4.55]	[4.55]
Constant	-0.352***	-0.352***	-0.352***	-0.352***	-0.352***
	[-15.46]	[-15.44]	[-15.44]	[-15.45]	[-15.45]
Year Dummies	*YES*	*YES*	*YES*	*YES*	*YES*
Industry Dummies	*YES*	*YES*	*YES*	*YES*	*YES*
Observations	12,261	12,261	12,261	12,261	12,261
R-squared	0.283	0.283	0.283	0.283	0.283
Differences between coefficients					
$\beta_1 - \beta_2$				0.009	0.008
				[0.60]	[0.53]

Table 7: The Sensitivity of CEO Pay to the Stock Price (*PPS*) and the Change in Stock Volatility around Unrelated Acquisitions

This table presents evidence on the effect of unrelated acquisitions on *PPS* conditional on the change in stock price volatility. The sample period is from 1993 to 2005. The dependent variable in Columns (1) and (2), $(\Delta PPS)_{t-1,\,t+1}$ is the change in the sensitivity of CEO to the stock price between year *t-1* and *t+1*. The dependent variable in Columns (3) and (4), New_PPS_{t+1} is the sensitivity of stocks and options granted in year *t+1*. $(Higher\ Volatility)_{t-1,\,t+1}$ is a dummy variable that equals of if stock volatility is higher after the unrelated acquisition than it was before. $(Lower\ Volatility)_{t-1,\,t+1}$ is a dummy variable that equals of if stock volatility is lower after the unrelated acquisition than it was before. Definitions of other independent variables are provided in Appendix A. Columns (1) and (3) use the 1% vertical-relatedness threshold, whereas Columns (2) and (4) use the 5% relatedness threshold. All columns use the OLS model for estimation. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of the table. All columns include year and Fama-French industry dummies (Fama and French, 1997). All columns exclude financial and utility industries. Robust t-statistics clustered at the firm level are reported in square brackets; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	$\Delta(PPS)_{t-1,\,t+1}$		New_PPS_{t+1}	
Vertical-Relatedness Threshold:	1%	5%	1%	5%
	(1)	(2)	(3)	(4)
$(Higher\ Volatility)_{t-1,\,t+1}$ x $Unrelated\_Acq_t$ (β_1)	0.266**	0.218*	0.029**	0.026**
	[2.09]	[1.91]	[2.14]	[2.13]
$(Lower\ Volatility)_{t-1,\,t+1}$ x $Unrelated\_Acq_t$ (β_2)	0.071	0.072	-0.004	-0.003
	[0.69]	[0.72]	[-0.54]	[-0.45]
$Ln(Market\ Value)_{t+1}$	0.062***	0.062***	0.032***	0.032***
	[4.57]	[4.57]	[18.41]	[18.41]
$Tobin's\ Q_{t+1}$	0.091***	0.091***	0.006***	0.006***
	[6.91]	[6.92]	[4.59]	[4.60]
PIN_{t+1}	0.974***	0.971***	0.040	0.040
	[3.94]	[3.93]	[1.63]	[1.62]
$Ln(CEO\ Tenure)_{t+1}$	0.108***	0.108***	-0.002*	-0.002*
	[8.42]	[8.42]	[-1.87]	[-1.87]
$Stock\ Volatility_{t+1}$	-0.106*	-0.107*	0.043***	0.043***
	[-1.79]	[-1.81]	[6.61]	[6.59]
$Cash\ Flow_{t+1}$	-0.052	-0.052	-0.037***	-0.037***
	[-0.56]	[-0.57]	[-3.73]	[-3.73]
$Inst\_Ownership_{t+1}$	0.000	0.000	0.000	0.000
	[0.49]	[0.48]	[1.30]	[1.30]
$Inst\_Concentration_{t+1}$	-0.080	-0.080	0.047***	0.047***
	[-0.82]	[-0.82]	[4.53]	[4.53]
Constant	-0.530**	-0.526**	-0.352***	-0.352***
	[-2.08]	[-2.06]	[-15.44]	[-15.43]
Year Dummies	*YES*	*YES*	*YES*	*YES*
Industry Dummies	*YES*	*YES*	*YES*	*YES*
Observations	9,546	9,546	12,261	12,261
R-squared	0.073	0.073	0.284	0.284
Differences between coefficients				
$\beta_1 - \beta_2$	0.195	0.146	0.033**	0.029**
	[1.40]	[0.91]	[4.46]	[4.11]

Table 8: The Sensitivity of CEO Pay to the Stock Price (*PPS*) and Acquirer Board Members with Expertise in the Target Industry

