THREE ESSAYS
IN
CORPORATE FINANCE

by

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ABSTRACT

This dissertation contains three distinct essays in the broad area of corporate finance. The first two essays examine the role of an independent director who is also a blockholder (IDB), a potent governance mechanism, on executive compensation, and corporate financial and investment policies, respectively. The last essay examines insider trading in takeover targets.

The first essay examines three issues. First, we investigate the determinants of an IDB's presence in a firm. Second, we examine the relations between IDB presence and (1) the level and structure of CEO compensation, and (2) CEO turnover-performance sensitivity. Third, we analyze if IDB presence is related to firm valuation. Our findings suggest that the presence of an independent blockholder on the board promotes better incentives and monitoring of the CEO, and consequently leads to higher firm valuation.

In the second essay, we examine how the presence of an IDB affects: (1) four key financial and investment policy choices of a firm: the levels of cash holdings, dividends, investments and financial leverage, and (2) firm risk. We also examine how the market values IDB presence and changes in various policy choices associated with IDB presence in a firm. We find that firms with IDBs have significantly lower levels of cash holdings, dividend yields, repurchases, and total payout, but higher levels of capital expenditures. We also find that firms with IDBs have lower risk. Overall, IDB presence appears to reduce agency problems between managers and shareholders.

The third essay brings large-sample evidence on whether the level and pattern of profitable insider trading before takeover announcements is abnormal for a broad cross-section of targets of takeovers during modern times. We find an interesting and subtle pattern in the average pre-takeover trading behavior of target insiders. While insiders reduce both their purchases and sales below normal levels, their sales reduce more than purchases, leading to an increase in net purchases. This pattern of 'passive' insider trading is confined to the six-month period before takeover announcement, holds for each insider group, for all measures of net purchases examined, and in certain sub-samples with less uncertainty about takeover completion.

DEDICATION

This dissertation is dedicated to my father, M. Akkas Ali.

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1. INTRODUCTION

This dissertation contains three distinct essays in the broad area of empirical corporate finance. The first two essays examine the role of an independent director who is also a blockholder (IDB), a potent governance mechanism, on executive compensation, and corporate financial and investment policies, respectively. The last essay examines insider trading in takeover targets.

There is an intense, ongoing debate on whether the level and composition of CEO pay is an outcome of an efficient arms-length bargaining process or is controlled by powerful CEOs. An independent director who is also a blockholder (IDB) has both a strong incentive and the ability to monitor management. So the presence of an IDB in a firm can lead to arms-length bargaining in setting CEO pay. Alternatively, IDBs may pursue private benefits at the expense of small shareholders. The first essay examines three issues. First, we investigate the determinants of an IDB's presence in a firm. Second, we examine the relations between IDB presence and (1) the level and structure of CEO compensation, and (2) CEO turnover-performance sensitivity. Third, we analyze if IDB presence is related to firm valuation. We find that IDB presence is systematically related to firm, CEO and governance characteristics. After controlling for CEO characteristics, governance mechanisms and relevant firm attributes, and accounting for the potential endogeneity of IDB presence, we find that CEOs of firms with IDBs have: (1) lower levels of cash and total compensation, (2) lower proportions of pay via stock and options, and (3) higher turnover-performance sensitivity. Finally, firms with an IDB have higher valuation, as measured by Tobin's q. The magnitudes of these effects are substantial, and are generally bigger when an IDB serves on the compensation committee. These results are robust to a variety of specifications, and are further supported by an analysis of firms that switched to or from having IDB presence. Our findings suggest that the presence of an independent blockholder on the board promotes better incentives and monitoring of the CEO, and consequently leads to higher firm valuation.

Any mechanism that can mitigate agency problems between managers and shareholders is valuable to a firm. The presence of an IDB can act as a powerful control mechanism because an IDB has both a strong incentive as well as the ability to effectively monitor managers. But an IDB's risk preferences can differ from those of other shareholders and the IDB can use his power to extract private benefits from the firm at the expense of other shareholders. One way to examine these agency implications is to empirically examine whether and how IDB presence influences firms' financial and investment policies and risk-taking. In the second essay, we examine how the presence of an IDB affects: 1) four key financial and investment policy choices of a firm: the levels of cash holdings, dividends, investments and financial leverage, and 2) firm risk. We also examine how the market values IDB presence and changes in various policy choices associated with IDB presence in a firm. After controlling for other variables and accounting for possible endogeneity of IDB presence, we find that firms with IDBs have significantly lower levels of cash holdings, dividend yields, repurchases, and total payout, but higher levels of capital expenditures. IDB presence, however, has no significant impact on the levels of a firm's financial leverage and R&D expenditures. We also find that firms with IDBs have lower total risk, systematic risk and unsystematic risk. While IDB presence enhances overall firm valuation and the market appears to value a decrease in dividend yields associated with IDB presence, changes in other policy choices associated with IDB presence do not appear to affect firm valuation.

Takeover announcements typically result in large increases in stock prices of target firms, providing a tempting opportunity for insider trading. Surprisingly, no prior study has examined whether the level and pattern of profitable insider trading before takeover announcements is abnormal for a broad cross-section of targets of takeovers during modern times. The third essay brings large-sample evidence on this issue in an attempt to fill this gap in the literature. We examine insider trading in about 3,700 targets of takeovers announced during 1988-2006. We analyze open-market purchases, sales and net purchases of five groups of corporate insiders during the one year pre-takeover period. Using cross-sectional and time-series control samples, the paper estimates difference-in-differences regressions of several measures of the level of insider trading that control for its other determinants. We find an interesting and subtle pattern in the average pre-takeover trading behavior of target insiders. While insiders reduce both their purchases and sales below normal levels, their sales reduce more than purchases, leading to an increase in net purchases. This pattern of 'passive' insider trading is confined to the six-month period before takeover announcement, holds for each insider group, for all three measures of net purchases examined, and in certain sub-samples with less uncertainty about takeover completion, such as deals with a single bidder, domestic acquirer, and less regulated target. Our findings suggest that while insiders are careful about trading before major corporate events, they try to get around the restrictions on their trading activities.

2. BLOCKHOLDERS ON BOARDS AND CEO COMPENSATION, TURNOVER AND FIRM VALUATION

"The typical large company has a compensation committee. They don't look for Dobermans on that committee, they look for Chihuahuas..., Chihuahuas that have been sedated."

Warren Buffett, at 2004 annual shareholders' meeting of Berkshire Hathaway,

CNNMoney.com, May 3, 2004

2.1 Introduction

There are two competing views of the CEO contracting process in the United States. In one view, CEO contracts are determined by arms-length bargaining that leads to efficient outcomes (see, e.g., Holmstrom and Kaplan (2003) and Edmans and Gabaix (2009)). An alternative ('skimming') view holds that powerful CEOs exercise enormous sway over boards, rendering the boards ineffective in setting appropriate CEO contracts (see, e.g., Bebchuk and Fried (2004) and Morse, Nanda and Seru (2008)). Bertrand and Mullainathan (BM, 2001) argue that both views have merit: bargaining takes place in firms with strong governance and skimming in firms with weak governance. Shleifer and Vishny (1986) show that a large shareholder, by overcoming the free-rider problem in monitoring managers, can serve as an effective governance mechanism. BM find that adding a large shareholder to the board substantially reduces what a firm pays its CEO for luck, i.e., changes in firm performance beyond the CEO's control.

As representatives of shareholders, boards of directors are charged with hiring, compensating, monitoring and disciplining CEOs. Given their substantial powers, boards can serve as an important governance mechanism. But boards' ability to monitor CEOs hinges on having strong, motivated and independent directors. A director is truly independent if she is not under undue influence of the CEO, allowing her to challenge the CEO if he pursues his interests at the expense of shareholders. Morck (2008) argues that a powerful CEO can usually subdue nominally independent directors, who often owe their board seats to the CEO. But a CEO's co-option of the board can break down with a strong voice of dissent. Hence, often all that is needed to overcome a CEO's 'rule' over the board is one truly independent director with a significant equity stake in the firm, who has a strong incentive to monitor the CEO and the ability to confront him should the need arise. This requirement is satisfied by an independent director who is a blockholder (IDB).[1] An IDB has both a strong incentive and the ability to monitor management. The incentive comes from large stockholdings, while the ability comes from several sources. A board seat gives an IDB a regular forum for monitoring managers. Large shareholdings give an IDB direct voting power, the ability to form coalitions with other large shareholders, and greater influence on the board relative to other outside directors, who typically have negligible stockholdings.

Anecdotal evidence suggests that IDBs have a significant say in hiring, compensating, and firing CEOs, and consequently can influence firm performance. Some prominent recent examples of IDBs are Warren Buffett, an IDB of Coke and Gillette (before it was acquired by Proctor and Gamble); Carl Icahn, an IDB of Blockbuster and Yahoo; Kirk Kerkorian, a

[1] Following the literature on boards (see Adams, Hermalin and Weisbach (2009) for an excellent review), we define an independent director as a director who is not a current or past executive of the company and does not has a business relationship with the company, e.g., as a supplier or customer.

blockholder of Chrysler and General Motors, who controlled seats on their boards; and Nelson Peltz, a blockholder who controls two board seats in Kraft Foods Inc.[2]

The presence of an independent blockholder (IB) on the compensation committee or the board can lead to arms-length bargaining in setting CEO pay.[3] But whether an IDB indeed stands up to the CEO in the interest of all shareholders, or uses her position to extract private benefits at the expense of other shareholders, is an open question. In this paper, we empirically examine the determinants of IDB presence in a firm, and the relation between IDB presence and the level and composition of CEO pay, the sensitivity of CEO turnover to firm performance, and firm valuation. We define a blockholder as an individual who either controls 1% or more of the equity's voting power or owns 1% or more of the equity's cash flow rights. We define an IDB as an independent director who is (or represents) a blockholder.[4]

Several prior studies have analyzed blockholders and independent directors in various contexts, but have not examined the role of IDBs in executive compensation directly. For instance, Becker, Cronqvist and Fahlenbrach (2008) find that the presence of large non-managerial shareholders significantly explains CEO compensation. They conjecture that blockholders may influence CEO compensation via the board, but do not examine whether these

[2] Blockholders often hold their equity stakes via investment firms controlled by them. For example, the investment vehicles of Buffett, Icahn, Kerkorian, and Peltz are, respectively, Berkshire Hathaway Inc., Icahn Capital L.P. and Icahn Enterprises L.P., Tracinda Corp., and Trian Fund Management.

[3] A recent example of such bargaining is Valeant Pharmaceuticals International (formerly, ICN Pharmaceuticals Inc.), where G. Mason Morfit, an IDB and hedge fund partner, is actively involved in setting the CEO's contract (see Lublin (2009)).

[4] Prior studies typically define blockholders as holders of 5% or larger blocks, whose holdings are reported in proxy statements. Since we are interested in individual blockholders who are independent directors, we take advantage of another disclosure requirement in proxy statements, which disclose the equity ownership of directors, and define an IDB as a 1% blockholder to increase the power of our tests. Panel A of Appendix 1 shows that, using a 1% (5%) ownership definition, 15.5% (4.6%) of the firm-years in our sample have an IDB. Given that IDB presence is our main explanatory variable, defining it using a 5% cut-off would cause it to be a column of nearly all zeros, and the variable would have minimal explanatory power. In any case, 1% of a large company's outstanding equity is a block of substantial size, especially for an individual investor. This is recognized by the SEC's recently proposed proxy access rules, which allow a 1% blockholder of a large company to place a director-nominee on the proxy statement. Appendix 3 shows that the mean (median) holdings of the largest IDB in our sample is - % (- %) or $ - million ($ - million).

blockholders have board seats and whether they exercise their influence via those seats. Cyert, Kang, and Kumar (2002) examine the influence of blockholders and boards on CEO compensation levels. They find that the CEO's equity-based compensation, but not cash compensation, is significantly negatively related to the stock holdings of the largest outside shareholder and of the directors serving on the compensation committee. Chhaochharia and Grinstein (2009) examine CEO compensation levels in companies whose boards were affected by the Sarbanes-Oxley Act, i.e., boards that did not have a majority of independent directors. They find that out of these firms, companies that did not have an outside blockholder on the board pre-SOX reduce CEO compensation substantially post-SOX; there is no significant decrease in CEO compensation for other firms.

Our main explanatory variable of interest, IDB, is likely endogenous: the presence of an IB who holds a board seat in a firm is not a random occurrence. Individuals decide which firms to invest in and whether to try to obtain a board seat. This endogeneity can affect our analysis through either omitted variables or selection bias. We address concerns about endogeneity of IDBs in several ways. First, to mitigate potential endogeneity caused by omitted variables, we include a large number of covariates that can explain the relevant dependent variables (the level and composition of CEO pay, CEO turnover, and firm valuation). Doing this reduces the possibility of omitting variables correlated with our main explanatory variable, IDB. But if omitted variables are unobservable and not orthogonal to the other regressors, including many relevant variables as covariates would still not remove the bias. So, we next use an instrumental variables (IV) approach to account for potential endogeneity caused by unobservable omitted variables. We use the densities of IDBs in the state of a company's headquarters and in its industry as instruments for IDB. Third, to account for possible sample selection bias, we use Heckman's (1979) two-stage treatment effect model. This model corrects the self-selection bias due to unobservable variables and computes the average treatment effect on the treated (ATT) relying on exclusion criteria. We also use maximum likelihood estimation (MLE) to estimate the selection and main equations simultaneously. Fourth, we use covariate matching (CM) and propensity score matching (PSM) to estimate ATT. Both CM and PSM methods attenuate the selection bias based on observables.

We find that IDBs are more prevalent in smaller firms and firms that have higher growth rates, worse prior performance, less powerful CEOs, bigger and more independent boards, more shareholder rights, and lower institutional ownership. These findings indicate that an IDB's presence in a firm is not a random occurrence. After controlling for CEO characteristics, governance mechanisms and relevant firm attributes, we find that CEOs of firms with IDBs have: (1) lower levels of cash and total compensation, and (2) lower proportions of pay via stock and options. These results hold up across different methods that account for potential endogeneity of an IDB's presence in a firm. While CEO turnover-performance sensitivity is unrelated to the presence of an IDB in OLS and probit regressions, this relation is significantly positive after accounting for endogeneity. Finally, firms with an IDB have higher valuation, as measured by Tobin's q. This is an important result given previous findings that blockholder presence is unrelated to firm valuation in the US (see, e.g., Mehran (1995) and Thomsen, Pedersen and Kvist (2006)). The magnitudes of these effects are substantial, and are generally stronger when an IDB serves on the board's compensation committee. Our results on the level and structure of CEO pay and on firm valuation are robust to several alternative definitions of IDB presence in a firm, changes in disclosure rules on executive pay, the adoption of Sarbanes-Oxley Act, and an alternate method of computing industry-adjusted Tobin's q. Our results are also generally robust to controlling for the presence of an outside blockholder or a majority independent board. Finally, an analysis of firms that switched to or from having IDB presence further supports these results. Our findings suggest that the presence of an independent blockholder on the board promotes better incentives and monitoring of the CEO, and consequently leads to better firm performance.

The paper is organized as follows. Section 2.2 briefly reviews the related literature on independent directors and blockholders. Section 2.3 develops our testable hypotheses. Section 2.4 details the data and methodology. Section 2.5 investigates the determinants of IDB presence in a firm. Section 2.6 examines the level and structure of CEO compensation. Sections 2.7 and 2.8 analyze CEO turnover-performance sensitivity and firm valuation, respectively. Section 2.9 presents the results of several robustness checks and an analysis of firms that switch to or from having IDB presence. Section 2.10 concludes.

2.2 Prior studies

2.2.1 Independent directors

Board independence is a key mechanism of corporate governance because independent directors face fewer constraints in monitoring managers. Rosenstein and Wyatt (1990) find that stock prices go up at the announcement of outside director appointments. Core, Holthausen and Larcker (1999) find a positive relation between the level of CEO pay and the percentage of the board composed of outside directors. Mehran (1995) finds that the proportion of executives' equity-based compensation is positively related to the proportion of outside directors on a board. Weisbach (1988) finds that CEO turnover-performance sensitivity is significantly higher in companies with boards that are outsider-dominated than those that are insider-dominated. Our paper addresses similar issues in relation to IDB presence in a company.

Although outside directors are generally viewed as independent, the independence of some outside directors is questionable. So in defining independent directors, it is common to exclude 'grey' outside directors, i.e., directors who are former employees, have any family relationship with the top management or a business relationship with the firm. A new stream of the literature on boards further refines the notion of board independence from various perspectives. For instance, Hwang and Kim (2009) define an independent director as socially independent if he has no social ties with the CEO. They find that firms whose boards are both conventionally and socially independent award a significantly lower level of CEO compensation and exhibit stronger CEO turnover-performance sensitivity than firms whose boards are only conventionally independent. Similarly, Masulis and Mobbs (2009) view inside directors holding outside directorships as less dependent on the CEO and argue that such directors can facilitate better informed, more independent boards, and consequently reduce managerial entrenchment and lower agency costs. Our paper is similar in spirit to this strand of the literature, as we argue that an IDB epitomizes director independence, as a director who is not beholden to the CEO, and who has significant incentives to monitor the CEO and the ability to confront him should the need arise.

Several recent studies examine firms' use of directors with specific professional backgrounds and their impact on firm policies and performance. For example, Agrawal and Knoeber (2001) examine firms' use of outside directors with backgrounds in politics, government and the law and find that firms that depend more on government are more likely to appoint them. Kroszner and Strahan (2001) analyze the trade-offs firms face in having a banker on their boards. Güner, Malmendier and Tate (2008) examine directors with financial expertise. They find that directors' financial expertise does not affect firms' CEO compensation policies. Fahlenbrach, Low and Stulz (2009) and Faleye (2008) examine directors who are CEOs of other firms (i.e., outside CEO-directors). Fahlenbrach et al. find that appointing such directors certifies firm quality to the market; other than that, once appointed, these directors have no discernable impact on the firm. Faleye (2008) finds that CEOs of firms with more outside CEO-directors have higher compensation, lower turnover and lower turnover-performance sensitivity. We extend this literature by examining another type of outside director, namely an IDB.

An IDB may be an activist-director who agitates for changes in the firm (e.g., Carl Icahn or Kirk Kerkorian) or a long-term investor-director who works quietly behind the scenes (e.g., Warren Buffett). This distinction is a matter of an IDB's operating style, and different styles can work in different situations. For instance, Hotchkiss and Mooradian (1997) examine the role of vulture investors in financially distressed firms and find that (similar to activist-directors) they often sit on the board and add value to the firm by actively monitoring and disciplining managers. Klein (1998) finds that firms with IBs on the board's investment or finance committee (similar to long-term investor directors) have better performance. Therefore, regardless of their *modus operandi*, both types of IDBs have the incentives and the ability to be truly independent directors.

2.2.2 Blockholders

Dispersed shareholdings lead to the separation of control and ownership (see, e.g., Berle and Means (1932) and Jensen and Meckling (1976)). Atomistic shareholders lack the incentive to monitor managers, resulting in free-rider problems. On the contrary, large shareholders have strong incentives to monitor and contract with managers to reduce agency problems (see, e.g., Demsetz and Lehn (1985), Shleifer and Vishny (1986) and Holderness (2003)). However, blockholder interests may not always coincide with those of atomistic shareholders.

McConnell and Servaes (1990) find no significant relation between firm valuation (i.e., Tobin's q) and the presence or holdings of an outside blockholder. Mehran (1995) examines the relation between outside blockholdings and CEO compensation or firm performance. He finds that the use of incentive compensation declines with outside blockholdings. He interprets this as evidence of blockholder monitoring substituting for incentive compensation. But he finds no relation between Tobin's q and outside blockholdings. Denis, Denis, and Sarin (1997) find that CEO turnover-performance sensitivity is higher in the presence of an unaffiliated blockholder. Core, Holthausen and Larcker (1999) find lower CEO compensation in firms with large outside blockholders.

Bertrand and Mullainathan (BM, 2001) examine whether CEO compensation increases for reasons that are beyond a CEO's control. They report that the magnitude of this pay-for-luck is lower when a non-CEO blockholder sits on the board. They also find that there tends to be greater pay-for-luck as a manager's tenure with the firm increases, except when a blockholder sits on the board. BM interpret these findings as evidence of monitoring by outside blockholders. Our paper differs from BM in two important respects. First, they focus on the pay-for-luck aspect of CEO compensation, while we examine the level and structure of CEO pay, among other issues. Second, they examine non-CEO blockholder-directors (a group that includes inside and grey directors), while we examine IDBs. The former group is much bigger than the latter. For example, our sample has 5,187 firm-years with a non-CEO blockholder-director, but only 1,790 firm-years with IDBs. Cyert, Kang, and Kumar (2002) find that a CEO's equity-based compensation is significantly negatively related to the equity holdings of the largest outside shareholder and of the board of directors.

Another stream of the literature examines the relation between stockholdings of other large investors, such as institutions and activist hedge funds, and executive compensation and firm performance. These investors have incentives to monitor and they often pressure managers to adopt better corporate governance. Activism by institutional investors, such as mutual funds and pension funds, does not improve firm performance (see, e.g., Black (1998), Karpoff (2001) and Gillan and Starks (2007)). This inability is often attributed to regulatory and institutional constraints. But institutional holdings appear to influence firms' governance. For instance, Hartzell and Starks (2003) find that institutional ownership concentration is negatively related to the level of executive compensation. Activist hedge funds, on the other hand, are more successful in influencing corporate boards and managements, yielding better returns and performance (see, e.g., Brav et al. (2008), Clifford (2008), and Klein and Zur (2009)).

Studies examining the relation between independent individual blockholders and CEO incentives, monitoring, and firm valuation are scarce. Becker, Cronqvist and Fahlenbrach (2008) find that firms with large non-managerial individual shareholders have lower CEO compensation and a lower proportion of CEO pay in the form of stock or options. To our knowledge, no prior study examines the determinants and consequences of the presence of an IB on the board or the compensation committee. This paper is an attempt at filling this gap in the literature.

2.3 Hypotheses

There are two competing views of the CEO contracting process in the United States. In one view, CEO contracts are determined by arms-length bargaining that leads to efficient outcomes (see, e.g., Holmstrom and Kaplan (2003)). An alternative view holds that CEOs exercise enormous sway over boards, rendering the boards ineffective in setting appropriate CEO contracts (see, e.g., Bebchuk and Fried (2004)). If CEO power renders the board ineffective in arms-length bargaining despite the presence of an IDB, there should be no relation between IDB presence and key aspects of CEO contracts such as pay level, pay structure (e.g., proportion of equity-based pay in the pay package), and turnover-performance sensitivity. In addition, if an IDB is unable to influence CEO contracts and other major firm policies, then IDB presence should be unrelated to firm valuation. We call this the 'CEO power hypothesis.'

Alternatively, an IDB can counter-balance the CEO's power over the board. Although a CEO may generally wield considerable influence over the board, an IDB has, given his large equity stake and board seat, a strong incentive and the ability to monitor and bargain effectively with the CEO. This implies that after controlling for other factors, firms with an IDB should have lower levels of CEO pay and higher CEO turnover-performance sensitivity. IDB monitoring and better contracting with the CEO should also result in higher firm valuation. We call this the 'IDB monitoring hypothesis.'

Jensen and Murphy (1990) argue that compensation via stock and options provides a powerful incentive to CEOs to maximize stockholder wealth. Since IDB monitoring can either substitute for equity incentives or complement it, the predicted relation between IDB presence and CEO pay structure can be either negative or positive under the 'IDB monitoring hypothesis.' If IDB monitoring is a substitute for CEO equity incentives, firms with an IDB should have lower (higher) proportions of option and equity-based (salary and cash) pay in the CEO pay package. We call this the 'IDB monitoring – substitutes hypothesis.' If IDB monitoring complements the CEO's equity incentives, these relations should be the opposite. We refer to this as the 'IDB monitoring – complements hypothesis.'

Table 2.1: Hypotheses and predictions

	Relation between IDB monitoring and			
Hypothesis	CEO pay level	% of CEO's equity-based pay	CEO turnover-performance sensitivity	Firm valuation
1. CEO power hypothesis	Unrelated	Unrelated	Unrelated	Unrelated
2. IDB monitoring hypotheses:	Lower		Higher	Higher
2A. IDB monitoring-complements hypothesis		Higher		
2B. IDB monitoring-substitutes hypothesis		Lower		
3. IDB private benefits hypothesis	Higher	-	Lower	Lower

A third possibility is that an IDB can use his position to pursue private benefits at the expense of other shareholders and collude with the CEO to that end. In this case, we would expect firms with an IDB to have higher levels of CEO pay and lower CEO turnover-performance sensitivity. In addition, skimming by both the CEO and the IDB should result in lower firm valuation. We call this the 'IDB private benefits hypothesis'. Table 2.1 summarizes the predictions of these hypotheses.

2.4 Sample, data and methodology

The purpose of this paper is to examine the relation between IDB presence in a firm and the level and structure of CEO compensation, CEO turnover-performance sensitivity, and firm valuation. Doing this requires data on CEO compensation; characteristics of CEOs, directors, and corporate governance; and firms' accounting and stock price information. Therefore, our largest possible sample (11,547 firm-years) consists of firm-years that are common in four databases—RiskMetrics[5] Directors (RM Directors), Center for Research in Securities Prices (CRSP), Compustat, and ExecuComp—over fiscal years 1998-2006 and meet our data requirements. Our main sample of IDBs comes from RM Directors database, which compiles its data from corporate proxy statements. In addition, we use RiskMetrics Governance (RM Governance), Thomson Reuters Institutional Ownership Data (TFN Institutional), corporate proxy statements (via Livedgar), news stories (from Factiva), Wikipedia, and other Internet sources. Firms in our sample belong to the S&P 1500.

2.4.1 Main variables and sample construction

We define a blockholder as an individual who either controls 1% or more of the equity's voting power or owns 1% or more of the equity cash flow rights. We define independent directors as directors classified as independent or designated in RM Directors.[6] So an IDB is an

[5] Formerly named Investor Responsibility Research Center (IRRC).