This table presents evidence on the effect of unrelated acquisitions on *PPS* conditional on whether acquirer has a board member with expertise in target's supply chain. The sample period is from 1993 to 2005. The dependent variable in Columns (1) and (2), $(\Delta PPS)_{t-1,\,t+1}$ is the change in the sensitivity of CEO to the stock price between year *t-1* and *t+1*. The dependent variable in Columns (3) and (4), New_PPS_{t+1} is the sensitivity of stocks and options granted in year *t+1*. *DRT* is a dummy variable that equals one if the acquirer has a board member who is at the same time an executive or a director in a related industry of the target. Definitions of other independent variables are provided in Appendix A. Columns (1) and (3) use the 1% vertical-relatedness threshold, whereas Columns (2) and (4) use the 5% relatedness threshold. All columns use the OLS model for estimation. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of the table. All columns include year and Fama-French industry dummies (Fama and French, 1997). All columns exclude financial and utility industries. Robust t-statistics clustered at the firm level are reported in square brackets; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	$\Delta(PPS)_{t-1,\,t+1}$		New_PPS_{t+1}	
Vertical-Relatedness Threshold:	1%	5%	1%	5%
	(1)	(2)	(3)	(4)
$Unrelated\_Acq_t$ x DRT=0 (β_1)	0.153*	0.119	0.015*	0.012
	[1.93]	[1.59]	[1.73]	[1.53]
$Unrelated\_Acq_t$ x DRT=1 (β_2)	0.509	0.653	-0.002	0.029
	[0.82]	[1.30]	[-0.05]	[0.86]
$Ln(Market\ Value)_{t+1}$	0.062***	0.061***	0.032***	0.032***
	[4.60]	[4.59]	[18.45]	[18.47]
$Tobin's\ Q_{t+1}$	0.091***	0.091***	0.006***	0.006***
	[6.94]	[6.95]	[4.62]	[4.63]
PIN_{t+1}	0.952***	0.947***	0.036	0.036
	[3.93]	[3.92]	[1.49]	[1.47]
$Ln(CEO\ Tenure)_{t+1}$	0.108***	0.108***	-0.002*	-0.002*
	[8.42]	[8.42]	[-1.82]	[-1.82]
$Stock\ Volatility_{t+1}$	-0.110*	-0.111*	0.042***	0.042***
	[-1.88]	[-1.90]	[6.43]	[6.41]
$Cash\ Flow_{t+1}$	-0.049	-0.049	-0.036***	-0.036***
	[-0.53]	[-0.53]	[-3.65]	[-3.64]
$Inst\_Ownership_{t+1}$	0.000	0.000	0.000	0.000
	[0.44]	[0.44]	[1.17]	[1.16]
$Inst\_Concentration_{t+1}$	-0.085	-0.085	0.046***	0.046***
	[-0.86]	[-0.86]	[4.41]	[4.41]
Constant	-0.517**	-0.514**	-0.351***	-0.351***
	[-2.03]	[-2.02]	[-15.36]	[-15.36]
Year Fixed Effects	*YES*	*YES*	*YES*	*YES*
Industry Fixed Effects	*YES*	*YES*	*YES*	*YES*
Observations	9,546	9,546	12,261	12,261
R-squared	0.073	0.073	0.282	0.282
Differences between coefficients				
$\beta_1 - \beta_2$	-0.356	-0.534	0.017	-0.017
	[0.33]	[1.11]	[0.18]	[0.23]

Table 9: The Sensitivity of CEO Pay to the Stock Price (*PPS*) and Acquirer Board Strength

This table presents evidence on the effect of unrelated acquisitions on *PPS* conditional on the strength of the board vis-à-vis the CEO. The sample period is from 1993 to 2005. The dependent variable in all columns, $(\Delta PPS)_{t-1, t+1}$ is the change in the sensitivity of CEO to the stock price between year *t-1* and *t+1*. In Column (1) and (2), *Strong Board* is a dummy variable that equals one if *CEO Tenure* is greater than its median value in year *t*, whereas *Weak Board* is a dummy variable that equals one if *CEO Tenure* is lower than its median value in year *t*. In Column (3) and (4), *Strong Board* is a dummy variable that equals one if the CEO is also the chairman of the board, whereas *Weak Board* is a dummy variable that equals one if the CEO is not the chairman if the board. In Column (5) and (6), *Strong Board* is a dummy variable that equals one if the majority of the directors are not appointed after the CEO assumed his post, i.e., not co-opted, whereas *Weak Board* is a dummy variable that equals one if the majority of the directors are co-opted. Definitions of other independent variables are provided in Appendix A. Columns (1) and (3) use the 1% vertical-relatedness threshold, whereas Columns (2) and (4) use the 5% relatedness threshold. All columns use the OLS model for estimation. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of the table. All columns include year and Fama-French industry dummies (Fama and French, 1997). All columns exclude financial and utility industries. Robust t-statistics clustered at the firm level are reported in square brackets; *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable:	$\Delta(PPS)_{t-1, t+1}$					
Board Strength is based on:	*CEO Tenure*		*Chairman-CEO*		*Non-Coopted*	
Vertical-Relatedness Threshold:	1%	5%	1%	5%	1%	5%
	(1)	(2)	(3)	(4)	(5)	(6)
$Unrelated\_Acq_t$ x $Strong\ Board_{t+1}$ (β_1)	0.227*	0.204*	0.340**	0.313*	0.357**	0.333**
	[1.89]	[1.85]	[2.03]	[1.94]	[2.06]	[2.05]
$Unrelated\_Acq_t$ x $Weak\ Board_{t+1}$ (β_2)	0.129	0.106	0.071	0.057	0.049	0.025
	[1.02]	[0.90]	[0.76]	[0.66]	[0.40]	[0.22]
$Strong\ Board_{t+1}$	0.039	0.039	-0.046**	-0.046**	-0.094***	-0.094***
	[1.36]	[1.35]	[-2.32]	[-2.32]	[-3.51]	[-3.52]
$Ln(Market\ Value)_{t+1}$	0.061***	0.061***	0.061***	0.061***	0.038**	0.038**
	[4.48]	[4.47]	[4.46]	[4.46]	[2.24]	[2.23]
$Tobin's\ Q_{t+1}$	0.074***	0.074***	0.075***	0.075***	0.086***	0.086***
	[6.93]	[6.93]	[7.02]	[7.01]	[6.65]	[6.64]
PIN_{t+1}	0.854***	0.852***	0.954***	0.952***	0.818**	0.816**
	[3.13]	[3.12]	[3.50]	[3.49]	[2.29]	[2.29]
$Ln(CEO\ Tenure)_{t+1}$	0.141***	0.141***	0.105***	0.105***	0.091***	0.091***
	[7.06]	[7.05]	[8.31]	[8.31]	[4.86]	[4.86]
$Stock\ Volatility_{t+1}$	-0.104*	-0.105*	-0.119**	-0.119**	-0.389***	-0.390***
	[-1.80]	[-1.81]	[-2.06]	[-2.07]	[-4.68]	[-4.68]
$Cash\ Flow_{t+1}$	-0.031	-0.031	-0.015	-0.014	-0.113	-0.113
	[-0.32]	[-0.32]	[-0.15]	[-0.15]	[-0.77]	[-0.77]
$Inst\_Ownership_{t+1}$	0.000	0.000	0.000	0.000	0.001	0.001
	[0.64]	[0.64]	[0.26]	[0.26]	[0.91]	[0.91]
$Inst\_Concentration_{t+1}$	-0.085	-0.085	-0.115	-0.115	-0.203*	-0.204*
	[-0.89]	[-0.89]	[-1.16]	[-1.16]	[-1.67]	[-1.67]
Constant	-0.726***	-0.724***	-1.071***	-1.069***	-0.102	-0.099
	[-2.81]	[-2.80]	[-5.50]	[-5.49]	[-0.36]	[-0.35]
Year Fixed Effects	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
Industry Fixed Effects	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
Observations	9,505	9,505	9,608	9,608	6,715	6,715
R-squared	0.078	0.078	0.078	0.078	0.080	0.079
Differences between coefficients						
$\beta_1 - \beta_2$	0.098	0.098	0.269	0.256	0.308	0.308
	[0.28]	[0.33]	[1.92]	[1.92]	[2.09]	[2.43]