[6] RM Directors defines as independent a director who is neither a current company employee nor is 'affiliated'. An affiliated director is a director who is a former employee of the company or of a majority-owned subsidiary; a provider of professional services — such as legal, consulting or financial — to the company or an executive of the service provider; a customer of or supplier to the company; a designee (i.e., a designated director) under a

independent director who is (or represents) a blockholder.[7] We define two main variables of interest for our analysis: 1) *IDB*, which is a binary variable that equals one if there is at least one IDB in a given firm-year, and equals zero otherwise; 2) *IDB_CC*, which is a binary variable that equals one if there is at least one IDB who sits on the board's compensation committee[8] in a given firm-year, and equals zero otherwise.

Table 2.2: Sample construction

This table shows the steps in obtaining the base sample for our analysis from S&P 1500 firms for the period 1998-2006.

Number of firm-year in the sample *Reason for dropping firm-years from the sample*	Number of firm-years dropped	Number of firm-years remaining
Firm-years available in RM Directors during calendar years 1997-2006		15,967
Firm-years missing in CRSP	0	
		15,967
Firm-years missing in Compustat	490	
		15,477
After conversion to fiscal year, number of firms-years that belongs to fiscal year 2007	83	
		15,394
Firm-years missing in ExecuComp	1,465	
		13,929
Exclude dual-class firms based on RM Governance	1,158	
Exclude additional dual-class firms based on CRSP data	65	
		12,706
Exclude fiscal year 1997	1,159	
Number of firm-years in the final sample		11,547

documented agreement between the company and a group, such as a significant shareholder; a director who controls more than 50% of the company's voting power; a family member of an employee; an interlocking director or an employee of an organization or institution that receives charitable gifts from the company.

[7] Our blockholder dataset differs substantially from Dlugosz et al.'s (2006) Blockholders database. We construct our dataset from RM Directors database for S&P 1500 firms by extracting data on individual blockholders who are independent directors during 1997-2006. Dlugosz et al.'s database contains all types of blockholders (e.g., individuals, mutual funds, pension funds, etc.) using 1996-2001 Compact Disclosure CDs for S&P 1500 firms. We define blockholders as individuals who own or control 1% or more of a firm's outstanding equity (i.e., higher of cashflow rights or voting rights). They define blockholders as owners of 5% or more of the voting rights where reported; otherwise, higher of voting or cashflow rights, as per SEC Rule 13d-3 definition for proxy reporting. Dlugosz et al. find problems in blockholdings data mostly in cases where reported blockholdings are very large, mainly due to double-counting. We avoid the potential problem of double-counting by using a dummy variable to indicate the presence of a blockholder.

[8] If the firm has no compensation committee, the entire board serves as the compensation committee.

Table 2.2 explains the construction of our sample. RM Directors obtains its data from proxy statements for shareholder meeting dates starting in 1996. Some of the key variables needed to compute a director's shareholdings are missing in the database for 1996. Also, some variables required for our analysis were not available after 2006. Hence, our analysis makes use of data for 1997-2006.

During 1997-2006, there are 15,967 distinct firm-calendar years in RM Directors.[9] We find all 15,967 firm-calendar years on CRSP. Since we use a fiscal year as the unit of time, we match each annual shareholder meeting date for a firm with the fiscal year in which the meeting is held. We obtain the fiscal year ending month for each firm from Compustat. We next match these 15,967 firm-fiscal years (henceforth, firm-years) with Compustat, and find 15,477 matches. After matching the annual meeting dates to the appropriate fiscal year, 83 firm-years fall under the 2007 fiscal year. Due to data limitations, we drop these observations. That leaves us with 15,394 RM Directors-CRSP-Compustat matched firm-years. Out of these, we find 13,929 firm-years with non-missing CEO data in ExecuComp. Our main analysis omits observations for the 1997 fiscal year because, as discussed in section 4.2 below, we use instrumental variables that are lagged by one year. In addition, we exclude dual-class firms because they tend to be family-controlled (see, e.g., DeAngelo and DeAngelo (1985)). Thus, our final sample for the main analysis consists of 11,547 firm-years over 1998-2006.

Appendix 1 provides an overview of our sample. Panel A reports the distribution of the number of firm-years by IDB count. Although we define blockholdings at 1% or more ownership of voting or cash flow rights, for comparison, we also show the corresponding distribution for 5% or more ownership, as often used by prior papers. Of the 11,547 firm-years in our sample,

[9] A single firm-calendar year often includes data from multiple proxy statements. Since directors are usually elected at the annual general meeting of shareholders, typically held three months after the end of a fiscal year, we use the list of directors from the proxy statement for this meeting.

1,790 or 15.5% (532 or 4.6%) of the firm-years have an IDB defined at 1% (5%) blockholding. Panel B reports the breakdown of firm-years with and without an IDB_CC, at both ≥ 1% and ≥ 5% ownership levels. Based on 1% (5%) blockholding level, of the 11,453 firm-years for which we have board committee membership information,[10] 1,042 or 9.1% (380 or 3.3%) of the firm-years have an IDB on the compensation committee. Panel C reports the distribution of the number of fiscal years a firm is present in our sample. Over the 1998-2006 period, our S&P 1500 sample contains 2,056 unique firms. Of these, there are 700 firms that are present in all nine years during 1998-2006 and 1,536 firms that are present in at least three years. Panel D shows the distribution of the proportion of a given firm's fiscal years that have an IDB. For example, 1,477 firms have no IDB for all the fiscal years that they are present in our sample. Panel E presents the number of firm-years in each fiscal year for IDB, non-IDB, and all firms in the sample. The sample size ranges from 1,212 in 2006 to 1,340 in 2001. The percentage of firms with IDBs ranges from 8.2 in 2006 to 13.1 in 2001.

2.4.2 Instrumental variables and empirical methodology

Our main variable of interest, IDB, is likely endogenous. As discussed in the introduction, the presence of an IB who has a board seat in a firm is not a random occurrence. Individuals decide which firms to invest in and whether to try to obtain a board seat. This endogeneity can affect our analysis through either omitted variables or selection bias. We employ five different approaches to mitigate concerns about the endogeneity of IDB presence in a firm. First, we use the two-stage least squares (2SLS) estimation to account for potential endogeneity caused by unobservable omitted variables. Although the potential endogenous

[10] We do not have board committee membership data for 94 firm-years in our sample because their annual shareholder meeting took place in 1997 and RM Directors database reports this data starting in 1998.

variable is binary, we use the linear probability model (LPM) in the first stage.[11] Using LPM for the first-stage regression generates consistent second-stage estimates even with a binary endogenous variable (Angrist and Krueger 2001).

We develop instruments for IDB based on the fact that there are significant variations in IDB density by geographic location and industry. Becker, Cronqvist and Fahlenbrach (2008) find that wealthy individuals tend to cluster more in certain geographic areas and invest in public companies located nearby, either due to better monitoring ability or lower asymmetric information.[12] Similarly, wealthy investors may tend to congregate in certain industries, either because they have specific industry-expertise or have skills that are more useful to certain industries. These factors can give rise to variations in blockholder and IDB presence by state and industry. While state- and industry-level densities of IDBs can explain IDB presence in a firm, these factors would not explain our main dependent variables (the level and composition of CEO pay, CEO turnover and firm valuation) except via their effects on IDB presence in a firm.

We compute the state-level density of IDBs (denoted as IDB state-density) as the average value of the IDB dummy for all the public companies in our sample headquartered in a state in a given fiscal year. For instance, an IDB density of 0.05 in California for fiscal year 2008 means that 5% of the public companies headquartered there in that year had an IB on their boards. We define the industry density of IDBs (denoted as IDB industry-density) for each of the 48 Fama and French (1997) industries similarly. Appendix 2 provides a sense for the variations in IDB

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[11] Using a non-linear model, such as the probit model, for the first stage would be a forbidden regression. An alternative to using LPM in the first stage is to use the predicted value of the potential endogenous variable using a non-linear model and use it as the instrument. The non-linear fitted value as an instrument (generated IV) provides a 'back-door' identification. But we avoid using this approach because IDB and our main dependent variables in sections 6 through 8 share many determinants in common, causing the generated IV to be highly correlated with the main dependent variables.

[12] The tendency of wealthy individuals to invest locally is consistent with the literature on local bias in investing (see, e.g., Lerner (1995), Coval and Moskowitz (1999), and Bailey, Kumar and Ng (2008)).

densities across states and industries.[13] We use these variations to develop instrumental variables for identification. Similar variables have been employed in other contexts by Villalonga (2004) and John and Kadyrzhanova (2009).[14]

We use lagged IDB state-density and lagged IDB industry-density as instruments for both IDB and IDB_CC. By design, these instrumental variables (IVs) are highly correlated with IDB and IDB_CC. Using lagged IDB-state and lagged IDB-industry densities as instruments helps us to remove any look-ahead bias in creating IVs and further reduces the possibility of the IVs being related to our main dependent variables. We calculate these instruments for fiscal years 1997-2006. The use of lagged densities forces us to exclude the 1997 data from our main analysis.

While the 2SLS estimator is not unbiased, it is consistent; and having a large sample makes the 2SLS results more reliable. We test for exogeneity using the Durbin-Wu-Hausman test, which examines the statistical difference between OLS and 2SLS coefficient estimates of the suspect endogenous variable. With two different IVs, we are also able to conduct an over-identification test. We use Wooldridge's (1995) over-identification test since we compute robust standard errors clustered at either the firm-level or the CEO-firm-level.[15] In addition, Bound, Jeager and Baker (1995) caution about weak instruments and suggest that one should not rely

[13] Panel A of Appendix 2 shows the IDB industry-density over our entire sample period, 1997-2006. Industries are ranked in descending order based on the column value of (B*(D-F)). Column (D-F) shows the difference in the relative frequency of IDB firm-years in a given industry compared to non-IDB firm-years in the industry. Column (B*(D-F)) shows weighted value of (D-F) based on the weight of that industry in our sample. Columns (D-F), (B*(D-F)) and (C/A) show the variation in IDB-density across industries in three different ways. The IDB industry-density IV is computed as in the last column, (C/A), except that it is computed on a yearly basis. Panel B shows the IDB state-density in a similar format.

[14] Villalonga uses the fraction of diversified firms in an industry to explain a firm's propensity to diversify, in matching models such as propensity score matching. John and Kadyrzhanova use the incidence of dictatorship firms (i.e., firms with fewer shareholder rights) near a firm's headquarters in a probit model of a firm's likelihood of being a dictatorship firm.

[15] We compute robust standard errors clustered at the CEO-firm level because each CEO brings in distinct skills, strategy, and corporate culture to a firm. Bertrand and Schoar (2003) find that there are systematic differences in corporate decision-making across CEOs, which are related to differences in firm performance.

solely on the over-identifying restriction. Staiger and Stock (1997) suggest that the F-statistic of the IVs used in the first-stage regression should be reasonably high (more than 10). In all of our 2SLS estimations, this F-statistic is higher than 10.

Some of our main dependent variables in sections 6 through 8 below take on a limited range of values. Given that our main explanatory variable, IDB, is potentially endogenous, we use IV-probit or IV-Tobit methodology in those regressions. When the dependent variable is censored (as in the case of the proportion of option or equity-based compensation), we use the IV-Tobit maximum likelihood estimator (MLE). In this framework, the main set of equations has a typical Tobit structure (i.e., the structural equation and the selection equation). In addition, we regress a linear equation for the endogenous variable on all exogenous variables from the structural equation and the IVs. We also conduct a Wald test for the exogeneity of the instrumented variable. When the dependent variable is binary (as in the case of CEO turnover regressions), we use the MLE of the probit model with an endogenous explanatory variable, namely IV-probit (see Wooldridge 2002, p. 476)).

Second, the binary nature of the IDB variable also allows us to use treatment effect models. Heckman's (1979) two-stage treatment effect model is appropriate for estimating the average treatment affect and correcting for sample selection bias. In this model, the inverse Mill's ratio (Lambda), computed from the first-stage probit regression, is added as a covariate in the second-stage regression to account for any selection bias. Standard errors of the two-stage treatment effect model are estimated using 1,000 bootstrap replications. Third, we use a MLE treatment effect model to estimate the selection and main equations simultaneously. We use the Wald test for the correlation between the error terms of the two equations to check for endogeneity.

The fourth and fifth methods we use are propensity score matching (PSM) and covariate matching (CM) to reduce the selection bias based on observables and estimate the average treatment effect for the treated (ATT). With the assumption of conditional independence, an appropriate control group of untreated observations can be the proxy for unobserved potential outcomes without any resulting bias. To achieve this end, Rosenbaum and Rubin (1983) suggest using a balancing score computed as a function of observable covariates, X, such that the conditional distribution of X given the balancing score is independent. PSM, the probability of participating in the treatment given observable variables X, is one such balancing score. Similarly, Abadie and Imbens (2006a, 2007) develop a simple and a bias-corrected CM estimator, where assignment to the treatment is exogenous, conditional on a set of control variables.

Potential IDBs likely decide to invest in the firm and seek board seats based on some observable firm and CEO characteristics. This makes both CM and PSM approaches appropriate methods for estimating ATT and controlling for selection bias. ATT is estimated from the difference between the actual mean of the treated and its counterfactual mean. We estimate the counterfactual mean using either CM or PSM, and use the following methods: 1) Simple matching, 2) Bias-corrected matching, 3) Radius caliper matching, and 4) Kernel matching. The first two are based on the CM method and the last two are based on the PSM method (see Imbens (2004) and Caliendo and Kopeinig (2008) for discussions of these methods).