Table 10: The Sensitivity of CEO Pay to the Stock Price (*PPS*) After Correcting for Endogeneity

This table presents evidence on the effect of unrelated acquisitions on *PPS* using the 2SLS model with instrumental variables or the Heckman treatment effects model for estimation. The sample period is from 1993 to 2005. Panel A reports the results from the first stage of the Heckman treatment effects model which is a predictive model for unrelated acquisitions. The dependent variable, $Unrelated\_Acq_t$ is a dummy variable that equals one if the acquisition is classified as an unrelated one. Column (1) uses the 1% vertical relatedness threshold, whereas Columns (2) uses the 5% relatedness threshold. Both columns use the Probit Model for estimation. The dependent variable in Panel B, $(\Delta PPS)_{t-1,\ t+1}$ is the change in the sensitivity of CEO to the stock price between year *t-1* and *t+1*. Columns (1) and (3) use the 1% vertical-relatedness threshold, whereas Columns (2) and (4) use the 5% relatedness threshold. Columns (1) and (2) use the 2SLS Model and Columns (3) and (4) use the Heckman treatment effects model for estimation. The coefficients of the instrumental variables used in Columns (1) and (2) are reported at the bottom of the panel along with the respective t-statistics. $Ln(IndRelatedDeals)_{t-1}$ is the natural logarithm of the number of related acquisitions by all firms in the firm's four-digit SIC industry at *t-1*. $RI\_Correlation_{t-1}$ is the average pair-wise correlation of equal-weighted stock returns between the firm's four-digit SIC industry and its customer and supplier industries, calculated using monthly returns from *t-3* to *t-1*. $Ln(Ind\_Integrated)_{t-1}$ is the natural logarithm of the number of vertically-integrated firms in the firm's four-digit SIC industry at *t-1*. Definitions of all other variables used in the table are provided in Appendix A. In both panels, all columns include year and Fama-French industry dummies (Fama and French, 1997) and exclude financial and utility industries. Robust t-statistics clustered at the firm level are reported in square brackets; *** p<0.01, ** p<0.05, * p<0.1.

Panel A: Determinants of Unrelated Acquisitions		
Dependent Variable:	$Unrelated\_Acq_t$	
Vertical-Relatedness Threshold:	1%	5%
	(1)	(2)
$Ln(Ind\_Related\_Deals)_{t-1}$	-0.067*	-0.056
	[-1.74]	[-1.55]
$RI\_Correlation_{t-1}$	-0.764**	-0.718**
	[-2.03]	[-1.99]
$Ln(RI\_Direc\_Supply)_{t-1}$	-0.032	-0.036*
	[-1.43]	[-1.67]
$(Tobin's\ Q/Ind\_Q)_{t-1}$	0.007	-0.014
	[0.17]	[-0.37]
$Ln(Market\ Value)_{t-1}$	-0.033	-0.027
	[-1.23]	[-1.05]
$Market\ Share_{t-1}$	0.346	0.334
	[1.27]	[1.31]
HHI_{t-1}	-0.280	-0.168
	[-0.81]	[-0.53]
$Book\ Leverage_{t-1}$	-0.811***	-0.910***
	[-3.36]	[-3.78]
$Multi\text{-}Segment_{t-1}$	0.115	0.103
	[1.52]	[1.40]
$Chairman\text{-}CEO_{t-1}$	-0.053	-0.007
	[-0.78]	[-0.10]
$Prop\_Outside_{t-1}$	0.203	0.213
	[0.98]	[1.04]
$Ln(Board\ Size)_{t-1}$	0.018	0.020
	[0.19]	[0.22]
Constant	-1.314***	-1.329***
	[-3.57]	[-3.77]
Year Dummies	*YES*	*YES*
Industry Dummies	*YES*	*YES*
Observations	9,278	9,351
R-squared	0.059	0.056