Çolak and Whited (2006) provide an excellent exposition of the simple and bias-corrected CM estimators developed in Abadie and Imbens (2006a, 2007). Abadie and Imbens (2006b) argue that because standard bootstrapping is invalid for the standard nearest-neighbor matching estimator with replacement, the simple matching estimator is a better alternative. However, an asymptotic bias may be present in simple matching estimators. This bias can arise if the control and treated groups are insufficiently comparable. This implies that there is an incomplete overlap between the distributions of control variables between the treated and control groups. Bias-corrected matching corrects for this asymptotic bias. For both CM methods, we match the treated observation with a maximum of four nearest neighbors from untreated observations, and match with replacement. We use the procedure suggested by Abadie et al. (2004) to estimate the ATT for both simple matching and bias-corrected matching.

Using a tolerance level on the maximum propensity score distance (caliper), radius caliper matching matches all the observations in the control group within the caliper. This helps avoid the risk of bad matches when the nearest neighbor is not too near, and at the same time, uses as many matches as the caliper allows. We use a caliper of 0.02. Kernel matching, on the other hand, uses weighted averages of all observations in the control group to estimate counterfactual outcomes. The weight is calculated by the propensity score distance between a treatment case and all control cases. We set the bandwidth at 0.06 and use Epanechnikov kernel for matching. For both of these methods, we impose common support restriction and estimate standard errors using 100 bootstrapped replications. Matching is done with replacement. We use Leuven and Sianesi's (2003) procedures to estimate the ATT for both radius caliper and kernel matching.

2.4.3 Dependent variables

We use two different measures of the level of compensation: total compensation and cash compensation. Total compensation is the sum of salary, bonus, the value of stock options and restricted stock granted during the year, long-term incentive payouts, and other miscellaneous compensation. Cash compensation is the sum of salary and bonus. Since both compensation variables are highly skewed, we normalize them by taking the natural log of one plus the variable. We obtain all CEO compensation data from ExecuComp, convert it to constant year 2000 dollars[16] and express it in thousands.

To analyze CEO pay structure, we use four different ratios: salary, cash compensation, option compensation, and equity compensation, each divided by total compensation. Cash compensation equals salary plus bonus. Option compensation is the aggregate Black-Scholes value of stock options granted to the executive during the year. Equity-based compensation is the value of stock options and restricted stock granted during the year.

We use ExecuComp to identify a change in CEO. We record a CEO turnover for a given fiscal year, if the CEO for the year differs from the prior year's CEO. We measure firm valuation using Tobin's q, computed as V/A, where A equals the book value of total assets, and V is an estimate of the market value of total assets computed as A plus the market value of equity minus the book value of equity. We use both unadjusted and industry-adjusted Tobin's q. The latter is measured as firm Tobin's q minus median industry Tobin's q, using Fama and French (1997) 48-industry classification. We reduce the influence of outliers by winsorizing the top and bottom one-half percent of Tobin's q values in the sample.

Appendix 3 provides descriptive statistics of these variables. The CEO's median total compensation in our sample is about $2.7 million in constant 2000 dollars. The median salary, cash, option, and equity compensation ratios are about 0.22, 0.41, 0.30, and 0.42. A CEO turnover occurs in about 12.4% of our firm-years. The median value of our unadjusted (industry-adjusted) Tobin's q measure is 1.47 (0.06). There is substantial variation in all of our dependent variables across the firm-years.

[16] We use the CPI – All Urban Consumer series from the US Department of Labor for inflation-adjustment.

2.4.4 Independent variables

In addition to the binary IDB and IDB_CC variables, the independent variables in our analysis consist of several financial ratios and characteristics of boards, CEOs, and firms. We also include year dummies as well as Fama-French 12 industry dummies.[17] We winsorize the top and bottom one-half percent of the observations of all financial ratios, CEO and institutional ownership variables, firm size variables, sales growth, Tobin's q, market adjusted stock return, and standard deviation of stock returns. Appendix 3 provides definitions and descriptive statistics of these variables.

The median board size in our sample is 9 members. The median proportion of independent directors is 0.7. Following Coles, Daniel and Naveen (2007), several of our tests also control for CEO co-option, defined as the proportion of directors who joined a board after the current CEO's appointment to the CEO position. This is a measure of a CEO's influence on the board, since the CEO may have been influential in the appointment of some of these directors to the board. The median CEO co-option in our sample is 0.33. The CEO chairs the board in about 64% of the firms in our sample, is the only insider on the board in 49% of the firms, and serves on the board's nomination or corporate governance committee in about 30% of the firms. The last four variables measure aspects of CEO power.

The median age of the CEOs in our sample is 55 years and they have held the CEO position for a median of 5 years. The median stock ownership of the CEO is 0.31%. The median age of the firms in our sample is 22 years. The typical firm in the sample is fairly large, with a

[17] We obtain the Fama-French 12 industry classification from Ken French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. Also, finer classifications, such as Fama and French (1997) 48 industries, result in partitions with many industries having only one or two firms in our sample. Since many of the board characteristics variables (e.g., classified board, CEO is chairman) are highly persistent over time, using industry dummies based on finer industry classifications would be tantamount to including firm-specific dummies.

median market cap of about $1.6 billion in constant year 2000 dollars and a median institutional ownership of 64%.

2.5 Determinants of IDB presence

We begin by examining whether the presence of an IB on a firm's board is systematically related to firm and governance characteristics that are related to an investor's decision to acquire a large equity stake in a firm and to seek and be able to obtain a board seat. If an IDB's presence in a firm is merely a random occurrence, we should not expect it to be related to such characteristics. This analysis serves a dual purpose. First, it contributes to the recent literature on firms' use of outside directors with different professional backgrounds such as corporate CEOs and directors with experience in banking, finance, politics, government and the law (see, e.g., Agrawal and Knoeber (2001), Kroszner and Strahan (2001), Güner, Malmendier and Tate (2008), Fahlenbrach, Low and Stulz (2009), and Dittmann, Maug and Schneider (2010)). We extend this literature by analyzing firms' use of another type of outside director, namely an independent blockholder. Second, this analysis helps us to identify the characteristics of firms with IDBs that can be used to deal with possible endogenous relations between IDB presence and the other variables of interest in sections 2.6 through 2.8 below.

First, we expect IDB presence to be related to measures of CEO power. There are two opposing forces at work here, so we should observe their net effect. Since IBs have strong incentives and the ability to monitor the CEO, powerful CEOs are likely to resist IBs' appointment to the board, making IDB presence less likely in firms with powerful CEOs. But firms with strong (and perhaps entrenched) CEOs are precisely the ones that stand to benefit more from IDB presence, increasing an investor's incentive to acquire a large block and seek a board seat. We use several measures aimed at capturing different aspects of CEO power, such as whether the CEO chairs the board, whether he is the only insider on the board (see Adams, Almeida and Ferreira (2005)), his tenure on the board or as CEO, whether he picks directors (by serving on the board's nominating or corporate governance committee; see Shivdasani and Yermack (1999)), and the proportion of directors possibly co-opted by him (i.e., who joined the board after the CEO; see Coles, Daniel and Naveen (2007)).

Second, if IB presence on the board increases firm value, CEOs with greater stock ownership have an incentive to support them in their bids for board seats. This implies a positive relation between IDB presence and CEO stock ownership. Third, since firms with classified or staggered boards have fewer board seats open in a given year, it is harder for anyone, including IBs, to get board seats in such firms. This implies a negative relation between IDB presence and a dummy variable for classified boards. Fourth, it is easier for a large shareholder to get a board seat in a firm where shareholders have more rights. We measure the number of anti-shareholder rights governing a company by Gompers, Ishii and Metrick's (2003) Governance (G) index or Bebchuk, Cohen and Farrell's (2009) Entrenchment (E) index.[18] Since both indices include the classified board provision, which we use as a separate explanatory variable, we exclude this provision from the indices and denote the resulting indices 'Net G-index' or 'Net E-index.' We expect both indices to be negatively related to IDB presence in a firm. Fifth, IDB presence is more likely in firms with bigger and more independent boards. It should be easier for a blockholder to get a seat on a bigger board simply because it has more seats, and on a more independent board because independent directors are more likely to support an independent blockholder's bid for a board seat than insiders or affiliated directors. Sixth, since institutional investors act as a substitute for blockholders as a monitoring force, we expect IDB presence to be negatively related to the percentage of institutional ownership in a firm.

[18] We follow these studies and replace missing values of G- or E-index in a given year by its value in the prior year.

Seventh, a blockholder has a stronger reason for seeking and getting a board seat in a poorly performing firm. So we expect IDB presence to be negatively related to measures of firm performance such as the prior year's industry-adjusted operating performance to sales (OPS), market-adjusted stock return, or Tobin's q. Eighth, since a block holding of a given percentage of the outstanding equity is obviously more expensive in a larger firm, in the face of risk-aversion and wealth constraints, we expect the presence of individual blockholders and thus IDBs to be negatively related to measures of firm size. Ninth, blockholders may be more attracted to firms with better growth opportunities because such firms have more room for managerial discretion. So IDB monitoring may be more productive in such firms. We control for growth opportunities via lagged R&D to sales, and sales growth rate. Tenth, Jensen (1986) argues that managers like to pay out low dividends and hoard cash to extract private benefits from firms. Since such firms face greater agency problems, we expect IDB presence to be more useful in such firms. Accordingly, we control for the prior year's dividend yield and cash holdings (i.e., the ratio of cash and short-term investments to total assets). We expect IDB presence to be negatively related to dividend yield and positively related to cash holdings. Eleventh, we expect IDB presence in a firm to be positively related to the proportion of firms among its peers (e.g., firms in the same industry or location) that have IDBs. We measure peer-density of IDBs as IDB industry-density, the average value of the IDB dummy for a firm's Fama and French (1997) 48-industry group, and IDB state-density, the average value of the IDB dummy for all public companies headquartered in the state of a firm's headquarters. Finally, we control for year dummies and Fama-French 12 industry-sector dummies to allow for the possibility that IDB presence can vary over time and across broad sectors of the economy. Accordingly, we estimate the following equation:

IDB = f (CEO power, CEO stock ownership %, classified board dummy, Net G-index or Net E-index, board size, board independence, institutional ownership %, firm performance, firm size, growth opportunities, dividend yield, cash holdings %, IDB industry-density, IDB state-density, year dummies, Fama-French 12 industry-sector dummies) (1)

We expect the potential determinants of IDB_CC to be similar to the determinants of IDB, as approximately two-thirds of IDB firm-years are also IDB_CC firm-years.

2.5.1 Univariate statistics and correlations

Table 2.3 presents univariate statistics of our main variables for firm-years with and without IDBs, and the Pearson product-moment correlations and Spearman rank correlations of these variables with IDB. Panel A deals with the dependent variables we analyze in sections 6 through 8 below; these are discussed in the relevant sections. Panel B deals with the independent variables used in this and the following sections.

Panel B shows that firms with IDBs are smaller and younger than firms without IDBs. For example, the median total assets of IDB (non-IDB) firms is about $1.1 (1.8) billion. The CEO of an IDB firm owns more stock, serves on the nominating committee more often, but chairs the board less often, and is less frequently the only insider on the board than the CEO of a non-IDB firm. The boards of IDB firms are slightly larger, less independent, less likely to be classified, and have lower proportions of outside directors who are CEOs than boards of non-IDB firms. IDB firms have fewer anti-shareholder provisions (as measured by G- or E-index) than non-IDB firms. Compared to non-IDB firms, IDB firms tend to have higher growth rates and stock volatility; lower cash holdings, R&D spending and dividend yield; lower institutional ownership; and worse performance. State and industry peers of IDB firms are more often IDB firms themselves than peers of non-IDB firms. The signs and statistical significance of the correlations of these variables with IDB are generally consistent with the inferences based on

Table 2.3: Univariate tests and correlations

Panel A (B) shows univariate comparisons of mean and median values of dependent (independent) variables, followed by t-statistics for differences in means and z-statistics of the Wilcoxon test for differences in distributions, between non-IDB and IDB firms. Statistical significance at the 1%, 5%, and 10% levels in two-tailed tests is indicated by ***, **, and *, respectively. The last four columns report the Pearson product-moment correlation and Spearman rank correlation, and their p-values in two-tailed tests, between IDB and each variable. The sample consists of non-dual class S&P 1500 firms during the period 1998-2006 with relevant non-missing data. Option compensation is the Black-Scholes value of stock options granted to the executive during the year. Equity based compensation is option compensation plus the value of restricted stock granted during the year. All CEO compensation data are obtained from ExecuComp, converted to constant 2000 dollars and expressed in thousands. CEO turnover is a dummy variable that equals 1, if the CEO in year *t* differs from the CEO in year *t*-1; 0 otherwise. Net G-index is G-index minus classified board. IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. All other variables are defined in Appendix 3, which also indicates the variables winsorized at the top and bottom 0.5% of the sample.

	Non-IDB firm-years				IDB firm-years				t-test	z-value	Pearson's correlation		Spearman's correlation	
	N	Mean	S.D.	Median	N	Mean	S.D.	Median			ρ	p-value	ρ	p-value
Panel A: Dependent variables														
Total compensation (in $000)	9,757	5,893	23,977	2,884	1,790	3,899	11,144	1,808	3.451 ***	15.151 ***	-0.032	0.001	-0.141	0.000
Cash compensation (in $000)	9,757	1,492	1,774	1,009	1,790	1,083	962	803	9.485 ***	11.507 ***	-0.088	0.000	-0.107	0.000
Option compensation (in $000)	9,757	2,675	10,778	689	1,790	1,880	9,996	349	2.900 **	8.738 ***	-0.027	0.004	-0.081	0.000
Equity based compensation (in $000)	9,757	3,311	13,229	989	1,790	2,322	10,389	562	2.997 ***	8.950 ***	-0.028	0.003	-0.083	0.000
Salary compensation ratio	9,749	0.282	0.229	0.213	1,789	0.353	0.251	0.293	-11.843 ***	-12.732 ***	0.110	0.000	0.119	0.000
Cash compensation ratio	9,749	0.455	0.277	0.401	1,789	0.530	0.288	0.498	-10.376 ***	-10.411 ***	0.096	0.000	0.097	0.000
Option compensation ratio	9,749	0.330	0.298	0.306	1,789	0.295	0.289	0.253	4.700 ***	4.582 ***	-0.044	0.000	-0.043	0.000
Equity compensation ratio	9,749	0.401	0.306	0.431	1,789	0.362	0.302	0.365	4.978 ***	4.978 ***	-0.046	0.000	-0.046	0.000
CEO turnover (1/0)	9,754	0.121			1,790	0.122			-0.143		0.001	0.886		
Tobin's q_t	9,743	1.961	1.435	1.473	1,790	1.951	1.490	1.429	0.264	2.449 **	-0.003	0.792	-0.023	0.014
Industry adjusted Tobin's q_t	9,743	0.421	1.294	0.056	1,790	0.486	1.343	0.089	-1.940 *	-3.466 ***	0.018	0.053	0.032	0.000
Panel B: Independent variables														
Firm age	9,757	29.037	20.262	23	1,790	24.753	17.251	19	8.404 ***	7.422 ***	-0.078	0.000	-0.069	0.000
Market cap$_{t-1}$ (in $000,000)	9,743	7,858	21,318	1,750	1,790	4,089	11,882	1,034	7.274 ***	13.642 ***	-0.068	0.000	-0.127	0.000
Total assets$_{t-1}$ (in $000,000)	9,755	12,205	43,812	1,779	1,790	6,266	24,054	1,087	5.583 ***	11.009 ***	-0.052	0.000	-0.103	0.000
Sales$_{t-1}$ (in $000,000)	9,754	4,833	9,923	1,401	1,788	2,661	6,318	724	8.931 ***	15.907 ***	-0.083	0.000	-0.148	0.000
CEO stock ownership %	9,377	2.157	5.665	0.283	1,711	2.662	5.961	0.551	-3.362 ***	-10.615 ***	0.032	0.001	0.101	0.000
Tenure as CEO	9,396	7.506	7.058	5	1,673	7.741	7.230	6	-1.253	-0.719	0.012	0.210	0.007	0.472
CEO's board tenure	9,732	9.756	8.684	7	1,786	10.274	8.649	8	-2.317 **	-2.598 ***	0.022	0.021	0.024	0.009
Max (CEO's board tenure, tenure as CEO)	9,755	10.337	8.632	8	1,788	10.796	8.539	9	-2.072 **	-2.476 **	0.019	0.038	0.023	0.013

Table 2.3 (cont.)

	Non-IDB firm-years				IDB firm-years				t-test	z-value	Pearson's correlation		Spearman's correlation	
	N	Mean	S.D.	Median	N	Mean	S.D.	Median			ρ	p-value	ρ	p-value
Panel B (cont.): Independent variables														
Board size	9,757	9.412	2.804	9	1,790	9.725	3.156	9	-4.253 ***	-2.870 ***	0.040	0.000	0.027	0.004
Fraction of independent directors	9,757	0.674	0.170	0.700	1,790	0.656	0.162	0.670	4.059 ***	5.269 ***	-0.038	0.000	-0.049	0.000
CEO co-option	9,643	0.387	0.322	0.333	1,763	0.387	0.333	0.333	-0.005	0.484	0.000	0.996	-0.005	0.628
Outside CEO-directors	9,757	0.147	0.136	0.125	1,790	0.131	0.124	0.111	4.779 ***	4.222 ***	-0.044	0.000	-0.039	0.000
CEO is chairman (1/0)	9,757	0.649			1,790	0.566			6.696 ***		-0.062	0.000		
CEO is the only insider (1/0)	9,532	0.492			1,735	0.451			3.146 ***		-0.030	0.002		
CEO on nominating committee (1/0)	9,680	0.279			1,773	0.395			-9.837 ***		0.092	0.000		
Classified board (1/0)	9,189	0.624			1,586	0.592			2.437 **		-0.024	0.015		
G-index	9,189	9.464	2.589	9	1,586	8.973	2.748	9	6.910 ***	6.982 ***	-0.066	0.000	-0.067	0.000
Net G-index	9,189	8.840	2.392	9	1,586	8.381	2.518	8	6.998 ***	6.923 ***	-0.067	0.000	-0.067	0.000
E-index	9,189	2.347	1.122	2	1,586	2.175	1.322	2	4.982 ***	5.159 ***	-0.048	0.000	-0.050	0.000
Net E-index	9,189	1.722	1.023	2	1,586	1.583	1.083	2	4.964 ***	5.017 ***	-0.067	0.000	-0.067	0.000
Sales growth %	9,749	12.159	15.932	9.489	1,789	15.553	19.761	11.220	-7.956 ***	-5.962 ***	0.074	0.000	0.056	0.000
Market adjusted stock return$_{t-1}$ %	9,619	-0.014	0.177	-0.024	1,766	-0.015	0.176	-0.022	0.097	-0.357	-0.001	0.921	0.003	0.721
Standard deviation of stock retun$_{t-1}$ %	9,619	2.761	1.339	2.437	1,766	2.814	1.321	2.514	-1.524	-2.200 **	0.014	0.128	0.021	0.028
Total institutional ownership$_{t-1}$	9,757	59.820	26.543	65.185	1,790	53.610	25.220	57.264	9.168 ***	11.361 ***	-0.085	0.000	-0.106	0.000
Tobin's q_{t-1}	9,740	2.070	1.655	1.505	1,790	2.040	1.716	1.453	0.697	2.869 ***	-0.007	0.486	-0.027	0.004
Industry adjusted ROA$_{t-1}$	9,755	0.047	0.113	0.028	1,790	0.035	0.110	0.022	3.944 ***	2.707 ***	-0.037	0.000	-0.025	0.007
Industry adjusted OPS$_{t-1}$	9,644	0.084	0.602	0.052	1,750	-0.275	9.031	0.049	3.856 ***	2.101 **	-0.036	0.000	-0.020	0.036
Cash holding$_{t-1}$	9,754	0.135	0.168	0.059	1,790	0.114	0.161	0.043	4.807 ***	6.694 ***	-0.045	0.000	-0.062	0.000
Cash flow$_{t-1}$	9,754	0.109	0.172	0.105	1,788	0.105	0.190	0.108	0.941	-0.023	-0.009	0.347	0.000	0.982
R&D to sales$_{t-1}$	9,754	0.043	0.110	0	1,788	0.036	0.107	0	2.815 ***	4.721 ***	-0.026	0.005	-0.045	0.000
Advertising expenses to sales$_{t-1}$	9,754	0.009	0.021	0	1,788	0.010	0.026	0	-1.830 *	1.215	0.017	0.067	-0.011	0.225
Capital expenditure to total assets$_{t-1}$	9,754	0.075	0.117	0.041	1,788	0.078	0.142	0.038	-1.024	4.138 ***	0.010	0.306	-0.039	0.000
Dividend yield %	9,743	1.260	1.692	0.520	1.790	1.138	1.540	0.525	2.849 ***	2.163 **	-0.027	0.004	-0.020	0.031
IDB state-density$_{t-1}$	9,756	0.151	0.072	0.146	1,786	0.193	0.123	0.171	-19.797 ***	-16.311 ***	0.181	0.000	0.152	0.000
IDB industry-density$_{t-1}$	9,755	0.151	0.085	0.143	1,790	0.199	0.100	0.188	-21.245 ***	-20.197 ***	0.194	0.000	0.188	0.000

univariate comparisons. These results suggest that the presence of IDBs is not randomly distributed across firm-years in our sample.

Appendix 4 shows the Pearson (bottom left corner) and Spearman (top right corner, italicized) correlations among select variables measuring firm age, firm size, CEO power, board characteristics and shareholder rights. To save space, we do not include all the variables in this table. Correlations with large absolute values (0.25 or higher) are indicated in bold face. The various measures of firm size (natural logarithms of market cap, total assets and sales) are correlated positively with each other and with firm age and board size, and negatively with the log of CEO stock ownership. The latter is positively correlated with CEO tenure (i.e., higher of tenure as CEO and tenure on board). Older, established firms tend to have larger, more independent boards, but more restrictions on shareholder rights. CEO stock ownership is correlated positively with his tenure and presence on the nominating committee, and negatively with board independence. CEO co-option is positively (and mechanically) correlated with CEO tenure.

2.5.2 Regressions

To examine whether these relations hold in a multiple regression framework, we estimate regressions of equation (1) above, where the dependent variable is IDB or IDB_CC. Since the dependent variable is binary (0, 1), we use the probit model. Columns (2) through (6) in Table 2.4 show estimated marginal effects (labeled 'dy/dx') and p-values of probit models of IDB. For comparison, column (1) shows estimated coefficients and p-values of a linear probability model of IDB. Column (7) shows estimates of a probit model of IDB_CC.

Table 2.4: Determinants of IDB

The table shows estimates of the linear probability model and probit regressions of IDB (Models 1-6) and probit regression of IDB_CC (Model 7). The sample consists of non-dual class S&P 1500 firms during the period 1998-2006 with non-missing data. IDB is a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. IDB_CC is a binary variable that equals one if there is at least one IDB who sits on the board's compensation committee in a given firm-year (if the firm has no compensation committee, the entire board serves as the compensation committee); zero otherwise. IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. All other variables are defined in Appendix 3. To reduce the influence of outliers, some variables, indicated in Appendix 3, are winsorized at the top and bottom 0.5% of the sample. The regressions include year dummies and Fama-French 12 industry dummies. P-values of the regression coefficients and marginal effects are computed using robust standard errors clustered at the CEO-firm level.

	IDB												IDB_CC	
	OLS (1)		Probit (2)		Probit (3)		Probit (4)		Probit (5)		Probit (6)		Probit (7)	
	Coeff.	p-value	*dy/dx*	p-value	*dy/dx*	p-value	*dy/dx*	p-value	*dy/dx*	p-value	*dy/dx*	p-value	*dy/dx*	p-value
Log CEO stock ownership	0.0080	0.079	0.0065	0.121	0.0048	0.188	0.0058	0.108	0.0047	0.214			0.0045	0.129
Max (CEO's board tenure, tenure as CEO)	-0.0008	0.376	-0.0006	0.440									-0.0001	0.799
CEO is chairman (1/0)	-0.0261	0.042	-0.0221	0.067	-0.0234	0.049	-0.0263	0.027	-0.0262	0.034			-0.0160	0.077
CEO on nominating committee (1/0)	0.0221	0.124	0.0169	0.195	0.0165	0.205	0.0189	0.149	0.0190	0.162			0.0253	0.011
Ratio of other firms' CEO on the board	-0.0952	0.016	-0.0897	0.024	-0.0860	0.031	-0.0848	0.033	-0.0780	0.060			-0.0633	0.042
Fraction of independent directors	0.1235	0.001	0.0950	0.007	0.0987	0.005	0.0882	0.010	0.0969	0.007			-0.0005	0.986
Board size	0.0153	0.000	0.0136	0.000	0.0135	0.000	0.0130	0.000	0.0154	0.000			0.0032	0.104
Classified board (1/0)	-0.0219	0.099	-0.0193	0.134	-0.0198	0.123	-0.0278	0.028	-0.0224	0.094			-0.0150	0.116
Net E-index	-0.0158	0.022	-0.0141	0.030	-0.0140	0.031			-0.0144	0.033			-0.0126	0.008
Firm age	0.0003	0.380	0.0002	0.578									0.0004	0.162
Log $sales_{t-1}$	-0.0491	0.000	-0.0476	0.000	-0.0468	0.000	-0.0453	0.000	-0.0526	0.000			-0.0244	0.000
Cash $holding_{t-1}$	-0.1449	0.002	-0.1529	0.002	-0.1524	0.001	-0.1385	0.003	-0.1938	0.000			-0.0480	0.211
Industry-adjusted OPS_{t-1}	-0.0030	0.000	-0.0056	0.063	-0.0056	0.066	-0.0055	0.066	-0.0092	0.098			0.0004	0.282
Dividend $yield_{t-1}$ %	-0.0089	0.035	-0.0094	0.030	-0.0088	0.046	-0.0089	0.043	-0.0093	0.042			-0.0053	0.125
R&D to $sales_{t-1}$	-0.0901	0.078	-0.1193	0.041	-0.1152	0.046	-0.1117	0.054	-0.1636	0.009			-0.0665	0.131
Tobin's q_{t-1}	-0.0004	0.929	0.0007	0.866									0.0032	0.300
Sales growth	0.0014	0.000	0.0013	0.000	0.0012	0.000	0.0013	0.000	0.0013	0.000			0.0006	0.029
Market adjusted stock $return_{t-1}$ %	-0.0060	0.758	-0.0097	0.613									-0.0129	0.368
Standard deviation of stock $return_{t-1}$ %	-0.0127	0.022	-0.0115	0.037	-0.0117	0.037	-0.0123	0.028	-0.0135	0.020			-0.0134	0.001
Total institutional $ownership_{t-1}$ %	-0.0008	0.000	-0.0007	0.002	-0.0007	0.001	-0.0007	0.001	-0.0008	0.000			-0.0003	0.030
IDB state-density	0.6535	0.000	0.5366	0.000	0.5383	0.000	0.5367	0.000			0.6194	0.000	0.2108	0.000
IDB industry-density	0.5609	0.000	0.4418	0.000	0.4452	0.000	0.4483	0.000			0.5503	0.000	0.2362	0.000
N	10,057		10,057		10,063		10,063		10,066		11,540		10,057	
Adjusted or pseudo R-squared	0.1117		0.1347		0.1343		0.1324		0.0926		0.0707		0.1038	