Panel B: The Effect of Unrelated Acquisitions on *PPS* using 2SLS and Heckman Treatment effects models.				
Dependent Variable:	$\Delta(PPS)_{t-1,\,t+1}$			
Estimation Model:	2SLS		Heckman Treatment	
Vertical-Relatedness Threshold:	1%	5%	1%	5%
	(1)	(2)	(3)	(4)
Unrelated_Acq$_t$	10.863**	10.456**	1.404*	1.212
	[1.97]	[2.05]	[1.73]	[1.49]
Ln(Market Value)$_{t+1}$	0.052**	0.041*	0.053***	0.053***
	[2.42]	[1.74]	[3.66]	[3.65]
Tobin's Q$_{t+1}$	0.105***	0.110***	0.099***	0.099***
	[5.83]	[5.80]	[7.00]	[7.02]
PIN$_{t+1}$	0.791*	0.593	0.931***	0.930***
	[1.76]	[1.24]	[3.49]	[3.50]
Ln(CEO Tenure)$_{t+1}$	0.111***	0.108***	0.105***	0.104***
	[5.59]	[5.52]	[7.60]	[7.61]
Stock Volatility$_{t+1}$	-0.106	-0.170	-0.126*	-0.127*
	[-0.98]	[-1.48]	[-1.87]	[-1.89]
Cash Flow$_{t+1}$	0.288	0.288	-0.025	-0.023
	[1.11]	[1.14]	[-0.24]	[-0.23]
Inst_Ownership$_{t+1}$	-0.000	-0.000	0.001	0.001
	[-0.27]	[-0.42]	[1.02]	[1.02]
Inst_Concentration$_{t+1}$	0.052	0.047	-0.097	-0.096
	[0.29]	[0.26]	[-0.90]	[-0.90]
Lambda			-0.489	-0.424
			[-1.50]	[-1.28]
Constant	-0.840***	-0.676**	-0.974***	-0.263
	[-2.72]	[-2.10]	[-3.59]	[-1.36]
Year Dummies	*YES*	*YES*	*YES*	*YES*
Industry Dummies	*YES*	*YES*	*YES*	*YES*
Observations	8,714	8,714	8,144	8,214
R-Squared			0.077	0.077
Hansen *J* p-value	0.141	0.185		
Sargan C p-value	0.004	0.003		
Anderson-Rubin p-value	<0.001	<0.001		
F-Statistic	2.30*	2.46*		
First-Stage Coefficients				
Ln(Ind_Related_Deals)$_{t-1}$	-0.002*	-0.002*		
	[1.92]	[1.76]		
RI_Correlation$_{t-1}$	-0.025*	-0.025		
	[1.68]	[1.62]		
Ln(Ind_Integrated)$_{t-1}$	-0.004	-0.001		
	[0.23]	[0.53]		

Table 11: The Effect of Acquisitions on the Sensitivity of CEO Pay to the Stock Price (*PPS*) After Controlling for Changes in Other Determinants

This table presents evidence on the effect of unrelated acquisitions on *PPS* controlling for changes in other determinants of *PPS* with the exception of CEO tenure. The sample period is from 1993 to 2005. Panel A uses the OLS model, while Panel B uses the 2SLS model for estimation. The dependent variable in both panels, $(\Delta PPS)_{t-1,\,t+1}$ is the change in the sensitivity of CEO to the stock price between year *t-1* and *t+1*. In Panel A, $(Higher\ Volatility)_{t-1,\,t+1}$ is a dummy variable that equals of if stock volatility is higher after the unrelated acquisition than it was before. $(Lower\ Volatility)_{t-1,\,t+1}$ is a dummy variable that equals of if stock volatility is lower after the unrelated acquisition than it was before. Columns (1) and (3) use the 1% vertical-relatedness threshold, whereas Columns (2) and (4) use the 5% relatedness threshold. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of the panel. In Panel B, the coefficients of the instrumental variables used in the 2SLS model are reported at the bottom of the panel along with the respective t-statistics. $Ln(IndRelatedDeals)_{t-1}$ is the natural logarithm of the number of related acquisitions by all firms in the firm's four-digit SIC industry. $RI\_Direc\_Supply_{t-1}$ is the total number directors in the related-industry firms located within one hundred miles with the firm's headquarters. Column (1) use the 1% vertical-relatedness threshold, whereas Columns (2) use the 5% relatedness threshold. Definitions of all other variables are provided in Appendix A. In both panels, all columns include year and Fama-French industry dummies (Fama and French, 1997) and exclude financial and utility industries. Robust t-statistics clustered at the firm level are reported in square brackets; *** p<0.01, ** p<0.05, * p<0.1.

Panel A: The Effect of Unrelated Acquisitions on *PPS* using the OLS model.

Dependent Variable:	$\Delta(PPS)_{t-1,\,t+1}$			
Vertical-Relatedness Threshold:	1%	5%	1%	5%
	(1)	(2)	(3)	(4)
$Unrelated\_Acq_t$	0.114	0.097		
	[1.44]	[1.31]		
$(Higher\ Volatility)_{t-1,\,t+1}$ x $Unrelated\_Acq_t$ (β_1)			0.202*	0.172
			[1.74]	[1.60]
$(Lower\ Volatility)_{t-1,\,t+1}$ x $Unrelated\_Acq_t$ (β_2)			0.005	0.001
			[0.05]	[0.01]
$\Delta(Ln(Market\ Value))_{t-1,\,t+1}$	0.286***	0.286***	0.286***	0.286***
	[8.52]	[8.52]	[8.51]	[8.51]
$\Delta(Tobin's\ Q)_{t-1,\,t+1}$	0.101***	0.101***	0.101***	0.101***
	[5.29]	[5.29]	[5.28]	[5.29]
$\Delta(PIN)_{t-1,\,t+1}$	0.037	0.035	0.044	0.040
	[0.14]	[0.13]	[0.17]	[0.16]
$Ln(CEO\ Tenure)_{t+1}$	0.102***	0.102***	0.102***	0.102***
	[7.93]	[7.92]	[7.93]	[7.92]
$\Delta(Stock\ Volatility)_{t-1,\,t+1}$	-0.325*	-0.325*	-0.328*	-0.329*
	[-1.92]	[-1.93]	[-1.94]	[-1.95]
$\Delta(Cash\ Flow)_{t-1,\,t+1}$	-0.250***	-0.250***	-0.250***	-0.251***
	[-2.88]	[-2.89]	[-2.89]	[-2.89]
$\Delta(Inst\_Ownership)_{t-1,\,t+1}$	-0.002***	-0.002***	-0.002***	-0.002***
	[-3.18]	[-3.18]	[-3.16]	[-3.17]
$\Delta(Inst\_Concentration)_{t-1,\,t+1}$	0.112	0.113	0.113	0.114
	[1.12]	[1.13]	[1.13]	[1.14]
Constant	-0.054	-0.054	-0.054	-0.054
	[-0.29]	[-0.29]	[-0.29]	[-0.29]
Year Dummies	*YES*	*YES*	*YES*	*YES*
Industry Dummies	*YES*	*YES*	*YES*	*YES*
Observations	8,632	8,632	8,632	8,632
R-squared	0.125	0.125	0.125	0.125
Differences between coefficients				
$\beta_1 - \beta_2$			0.197	0.171
			[1.73]	[1.42]

Panel B: The Effect of Unrelated Acquisitions on *PPS* using 2SLS model.		
Dependent Variable:	$\Delta(PPS)_{t-1,\,t+1}$	
Estimation Model:	2SLS	
Vertical-Relatedness Threshold:	1%	5%
	(1)	(2)
$Unrelated\_Acq_t$	6.386	6.362
	[1.48]	[1.43]
$\Delta(Ln(Market\ Value))_{t-1,\,t+1}$	0.186**	0.171*
	[2.49]	[1.94]
$\Delta(Tobin's\ Q)_{t-1,\,t+1}$	0.133***	0.138***
	[4.69]	[4.30]
$\Delta(PIN)_{t-1,\,t+1}$	0.334	0.218
	[0.98]	[0.67]
$Ln(CEO\ Tenure)_{t+1}$	0.111***	0.110***
	[6.92]	[6.92]
$\Delta(Stock\ Volatility)_{t-1,\,t+1}$	-0.409*	-0.480*
	[-1.85]	[-1.88]
$\Delta(Cash\ Flow)_{t-1,\,t+1}$	0.170	0.205
	[0.54]	[0.58]
$\Delta(Inst\_Ownership)_{t-1,\,t+1}$	-0.002*	-0.002*
	[-1.93]	[-1.95]
$\Delta(Inst\_Concentration)_{t-1,\,t+1}$	0.028	0.058
	[0.19]	[0.41]
Constant	-0.231**	-0.227**
	[-2.30]	[-2.28]
Year Dummies	*YES*	*YES*
Industry Dummies	*YES*	*YES*
Observations	8,632	8,632
Hansen *J* p-value	0.218	0.219
Sargan C p-value	0.0932	0.0909
Anderson-Rubin p-value	0.0736	0.0736
F-Statistic	3.516**	2.906*
First-Stage Coefficients		
$Ln(Ind\_Related\_Deals)_{t-1}$	-0.002*	-0.002*
	[2.09]	[1.96]
$RI\_Direc\_Supply_{t-1}$	-0.000*	-0.000*
	[1.76]	[1.69]

Table 12: The Effect of Acquisitions on the Level of CEO Compensation (*TDC1*) and Its Cash and Stock-Based Components