The table yields several insights about the incidence of an IDB in a firm. First, IDBs are more likely in firms where CEOs are less powerful (i.e., where the CEO does not chair the board, and boards with smaller proportions of other firms' CEOs, who may be more likely to support the CEO); where boards are bigger, more independent and non-classified; and where shareholders have more rights. Second, IDBs are more likely in smaller firms, where blocks are less expensive, and firms with worse operating performance, where there is more need for IDB monitoring. Third, IDBs are more likely in high (sales) growth firms, where there is more room for managerial discretion, suggesting that IDB presence is more useful. Fourth, IDB presence is more likely in firms that hold less cash, spend less on R&D, pay lower dividends, and have lower stock volatility. Fifth, IDBs are more likely in firms with lower institutional ownership, consistent with the idea that institutional investors and blockholders act as substitute monitoring mechanisms. Finally, IDB presence is more likely in firms whose industry and local peers have greater IDB presence.

The magnitudes of several of the effects are non-trivial. For example, based on estimates of model (2), an increase in firm size (log of sales) from the first to the third quartile of the sample results in a decrease of about 0.097 (= 2.03 x .0476) in the probability of IDB presence. Compared to the unconditional probability of 0.155, this represents a decrease of about 63%. Similarly, an increase in board size equal to the inter-quartile range results in an increase of about .054 (= 4 x .0136) in the probability of IDB presence, or about 35% of the unconditional probability. Firms with CEO chairs are about .022 (about 14% of the unconditional probability) less likely to have an IDB.

2.6 IDB presence and CEO compensation

This section examines the relation between IDB presence and the level (in section 2.6.1) and composition (in section 2.6.2) of CEO pay. Panel A of Table 2.3 shows that both total and cash pay of the CEO is substantially lower in firms with an IDB than in firms without an IDB. The CEO's median total compensation in IDB (non-IDB) firms is $1.8 ($2.9) million; her cash compensation is $0.8 ($1) million. Relative to their counterparts in non-IDB firms, CEOs of IDB firms receive more of their pay in salary or cash than in options or equity-based components. For example, the median proportion of their cash pay is about 0.5 (0.4) in IDB (non-IDB) firms, while the proportion of equity-based pay is about 0.36 (0.43). All of these differences are statistically significant. Correlations of the level or composition of CEO pay with IDB tell a similar story. The lower level of CEO pay in firms with IDBs is consistent with the IDB monitoring hypothesis that IDB monitoring curbs excessive levels of CEO pay. The lower proportion of equity-based pay in firms with IDBs is consistent with the IDB monitoring-substitutes hypothesis that IDB monitoring is a substitute for CEO equity incentives. But this evidence is preliminary because it does not control for other variables and does not account for the endogeneity of IDB presence in a firm, a task that we turn to next.

2.6.1 CEO compensation level

In this section, we estimate regressions of CEOs' total and cash compensation. As discussed in section 2.4.3 above, since both variables are highly skewed, we normalize them by taking the natural logarithm of one plus the variable. The main explanatory variable of interest is IDB or IDB_CC. The IDB monitoring hypothesis predicts that the coefficient of IDB or IDB_CC is negative. The CEO power hypothesis predicts that this coefficient equals zero.

The regressions control for other determinants of the level of CEO pay. Prior studies find that these determinants include measures of CEO power, and CEO, board, governance and other firm characteristics. An increase in CEO power over the board increases the CEO's ability to negotiate a bigger pay package. For instance, CEO pay is higher when the CEO chairs the board (see, e.g., Cyert, Kang and Kumar (2002), and Core, Holthausen and Larcker (1999)), has more influence over director selection (see, e.g., Core, Holthausen and Larker (1999), Coles, Daniel and Naveen (2007)), has longer tenure (see, e.g., Bebchuk, Grinstein and Peyer (2009)), and when the board has a higher fraction of outside CEOs (Faleye (2008)). We control for CEO power and other CEO characteristics via the following variables: CEO age, log of CEO stock ownership, max (CEO's board tenure, tenure as CEO), CEO is chairman, CEO co-option, fraction of outside CEO-directors, CEO is the only insider, and CEO on nominating committee.

A firm's board and governance characteristics also influence the level of CEO pay. Prior studies find that CEO compensation is positively related to board size and the proportion of outside directors on the board (see, e.g., Core, Holthausen and Larker (1999), and Cyert et al. (2002)) We control for both board size and the proportion of outside directors. Hartzell and Starks (2003) find that CEO pay is negatively related to the concentration of institutional ownership. We control for institutional ownership. Agrawal and Knoeber's (1998) findings suggest that CEO pay is negatively related to the level of takeover protection in a firm. We control for Gompers, Ishii and Metrick's (2003) G-index as a measure of the level of takeover protection in a firm.

The level of CEO compensation is positively related to firm size, performance, growth opportunities and complexity (see, e.g., Murphy (1999), Smith and Watts (1992), and Core, Holthausen and Larker (1999)). We control for firm size via log of lagged total assets; performance via lagged market-adjusted stock return, and lagged industry-adjusted ROA; growth opportunities via lagged Tobin's q, lagged R&D to sales, and sales growth rate; and firm complexity via lagged standard deviation of stock returns. The regressions include year dummies

Table 2.5: CEO's total and cash compensation level

Panel A shows estimates of OLS, 2SLS instrumental variable, Heckman 2-stage treatment effect, and MLE treatment effect regressions of log total compensation or log cash compensation. The sample consists of non-dual class S&P 1500 firms during the period 1998-2006 with relevant non-missing data. The covariates in the OLS regression are: IDB or IDB_CC, CEO age, Log CEO stock ownership, Max (CEO's board tenure, tenure as CEO), CEO is chairman, CEO co-option, Outside CEO-directors, CEO is the only insider, CEO on nominating committee, Fraction of independent directors, Board size, G-index, Total assets$_{t-1}$, Industry-adjusted ROA$_{t-1}$, Market adjusted stock return$_{t-1}$, Standard deviation of stock return$_{t-1}$, Tobin's q$_{t-1}$, R&D to sales $_{t-1}$, Sales growth, Total institutional holdings$_t$, year dummies, and Fama-French 12 industry dummies. IDB is a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. IDB_CC is a dummy variable that equals one if there is at least one IDB who sits on the board's compensation committee in a given firm-year (if the firm has no compensation committee, the entire board serves on the compensation committee); zero otherwise. All other variables are defined in Appendix 3. To reduce the influence of outliers, some variables, indicated in Appendix 3, are winsorized at the top and bottom 0.5% of the sample. We use robust standard errors clustered at the CEO-firm level. The second stage of the 2SLS instrumental variable estimation uses the same covariates as the OLS, but instruments IDB (or IDB_CC) by lagged IDB state-density and lagged IDB industry-density. Lagged IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. Lagged IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. The table reports the p-value of Wooldridge's (1995) over-identification test, the p-value of Durbin-Wu-Hausman test for exogeniety, and the F-test for the IVs of the first stage estimation; standard errors are clustered at the CEO-firm level. The second stage of Heckman's 2-stage treatment effect model uses the same covariates as the OLS and the inverse Mill's ratio (Lambda). Lambda is computed in the first stage by regressing IDB (IDB_CC) on the variables in Model #2 (#7) in Table 2.4. Standard errors of the Heckman 2-stage treatment effect model are estimated using 1,000 bootstrap replications. The MLE treatment effect model estimates the main and selection equations simultaneously. The main equation is the same as the OLS and the selection equation is for IDB (IDB_CC) with the variables in Model #2 (#7) in Table 2.4. The table reports the p-value of Wald test for rho (correlation between first and second stage error terms); standard errors are clustered at the CEO-firm level. Panel B reports the average treatment effect for the treated (i.e., ATT) of log total compensation or log cash compensation on IDB (or IDB_CC) using four different methods. We estimate ATTs based on simple matching and bias-corrected matching using Abadie et al.'s (2004) method for covariate matching (CM), and radius caliper matching and kernel matching using Leuven and Sianesi's (2003) method for propensity score matching (PSM). For CM and PSM, we use all variables in Model #2 (#7) as covariates for estimating the ATT of IDB (IDB_CC); we use the same set of variables for bias-correction in CM. We use a maximum of four nearest neighbors for CM. We impose common support and estimate standard errors using 100 bootstrap replications for PSM. We set the caliper at 0.02 for radius caliper matching. We set the bandwidth at 0.06 and use the Epanechnikov kernel for kernel matching.

Table 2.5 (cont.)

Panel A: Regression results

	Log total compensation								Log cash compensation							
	OLS		Instrumental variable 2SLS		Treatment effects 2-Stage		Treatment effects MLE		OLS		Instrumental variable 2SLS		Treatment effects 2-Stage		Treatment effects MLE	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	-0.138	0.017	-0.459	0.006	-0.600	0.000	-0.718	0.087	-0.101	0.061	-0.360	0.046	-0.615	0.000	-1.087	0.000
N	9,881		9,878		9,773		9,773		9,881		9,878		9,773		9,773	
Adjusted R-square / [chi-square p-value]	0.4329		0.4235		[0.000]		[0.000]		0.2808		0.2723		[0.000]		[0.000]	
Over-identification test (p-value)			0.4439								0.4130					
Test for exogeneity (p-value)			0.0379								0.1142					
F-statistic for first-stage IVs			86.60								86.60					
Lambda					0.270	0.000							0.301	0.000		
Wald test for rho (p-value)							0.000								0.000	
IDB_CC (1/0)	-0.155	0.002	-0.870	0.009	-1.078	0.000	-1.238	0.000	-0.087	0.086	-0.712	0.052	-0.937	0.000	-1.256	0.000
N	9,881		9,878		9,773		9,773		9,881		9,878		9,773		9,773	
Adjusted R-square / [chi-square p-value]	0.4325		0.4031		[0.000]		[0.000]		0.2801		0.2489		[0.000]		[0.000]	
Over-identification test (p-value)			0.2601								0.6044					
Test for exogeneity (p-value)			0.0250								0.0619					
F-statistic for first-stage IVs			23.03								23.03					
Lambda					0.491	0.000							0.452	0.000		
Wald test for rho (p-value)							0.000								0.000	

Panel B: Matching results on average treatment effect for the treated (ATT)

	Log total compensation								Log cash compensation							
	Simple matching		Biases adjusted matching		Radius caliper matching		Kernel matching		Simple matching		Biases adjusted matching		Caliper matching		Kernel matching	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	-0.282	0.000	-0.116	0.000	-0.114	0.000	-0.126	0.000	-0.218	0.000	-0.117	0.000	-0.093	0.000	-0.099	0.000
IDB_CC (1/0)	-0.299	0.000	-0.136	0.000	-0.167	0.000	-0.195	0.000	-0.227	0.000	-0.117	0.000	-0.123	0.000	-0.138	0.000

and Fama-French 12 industry dummies. Since both total and cash compensation variables are highly skewed, we use the natural logarithm of one plus compensation as the dependent variable. To save space, we do not tabulate the coefficients of the control variables.

Panel A of Table 2.5 reports marginal or treatment effects of IDB and IDB_CC on both total and cash compensation of the CEO, using different regression-based methodologies. In OLS regressions, both total and cash compensation are negatively related to IDB presence. In firms with IDB, total (cash) compensation is 12.89% [= $e^{-0.138}$ – 1] (9.61% [= $e^{-0.101}$ – 1]) lower than the compensation in non-IDB firms, after controlling for the other determinants of compensation. In untabulated results, total compensation is negatively related to the CEO's stock ownership, tenure, and membership on the nominating committee; positively related to other measures of CEO power, such as CEO is chairman and CEO co-option; and positively related to G-index, institutional ownership, and measures of firm size, performance, growth opportunities and complexity. All of these relations are statistically significant. The results are qualitatively similar in regressions of cash compensation, except that CEO tenure and stock volatility are insignificant.

Next, we use five different methodologies, discussed in section 2.4.2 above, to account for the potential endogeneity of IDB presence. First, we employ 2SLS regressions using IDB state-density and IDB industry-density as IVs, as discussed in section 2.4.2 above. In the total compensation regression, Table 2.5 shows that the test for exogeneity of IDB has a p-value of less than 0.05, indicating that IDB is endogenous; but in the cash compensation regression, the test is insignificant, consistent with IDB being exogenous. The results from over-identification tests and the F-tests for the IVs in the first-stage regressions mitigate the concern about weak IVs. After accounting for endogeneity, IDB presence appears to have a much larger effect on the CEO's total and cash compensation than that seen in OLS regressions. The CEO's abnormal total (cash) compensation is as much as 36.81% [= $e^{-0.459}$ – 1] (30.23% [= $e^{-0.36}$ – 1]) lower in firms with an IDB than in firms without an IDB.

Second, we estimate Heckman's two-stage treatment effects model, where the first-stage probit regression is model (2) in Table 2.4.[19] Panel A of Table 2.5 shows that the inverse Mills ratio (Lambda) is significantly positive in regressions of both total compensation and cash compensation, consistent with endogenous selection of IDBs. Positive coefficient estimates of Lambda imply that factors that induce IDBs to self-select into particular firm-years are related to higher total and cash compensation for CEOs. Treatment effects of IDB imply that IDB presence reduces a CEO's total (cash) compensation by –45.12% [=$e^{-0.6}$ – 1] (–45.94% [=$e^{-0.615}$ – 1]). Third, we jointly estimate the treatment effect model using MLE. Here, the treatment effects of IDB imply that IDB presence reduces a CEO's abnormal total (cash) compensation by as much as -51.23% [= $e^{-0.718}$ – 1] (–66.28% [= $e^{-1.087}$ – 1]).

Finally, we use two covariate matching methods (simple and bias-adjusted) and two propensity score matching methods (radius caliper and kernel) using model (2) of Table 2.4.[20] Panel B of Table 2.5 shows that the ATTs estimated by these four different methods are all negative and statistically significant; they range between -0.282 to -0.114 for the log of total compensation, and -0.218 to -0.093 for the log of cash compensation. This suggests that the presence of IDBs reduces abnormal total (cash) compensation on average by 10.77% [= $e^{-0.114}$ - 1] to 24.57% [= $e^{-0.282}$ - 1] (8.88% to 19.59%).

We next repeat the above analysis by replacing IDB by IDB_CC. Table 2.5 shows that the presence of an IDB on the compensation committee reduces the CEO's abnormal total and cash compensation even more than the presence of an IDB. Strikingly, this effect is consistent

[19] The results are similar when we use model (3) of Table 2.4 as the first-stage probit model.

[20] The results are similar using model (3) of Table 2.4.

across all the methodologies that we use. Tests for exogeneity in 2SLS regressions, the significance of Lambdas in the two-stage treatment effect model, and the Wald tests for rho in the MLE treatment effect model suggest that the IDB_CC variable is endogenous in both total and cash compensation regressions. Overall, the evidence presented here strongly favors the IDB monitoring hypothesis that the presence of an IB on the board or the compensation committee limits excessive CEO pay.

2.6.2 CEO compensation structure

We next examine the relation between IDB presence and the composition of CEO pay. We estimate regressions of four components of CEO pay: the proportions of salary, cash, option and equity-based compensation. The main explanatory variable of interest is IDB or IDB_CC. The IDB monitoring-substitutes hypothesis predicts that the coefficient of IDB or IDB_CC is negative (positive) in the regression of the proportion of option or equity-based (salary or cash) compensation. The IDB monitoring-complements hypothesis has the opposite predictions for the signs of these coefficients. The CEO power hypothesis predicts that this coefficient equals zero.

To do this, we need to control for other determinants of CEO compensation structure. First, as Aggarwal and Samwick (1999) point out, one of the main predictions of principal-agent models of incentive contracting is that riskier firms will tie less of their executives' pay to firm performance (as measured, for example, by stock price). This implies that the proportion of a CEO's option and equity-based (salary and cash) compensation should be negatively (positively) related to the standard deviation of stock returns. We control for lagged standard deviation of stock returns in regressions of compensation structure. Second, Smith and Watts (1992) argue that managers' actions are less observable in firms with higher growth opportunities, so such firms will tie a higher proportion of CEO pay to stock price. This implies that the proportion of option and equity-based (salary and cash) compensation should be positively (negatively) related to measures of a firm's growth opportunities. We control for growth opportunities via lagged Tobin's q, lagged R&D to sales, and sales growth rate. Third, Mehran (1995) finds that the proportion of a CEO's equity-based pay is positively related to the proportion of outside directors on the board and negatively related to the CEO's stock ownership; we control for both of these variables. Fourth, CEOs of larger firms are expected to have higher dollar incentives from equity, but these incentives increase at a decreasing rate with firm size (see Baker and Hall (2004)). Fifth, Hartzell and Starks (2003) find a positive relation between institutional ownership and the use of incentive compensation. Our regressions control for firm size (log of lagged total assets) and institutional ownership. The regressions also include year dummies and Fama-French 12 industry dummies. To save space, we do not tabulate the coefficient estimates of these control variables, but briefly discuss the results.

As discussed in section 2.4.3 above, the dependent variables in these regressions are the ratios of salary, cash (i.e., salary plus bonus) compensation, option compensation, and equity (i.e., the value of stock options and restricted stock granted during the year) compensation, each divided by total compensation. Panel A (B) of Table 2.6 reports the regression and matching results for the salary or cash compensation ratio (option or equity compensation ratio). Part 1 of each panel reports the regression results and part 2 shows the matching results on ATT. All four compensation ratios are non-negative. While less than 1% of the observations equal zero for the salary or cash compensation ratio, about 31% (27%) of the observations equal zero for the option (equity) compensation ratio. In other words, while salary and cash compensation ratios display essentially no data censoring, option and equity compensation ratios exhibit substantial censoring. Therefore, we estimate OLS regressions of salary and cash compensation ratios, and Tobit regressions of option and equity compensation ratios.

In Panel A.1 of Table 2.6, the estimated coefficient of IDB is highly significant and positive in OLS regressions of both salary and cash compensation ratios. The proportion of salary or cash compensation in the CEO pay package is about 3.3% higher in the presence of an IDB in a firm. On the contrary, Panel B.1 shows that the coefficient estimate of IDB is significantly negative in Tobit regressions of option and equity compensation ratios. The proportion of option (equity) compensation in the CEO pay package is about 3.5% (2.6%) lower in the presence of an IDB in a firm. In untabulated results, the proportion of a CEO's option or equity-based pay (salary or cash pay) is negatively (positively) related to the CEO's stock ownership, and positively (negatively) related to board independence, institutional holdings, and measures of firm size, growth opportunities and risk. All of these relations are highly statistically significant.

As in section 2.6.1 above, we next use several methodologies to deal with the potential endogeneity of IDB presence in a firm. First, we use 2SLS instead of OLS, and maximum likelihood Tobit regression with an endogenous variable (IV-Tobit) instead of Tobit regressions. For identification, we use IDB state-density and IDB industry-density as IVs. Using the over-identification test and the F-test for weak IVs, we find both these IVs to be appropriate. Use of these IVs in IV-Tobit models is justified based on exclusion criteria. But the test for exogeneity suggests that IDB presence is exogenous in all the regressions, suggesting that the OLS and Tobit results are unbiased. Given that OLS and Tobit regressions are more efficient, those results appear to be preferable to 2SLS and IV-Tobit, respectively.

We also estimate Heckman's two-stage treatment effects and MLE treatment effects models for salary and cash compensation. As in section 2.6.1 above, we use model (2) of Table 2.3 as the first-stage probit regression for the two-stage model and as the selection equation for the MLE model. The coefficients of IDB continue to be significantly positive, but are much

Table 2.6: CEO pay structure

Panel A.1 shows estimates of OLS, 2SLS instrumental variable, Heckman 2-stage treatment effect, and MLE treatment effect regressions of salary compensation ratio or cash compensation ratio. The sample consists of non-dual class S&P 1500 firms during the period 1998-2006 with relevant non-missing data. The covariates in the OLS regression are: IDB or IDB_CC, Standard deviation of stock return$_{t-1}$, Tobin's q$_{t-1}$, R&D to sales$_{t-1}$, Sales growth rate, Fraction of independent directors, Log CEO stock ownership, Total assets$_{t-1}$, Total institutional holdings$_{t}$, year dummies, and Fama-French 12 industry dummies. IDB is a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. IDB_CC is a dummy variable that equals one if there is at least one IDB who sits on the board's compensation committee in a given firm-year (if the firm has no compensation committee, the entire board serves on the compensation committee); zero otherwise. All other variables are defined in Appendix 3. To reduce the influence of outliers, some variables, indicated in Appendix 3, are winsorized at the top and bottom 0.5% of the sample. We use robust standard errors clustered at the CEO-firm level. The second stage of the 2SLS instrumental variable estimation uses the same covariates as the OLS, but instruments IDB (or IDB_CC) by lagged IDB state-density and lagged IDB industry-density. Lagged IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. Lagged IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. The table reports the p-value of Wooldridge's (1995) over-identification test, the p-value of Durbin-Wu-Hausman test for exogeniety, and the F-test for the IVs of the first stage estimation; standard errors are clustered at the CEO-firm level. The second stage of Heckman's 2-stage treatment effect model uses the same covariates as the OLS and the inverse Mill's ratio (Lambda). Lambda is computed in the first stage by regressing IDB (IDB_CC) on the variables in Model #2 (#7) in Table 2.4. Standard errors of the Heckman 2-stage treatment effect model are estimated using 1,000 bootstrap replications. The MLE treatment effect model estimates the main and selection equations simultaneously. The main equation is the same as the OLS and the selection equation is for IDB (IDB_CC) with the variables in Model #2 (#7) in Table 2.4. The table reports the p-value of Wald test for rho (correlation between first and second stage error terms); standard errors are clustered at the CEO-firm level. Panel A.2 reports the average treatment effect for the treated (i.e., ATT) of salary compensation ratio or cash compensation ratio on IDB (or IDB_CC) using four different methods. We estimate ATTs based on simple matching and bias-corrected matching using Abadie et al.'s (2004) method for covariate matching (CM), and radius caliper matching and kernel matching using Leuven and Sianesi's (2003) method for propensity score matching (PSM). For CM and PSM, we use all variables in Model #2 (#7) as covariates for estimating the ATT of IDB (IDB_CC); we use the same set of variables for bias-correction in CM. We use a maximum of four nearest neighbors for CM. We impose common support and estimate standard errors using 100 bootstrap replications for PSM. We set the caliper at 0.02 for radius caliper matching. We set the bandwidth at 0.06 and use the Epanechnikov kernel for kernel matching. Panel B.1 shows estimates of Tobit and ML endogenous Tobit regressions of option compensation ratio or equity compensation ratio. The Tobit regressions use the same covariates as the OLS regressions in Panel A.1. The ML endogenous Tobit regressions use the same IVs as the 2SLS regressions in Panel A.1, and report the Wald test for endogeneity. For both types of regressions, robust standard errors are clustered at the CEO-firm level. Panel B.2 reports ATTs for option compensation ratio or equity compensation ratio using same methods as in Panel A.2.

Table 2.6 (cont.)

Panel A: Regression and matching results for salary and cash compensation ratios																
Panel A.1: Regression results																
	Salary compensation ratio								Cash compensation ratio							
	OLS		Instrumental variable 2SLS		Treatment effects 2-Stage		Treatment effects MLE		OLS		Instrumental variable 2SLS		Treatment effects 2-Stage		Treatment effects MLE	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	0.033	0.001	0.087	0.021	0.119	0.000	0.191	0.279	0.033	0.001	0.072	0.082	0.096	0.000	0.116	0.115
N	10,921		10,915		10,052		10,052		10,921		10,915		10,052		10,052	
Adjusted R-square / [chi-square p-value]	0.2150		0.2083		[0.000]		[0.000]		0.1871		0.1847		[0.000]		[0.000]	
Over-identification test (p-value)			0.7804								0.9429					
Test for exogeneity (p-value)			0.1306								0.3295					
F-statistic for first-stage IVs			113.30								113.30					
Lambda					-0.053	0.000							-0.041	0.007		
Wald test for rho (p-value)							0.000								0.001	
IDB_CC (1/0)	0.040	0.002	0.161	0.023	0.241	0.000	0.283	0.000	0.047	0.000	0.130	0.082	0.239	0.000	0.297	0.000
N	10,834		10,915		10,052		10,052		10,834		10,828		10,052		10,052	
Adjusted R-square / [chi-square p-value]	0.2156		0.1847		[0.000]		[0.000]		0.1880		0.1809		[0.000]		[0.000]	
Over-identification test (p-value)			0.5751								0.7401					
Test for exogeneity (p-value)			0.0751								0.2661					
F-statistic for first-stage IVs			30.22								30.22					
Lambda					-0.109	0.000							-0.105	0.000		
Wald test for rho (p-value)							0.000								0.000	
Panel A.2: Matching results on average treatment effect for the treated (ATT)																
	Salary compensation ratio								Cash compensation ratio							
	Simple matching		Bias-adjusted matching		Radius caliper matching		Kernel matching		Simple matching		Bias-adjusted matching		Radius caliper matching		Kernel matching	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	0.050	0.000	0.025	0.000	0.019	0.009	0.021	0.002	0.047	0.000	0.026	0.002	0.021	0.009	0.022	0.003
IDB_CC (1/0)	0.053	0.000	0.030	0.001	0.032	0.001	0.036	0.000	0.058	0.000	0.034	0.001	0.037	0.000	0.043	0.000

Table 2.6 (cont.)