This table presents evidence on the effect of all, related and unrelated acquisitions on total direct compensation (*TDC1*) and its cash and stock-based components. The sample period is from 1993 to 2005. All columns in Panel A and B use the OLS model for estimation, while Panel C uses the 2SLS model for estimation. In Panel A, the dependent variable in all columns is $(\Delta\ TDC1)_{t-1,\ t+1}$, the change in *TDC1* between *t-1* and *t*+1. *TDC1* is the sum of salary, bonus, other annual compensation, long-term incentive payouts, grant-date value of restricted stock and grant-date value of stock options and other compensation. Columns (1) and (3) use the 1% vertical-relatedness threshold, whereas Columns (2) and (4) use the 5% relatedness threshold. In Panel B, the dependent variable in Columns (1) and (2) is $\Delta(TotalCash)_{t-1,\ t+1}$, the change in cash compensation between *t-1* and *t+1*, while that in Columns (3)-(6) is $\Delta(TotalStock)_{t-1,\ t+1}$, the change in stock-based compensation between *t-1* and *t+1*. Columns (1), (3) and (6) use the 1% vertical-relatedness threshold, whereas Columns (2), (4) and (6) use the 5% relatedness threshold. $(Higher\ Volatility)_{t-1,\ t+1}$ is a dummy variable that equals of if stock volatility is higher after the unrelated acquisition than it was before. $(Lower\ Volatility)_{t-1,\ t+1}$ is a dummy variable that equals of if stock volatility is lower after the unrelated acquisition than it was before. In Panels A and B, the differences between coefficients of interest along with the respective t-statistics are provided at the bottom of each panel. In Panel C, the dependent variable in Column (1) is $\Delta(TDC1)_{t-1,\ t+1}$ and that in Column (2) is $\Delta(TotalStock)_{t-1,\ t+1}$. Both columns use the 1% vertical-relatedness threshold. The coefficients of the instrumental variables used in the 2SLS model are reported at the bottom of the panel along with the respective t-statistics. $Ln(IndRelatedDeals)_{t-1}$ is the natural logarithm of the number of related acquisitions by all firms in the firm's four-digit SIC industry at *t-1*. $RI\_Direc\_Supply_{t-1}$ is the total number directors in the related-industry firms located within one hundred miles with the firm's headquarters at *t-1*. $Ln(RI\_Firms)_{t-1}$ is the natural logarithm of the number of related-industry firms in customer and supplier industries of the firm's four-digit SIC industry at *t-1*. Definitions of all other variables used in the table are provided in Appendix A. In all panels, all columns include year and Fama-French industry dummies (Fama and French, 1997) and exclude financial and utility industries. Robust t-statistics clustered at the firm level are reported in square brackets; *** p<0.01, ** p<0.05, * p<0.1.

Panel A: The dependent variable is the change in *TDC1* around acquisitions.

Dependent Variable:	$\Delta(TDC1)_{t-1,\ t+1}$				
Vertical-Relatedness Threshold:		1%	5%	1%	5%
	(1)	(2)	(3)	(4)	(5)
Acq_t	0.741*				
	[1.80]				
$Unrelated\_Acq_t\ (\beta_1)$		1.105*	1.017*	1.112*	1.024*
		[1.88]	[1.87]	[1.89]	[1.88]
$Related\_Acq_t\ (\beta_2)$				0.421	0.454
				[0.75]	[0.75]
$Ln(Market\ Value)_{t+1}$	0.374***	0.376***	0.375***	0.375***	0.374***
	[4.70]	[4.70]	[4.69]	[4.70]	[4.69]
$Tobin's\ Q_{t+1}$	0.382***	0.381***	0.381***	0.382***	0.382***
	[5.62]	[5.60]	[5.60]	[5.61]	[5.61]
PIN_{t+1}	5.538***	5.542***	5.527***	5.534***	5.526***
	[3.32]	[3.32]	[3.31]	[3.32]	[3.31]
$Ln(CEO\ Tenure)_{t+1}$	-0.042	-0.042	-0.042	-0.042	-0.042
	[-0.67]	[-0.66]	[-0.66]	[-0.66]	[-0.67]
$Stock\ Volatility_{t+1}$	0.401	0.410	0.404	0.406	0.402
	[1.00]	[1.02]	[1.01]	[1.01]	[1.00]
$Cash\ Flow_{t+1}$	-0.732	-0.742	-0.744	-0.730	-0.731
	[-1.14]	[-1.16]	[-1.16]	[-1.14]	[-1.14]
$Inst\_Ownership_{t+1}$	0.002	0.002	0.002	0.002	0.002
	[0.89]	[0.91]	[0.91]	[0.89]	[0.89]
$Inst\_Concentration_{t+1}$	-1.312**	-1.312**	-1.313**	-1.308**	-1.310**
	[-2.45]	[-2.45]	[-2.46]	[-2.45]	[-2.45]
Constant	-4.795***	-4.809***	-4.796***	-4.800***	-4.792***
	[-3.91]	[-3.91]	[-3.90]	[-3.91]	[-3.90]
Year Dummies	*YES*	*YES*	*YES*	*YES*	*YES*

Industry Dummies	*YES*	*YES*	*YES*	*YES*	*YES*
Observations	9,464	9,464	9,464	9,464	9,464
R-squared	0.049	0.050	0.049	0.050	0.050
Differences between coefficients					
$\beta_1 - \beta_2$				0.691	0.570
				[0.73]	[0.49]

Panel B: The dependent variables are changes in the components of *TDC1*.

	$\Delta(TotalCash)_{t-1,\,t+1}$		$\Delta(TotalStock)_{t-1,\,t+1}$			
Vertical-Relatedness Threshold:	1%	5%	1%	5%	1%	5%
	(1)	(2)	(3)	(4)	(5)	(6)
Unrelated_ Acq$_t$	-0.042	-0.090	1.164**	1.144**		
	[-0.70]	[-1.47]	[2.04]	[2.16]		
(Higher Volatility)$_{t-1,\,t+1}$ *x Unrelated_Acq*$_t$ (β_1)					1.888**	1.710**
					[2.12]	[2.14]
(Lower Volatility)$_{t-1,\,t+1}$ *x Unrelated_Acq*$_t$ (β_2)					0.334	0.432
					[0.52]	[0.69]
Ln(Market Value)$_{t+1}$	0.080***	0.080***	0.277***	0.275***	0.276***	0.274***
	[7.30]	[7.30]	[3.72]	[3.71]	[3.71]	[3.69]
Tobin's Q$_{t+1}$	0.002	0.002	0.388***	0.388***	0.387***	0.388***
	[0.29]	[0.28]	[5.85]	[5.85]	[5.85]	[5.86]
PIN$_{t+1}$	0.783***	0.786***	4.209***	4.189***	4.247***	4.219***
	[3.65]	[3.66]	[2.64]	[2.63]	[2.66]	[2.65]
Ln(CEO Tenure)$_{t+1}$	0.056***	0.056***	-0.215***	-0.216***	-0.215***	-0.216***
	[5.19]	[5.19]	[-3.76]	[-3.76]	[-3.75]	[-3.76]
Stock Volatility$_{t+1}$	0.195***	0.195***	0.132	0.126	0.131	0.124
	[3.74]	[3.74]	[0.35]	[0.33]	[0.35]	[0.33]
Cash Flow$_{t+1}$	0.268***	0.267***	-0.930	-0.929	-0.933	-0.932
	[3.40]	[3.38]	[-1.54]	[-1.54]	[-1.55]	[-1.55]
Inst_Ownership$_{t+1}$	-0.000	-0.000	0.003	0.003	0.003	0.003
	[-0.38]	[-0.37]	[1.33]	[1.32]	[1.35]	[1.34]
Inst_Concentration$_{t+1}$	-0.238***	-0.239***	-0.837*	-0.837*	-0.841*	-0.843*
	[-2.95]	[-2.96]	[-1.65]	[-1.65]	[-1.65]	[-1.66]
Constant	-0.461	-0.463	-4.664***	-4.649***	-4.661***	-4.642***
	[-1.39]	[-1.40]	[-4.44]	[-4.43]	[-4.43]	[-4.42]
Year Fixed Effects	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
Industry Fixed Effects	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
Observations	9,593	9,593	9,464	9,464	9,464	9,464
R-squared	0.058	0.058	0.046	0.046	0.046	0.046
Differences between coefficients						
$\beta_1 - \beta_2$					1.554	1.278
					[2.01]	[1.60]

Panel C: The Effect of Unrelated Acquisitions on *TDC* and its stock component using 2SLS model.		
Estimation Model:	2SLS	
Dependent Variable:	$\Delta(TDC)_{t-1,\,t+1}$	$\Delta(TotalStock)_{t-1,\,t+1}$
	(1)	(2)
Unrelated_Acq$_t$	69.942**	58.097**
	[2.09]	[2.01]
Ln(Market Value)$_{t+1}$	0.316**	0.229**
	[2.40]	[2.00]
Tobin's Q$_{t+1}$	0.433***	0.433***
	[4.36]	[4.88]
PIN$_{t+1}$	3.654	2.653
	[1.26]	[1.05]
Ln(CEO Tenure)$_{t+1}$	-0.049	-0.225**
	[-0.43]	[-2.33]
Stock Volatility$_{t+1}$	0.582	0.161
	[0.80]	[0.26]
Cash Flow$_{t+1}$	1.492	0.852
	[0.97]	[0.64]
Inst_Ownership$_{t+1}$	-0.001	0.000
	[-0.14]	[0.08]
Inst_Concentration$_{t+1}$	-0.019	0.312
	[-0.02]	[0.29]
Constant	-3.625*	-2.729*
	[-1.93]	[-1.67]
Year Dummies	*YES*	*YES*
Industry Dummies	*YES*	*YES*
Observations	9,004	9,004
Hansen *J* p-value	0.937	0.888
Sargan C p-value	<0.001	0.001
Anderson-Rubin p-value	0.004	0.008
F-Statistic	2.09*	2.09*
First-Stage Coefficients		
Ln(Ind_Related_Deals)$_{t-1}$	-0.002*	-0.002*
	[1.84]	[1.84]
RI_Direc_Supply$_{t-1}$	-0.000*	-0.000*
	[1.70]	[1.70]
Ln(RI_Firms)$_{t-1}$	-0.001	-0.001
	[1.22]	[1.22]

Table 13: The Effect of Acquisitions on the Level of CEO Compensation (*TDC*) After Controlling for Changes in Other Determinants

This table presents evidence on the effect of unrelated acquisitions on *TDC1* controlling for changes in other determinants of *TDC1* with the exception of CEO tenure. The sample period is from 1993 to 2005. Panel A uses the OLS model for estimation, while Panel B uses the 2SLS model for estimation. In Panel A, the dependent variable in Columns (1) and (2) is $(\Delta\ TDC1)_{t-1,\ t+1}$, the change in *TDC1* between *t-1* and *t*+1. *TDC1* is the sum of salary, bonus, other annual compensation, long-term incentive payouts, grant-date value of restricted stock and grant-date value of stock options and other compensation. The dependent variable in Columns (3) and (4) is $\Delta(TotalStock)_{t-1,\ t+1}$, the change in stock-based compensation between *t-1* and *t+1*. $(Higher\ Volatility)_{t-1,\ t+1}$ is a dummy variable that equals of if stock volatility is higher after the unrelated acquisition than it was before. $(Lower\ Volatility)_{t-1,\ t+1}$ is a dummy variable that equals of if stock volatility is lower after the unrelated acquisition than it was before. The differences between coefficients of interest along with the respective t-statistics are provided at the bottom of the panel. In Panel B, the dependent variable in Column (1) is $\Delta(TDC1)_{t-1,\ t+1}$ and that in Column (2) is $\Delta(TotalStock)_{t-1,\ t+1}$. The coefficients of the instrumental variables used in the 2SLS model are reported at the bottom of the panel along with the respective t-statistics. $Ln(IndRelatedDeals)_{t-1}$ is the natural logarithm of the number of related acquisitions by all firms in the firm's four-digit SIC industry at *t-1*. $RI\_Direc\_Supply_{t-1}$ is the total number directors in the related-industry firms located within one hundred miles with the firm's headquarters at *t-1*. $Ln(RI\_Firms)_{t-1}$ is the natural logarithm of the number of related-industry firms in customer and supplier industries of the firm's four-digit SIC industry at *t-1*. Definitions of all other variables used in the table are provided in Appendix A. In both panels, all columns use the 1% vertical-relatedness threshold. In both panels, all columns include year and Fama-French industry dummies (Fama and French, 1997) and exclude financial and utility industries. Robust t-statistics clustered at the firm level are reported in square brackets; *** p<0.01, ** p<0.05, * p<0.1.

Panel A: The Effect of Unrelated Acquisitions on *TDC* and its stock component using the OLS model.

Dependent Variable:	$\Delta(TDC)_{t-1,\ t+1}$		$\Delta(TotalStock)_{t-1,\ t+1}$	
	(1)	(2)	(3)	(4)
$Unrelated\_Acq_{\ t}$	0.620		0.735	
	[1.02]		[1.25]	
$(Higher\ Volatility)_{t-1,\ t+1}$ x $Unrelated\_Acq_t$ (β_1)		1.586*		1.623*
		[1.66]		[1.74]
$(Lower\ Volatility)_{t-1,\ t+1}$ x $Unrelated\_Acq_t$ (β_2)		-0.579		-0.367
		[-0.93]		[-0.60]
$\Delta(Ln(Market\ Value))_{t-1,\ t+1}$	1.786***	1.785***	1.320***	1.319***
	[9.71]	[9.72]	[7.72]	[7.73]
$\Delta(\ Tobin's\ Q)_{t-1,\ t+1}$	0.112	0.112	0.155	0.155
	[0.97]	[0.96]	[1.39]	[1.39]
$\Delta(\ PIN)_{t-1,\ t+1}$	-0.611	-0.534	-0.967	-0.895
	[-0.38]	[-0.33]	[-0.60]	[-0.55]
$Ln(CEO\ Tenure)_{\ t+1}$	-0.056	-0.056	-0.214***	-0.214***
	[-0.92]	[-0.92]	[-3.89]	[-3.89]
$\Delta(\ Stock\ Volatility)_{t-1,\ t+1}$	1.862**	1.820*	1.217	1.178
	[2.00]	[1.95]	[1.43]	[1.38]
$\Delta(\ Cash\ Flow)_{t-1,\ t+1}$	-1.687**	-1.692**	-2.076***	-2.081***
	[-2.16]	[-2.17]	[-2.78]	[-2.79]
$\Delta(\ Inst\_Ownership)_{t-1,\ t+1}$	-0.011*	-0.010*	-0.007	-0.006
	[-1.69]	[-1.66]	[-1.09]	[-1.06]
$\Delta(Inst\_Concentration)_{t-1,\ t+1}$	-0.133	-0.121	0.351	0.361
	[-0.19]	[-0.17]	[0.52]	[0.53]
Constant	4.777**	4.769**	-0.846*	-0.852*
	[2.26]	[2.25]	[-1.74]	[-1.76]
Year Dummies	*YES*	*YES*	*YES*	*YES*
Industry Dummies	*YES*	*YES*	*YES*	*YES*
Observations	8,547	8,547	8,547	8,547
R-squared	0.065	0.065	0.051	0.052

Differences between coefficients		
$\beta_1 - \beta_2$	2.165*	1.990*
	[3.45]	[3.09]

Panel B: The Effect of Unrelated Acquisitions on *TDC* and its stock component using 2SLS model.		
Estimation Model:	2SLS	
Dependent Variable:	$\Delta(TDC)_{t-1,\,t+1}$	$\Delta(TotalStock)_{t-1,\,t+1}$
	(1)	(2)
$Unrelated\_Acq_t$	30.838	22.292
	[1.52]	[1.27]
$\Delta(Ln(Market\ Value))_{t-1,\,t+1}$	1.241***	0.931***
	[3.24]	[2.79]
$\Delta(Tobin's\ Q)_{t-1,\,t+1}$	0.294*	0.290**
	[1.88]	[2.03]
$\Delta(PIN)_{t-1,\,t+1}$	0.819	0.127
	[0.40]	[0.07]
$Ln(CEO\ Tenure)_{t+1}$	-0.031	-0.197***
	[-0.41]	[-2.99]
$\Delta(Stock\ Volatility)_{t-1,\,t+1}$	1.412	0.870
	[1.29]	[0.91]
$\Delta(Cash\ Flow)_{t-1,\,t+1}$	0.389	-0.613
	[0.23]	[-0.40]
$\Delta(Inst\_Ownership)_{t-1,\,t+1}$	-0.008	-0.005
	[-1.17]	[-0.72]
$\Delta(Inst\_Concentration)_{t-1,\,t+1}$	-0.552	0.068
	[-0.66]	[0.09]
Constant	0.318	0.480*
	[1.02]	[1.71]
Year Dummies	*YES*	*YES*
Industry Dummies	*YES*	*YES*
Observations	8,484	8,484
Hansen *J* p-value	0.470	0.149
Sargan C p-value	0.041	0.115
Anderson-Rubin p-value	0.093	0.055
F-Statistic	2.784**	2.784**
First-Stage Coefficients		
$Ln(Ind\_Related\_Deals)_{t-1}$	-0.002**	-0.002*
	[2.17]	[1.84]
$RI\_Direc\_Supply_{t-1}$	-0.000*	-0.000*
	[1.89]	[1.70]
$Ln(RI\_Firms)_{t-1}$	-0.001	-0.001
	[1.05]	[1.22]