Panel B: Regression and matching results for option and equity compensation ratios

Panel B.1: Regression results

	Option compensation ratio				Equity compensation ratio			
	Tobit		ML Tobit with endogenous variable		Tobit		ML Tobit with endogenous variable	
	coefficient	p-value	coefficient	p-value	coefficient	p-value	coefficient	p-value
IDB (1/0)	-0.035	0.013	-0.044	0.452	-0.026	0.049	-0.060	0.305
N	10,921		10,915		10,921		10,915	
Pseudo R-square / [chi-square p-value]	0.2907		[0.000]		0.2977		[0.000]	
Test for exogeneity (p-value)			0.8616				0.5400	
IDB_CC (1/0)	-0.050	0.004	-0.080	0.479	-0.042	0.013	-0.106	0.341
N	10,834		10,828		10,834		10,828	
Pseudo R-square / [chi-square p-value]	0.2935		[0.000]		0.3004		[0.000]	
Test for exogeneity (p-value)			0.7884				0.5577	

Panel B.2: Matching results on average treatment effect for the treated (ATT)

	Option compensation ratio								Equity compensation ratio							
	Simple matching		Bias-adjusted matching		Radius caliper matching		Kernel matching		Simple matching		Bias-adjusted matching		Radius caliper matching		Kernel matching	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	-0.031	0.000	-0.019	0.019	-0.015	0.041	-0.015	0.047	-0.034	0.000	-0.019	0.026	-0.010	0.235	-0.011	0.201
IDB_CC (1/0)	-0.039	0.000	-0.033	0.001	-0.028	0.002	-0.030	0.001	-0.041	0.000	-0.028	0.008	-0.024	0.011	-0.026	0.010

larger than the OLS estimates. The Lambdas of both two-stage treatment effects models are significantly negative, indicating that the factors that induce IDBs to self-select into particular firm-years are negatively related to the proportion of salary or cash in CEO pay packages.

Panels A.2 and B.2 of Table 2.6 report estimated ATTs based on four different matching methods. Almost all the estimates of ATTs are highly significant, and they all have the same signs as in the corresponding OLS or Tobit regressions. Estimates of the effect of an IDB's presence on the proportion of cash (equity-based) compensation in a CEO's pay package range between +2.1% to +4.7% (-3.4% to -1%). All the results in Table 2.6 are consistently stronger for an IDB's presence on the compensation committee. The presence of an IDB generally leads to the CEO being paid slightly less via stock and options and slightly more via salary and bonus. These results are consistent with the IDB monitoring-substitutes hypothesis. IDB monitoring appears to be a substitute for CEO incentives.

2.7 IDB presence and CEO turnover-performance sensitivity

This section examines the relation between IDB presence and CEO turnover-performance sensitivity. We do this by estimating an empirical model of the likelihood of CEO turnover. The dependent variable in this model is *CEO turnover*, a binary variable that equals 1 if the CEO changed in the current year, and equals zero otherwise. Prior studies find that the likelihood of CEO turnover is negatively related to prior stock performance (see, e.g., Warner, Watts, and Wruck (1988)). We control for *market-adjusted stock return*$_{t-1}$, computed as daily average of the stock return for a firm over the prior year minus the corresponding return on the CRSP equal-weighted market index. The coefficient of this variable measures the CEO turnover-performance sensitivity. To examine whether this sensitivity differs in the presence of an IDB, we add an interaction term, *IDB*market-adjusted stock return*$_{t-1}$, as an explanatory variable in the regression.[21] The IDB monitoring hypothesis predicts that the coefficient of this interaction variable is negative, while the CEO power hypothesis predicts that it equals zero.

The regression controls for other determinants of the probability of CEO turnover. First, DeFond and Park (1999) find that the probability of CEO turnover increases with stock price volatility, so we control for the standard deviation of daily stock returns over the previous year. Second, a significant part of CEO turnover is likely due to normal retirement. To control for normal retirement, we follow Murphy and Zimmerman (1993) and use a dummy variable *CEO Age64*, which equals 1 if the CEO's age is 64 years or more, and equals zero otherwise. Third, the probability of normal retirement increases as the CEO's tenure increases; we control for CEO's tenure as max (CEO's tenure on the board, tenure as CEO).

Fourth, following Yermack's (1996) finding that CEO turnover is negatively related to board size and CEO ownership, we control for both these variables. Fifth, Goyal and Park (2002) find that the probability of CEO turnover is significantly lower when the CEO chairs the board. We control for a dummy variable *CEO is chairman*. Sixth, Weisbach (1988) finds that CEO turnover is negatively related to board independence; we control for the proportion of independent directors on the board. Seventh, Huson, Parrino and Starks (2001) find that CEO turnover is positively related to firm size; we control for the log of sales as a measure of firm size. All explanatory variables (except for IDB, the fraction of independent directors and board size) are lagged by one year to ensure that they relate to the departing CEO.

We start with our analysis with the simple linear probability model (LPM) using OLS. The columns labeled *OLS* in Table 2.7 show the coefficient estimates and p-values for this model. The probability of CEO turnover is negatively related to the market-adjusted stock return.

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[21] We do not include IDB as a separate explanatory variable in the regression because unlike CEO turnover-performance sensitivity, there is no reason to expect CEO turnover per se to depend on IDB presence.

In other words, the turnover-performance sensitivity is negative. But this sensitivity is unrelated to the presence of an IDB. The probability of CEO turnover is negatively related to CEO ownership and positively related to stock volatility, CEO is chairman, CEO tenure, CEO age and firm size. All these relations are statistically significant and generally consistent with prior studies. The columns labeled *Probit* show that the results of probit regressions are quite similar to the LPM results. But these results do not take into account the potential endogeneity of the interaction variable, *IDB*market-adjusted stock return*$_{t-1}$.

To account for the endogeneity of the interaction term, we use two different models: 1) Two-stage linear probability model (2SLS-LPM), and 2) Instrumented probit regression (IV-probit). Since the endogeneity of the interaction variable arises from the endogeneity of IDB, we use our two IVs for IDB as the IVs for the interaction term. We instrument the interaction variable by IDB state-density and IDB industry-density. There is no *a priori* reason to believe that CEO turnover should be related to the two IVs. The correlations between the interaction variable and the two IVs are significantly negative. These correlations (their p-values) are -0.028 (0.003) and -0.032 (0.001) for IDB state-density and IDB industry-density, respectively. As diagnostic checks for 2SLS, we find that the overidentifying restriction of both IVs holds (p-value of the over-identification test is 0.776), and the F-statistic for the joint significance of the two IVs in the first stage is 10.91, above the cut-off value of 10 suggested by Staiger and Stock (1997). These findings indicate that we do not have weak IVs. The test for exogeneity in the 2SLS regression indicates that the interaction variable is endogenous.

After accounting for the endogeneity of the interaction term, the 2SLS regression reverses our main finding in the LPM regression. The estimated coefficient of the interaction variable is now significantly negative. The magnitude of the effect of IDB presence on CEO turnover-performance sensitivity is quite large. Since the second stage regression is LPM, the

Table 2.7: CEO turnover-performance sensitivity

The table shows estimates of OLS, probit, 2SLS instrumental variable, and IV-probit regressions of CEO turnover on the interaction between IDB and market adjusted stock return$_{t-1}$ and control variables. The sample consists of non-dual class S&P 1500 firms during the period 1998-2006 with relevant non-missing data. CEO turnover is a dummy variable that equals one if the CEO in year *t* differs from the CEO in year *t*-1; it equals zero otherwise. IDB is a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. All other variables are defined in Appendix 3. To reduce the influence of outliers, some variables, indicated in Appendix 3, are winsorized at the top and bottom 0.5% of the sample. Both the second stage of the 2SLS instrumental variables estimation and the MLE IV-probit model use the same covariates as the OLS, but instrument for possible endogeneity of IDB by lagged IDB state-density and lagged IDB industry-density. Lagged IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. Lagged IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. The 2SLS regression reports p-value of Wooldridge's (1995) over-identification test, the p-value of Durbin-Wu-Hausman test for exogeniety, and the F-test for the IVs of the first stage estimation; standard errors are clustered at the CEO-firm level. The IV-probit regression reports the Wald test for exogeneity. Each regression includes year and Fama-French 12 industry dummies; robust standard errors are clustered at the firm level.

Variables	OLS		Probit		2SLS		IV- Probit	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB* Market adjusted stock return$_{t-1}$ %	0.020	0.728	0.089	0.755	-2.948	0.055	-10.543	0.003
Market adjusted stock return$_{t-1}$ %	-0.111	0.000	-0.536	0.000	0.326	0.155	1.147	0.068
Standard deviation of stock return$_{t-1}$ %	0.016	0.000	0.078	0.000	0.016	0.000	0.060	0.004
Log CEO's stock ownership$_{t-1}$	-0.038	0.000	-0.188	0.000	-0.042	0.000	-0.160	0.000
CEO is chairman$_{t-1}$ (0/1)	0.022	0.001	0.118	0.002	0.017	0.034	0.075	0.074
Max (CEO's board tenure, tenure as CEO)$_{t-1}$	0.003	0.000	0.012	0.000	0.003	0.000	0.010	0.000
CEO Age64$_{t-1}$ (0/1)	0.153	0.000	0.602	0.000	0.163	0.000	0.499	0.000
Log sales$_{t-1}$	0.005	0.062	0.024	0.071	0.008	0.016	0.029	0.011
Fraction of independent directors	-0.018	0.378	-0.096	0.358	-0.004	0.852	-0.024	0.798
Board size	0.001	0.330	0.007	0.356	0.000	0.897	0.000	0.957
Intercept	0.027	0.363	-1.638	0.000	0.015	0.660	-1.303	0.000
N	10,090		10,090		10,089		10,089	
Adjusted or pseudo R^2 / [chi-square p-value]	0.036		0.047		[0.000]		[0.000]	
Over-identification test (p-value)					0.7725			
Test for exogeneity (p-value)					0.0366			
F-statistic for first-stage IVs					10.40			
Wald test for exogeneity (p-value)							0.036	

marginal effect of the interaction variable simply equals its coefficient estimate. So a decrease in the market-adjusted stock return of 5% per year or 0.02% (= 5/250) per day results in an increase of 0.059 (= 0.02 x 2.948) in the probability of CEO turnover in IDB presence relative to IDB absence. Relative to the unconditional probability of CEO turnover of 0.1239 in our sample (see

Appendix 3), this represents an increase of about 47.6%. The signs and statistical significance of the remaining coefficient estimates are similar to the LPM and probit models.

Finally, the results of the IV-probit model are similar to the 2SLS results. The estimated coefficient of the interaction variable is significantly negative. The Wald test for exogeneity for the IV-probit regression also indicates that the interaction variable is endogenous. Here a decrease in market-adjusted stock return of 0.02% per day from its mean value of -0.0142% (see Appendix 3) results in an increase of 0.0471 in the probability of CEO turnover in IDB presence relative to IDB absence.[22] Relative to the unconditional probability of CEO turnover of 0.1239 in our sample (see Appendix 3), this represents an increase of about 38%. Thus, after accounting for the endogeneity of IDB presence, the presence of an IDB substantially increases the CEO turnover-performance sensitivity. This finding strongly supports the IDB monitoring hypothesis.

2.8 IDB presence and firm valuation

This section examines the relation between firm valuation, as measured by Tobin's q, and the presence of an IB on the board or compensation committee (i.e., IDB or IDB_CC). We measure Tobin's q as (the book value of total assets plus the market value of equity minus the book values of equity) divided by the book value of total assets. Chung and Pruitt (1994) find that this simple measure of q explains more than 95% of the variation in more complicated q measures. As an additional measure of firm performance, we use industry-adjusted Tobin's q, which equals q minus the median q for the firm's Fama and French (1997) 48 industry.

Panel A of Table 2.3 shows that while the mean Tobin's q is insignificantly different in IDB and non-IDB firm-years, the median q is lower in IDB firms. But both the mean and median values of the industry-adjusted q are significantly higher in IDB firm-years. In untabulated

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[22] Since the main equation here is a probit model, we compute this change in p, the probability of CEO turnover, as [p(IDB = 1, r = -0.0342) - p(IDB = 1, r = -0.0142)] - [p(IDB = 0, r = -0.0342) - p(IDB = 0, r = -0.0142)], where r is the market-adjusted stock return and other variables take their sample mean values.

Table 2.8: Firm valuation

Panel A shows estimates of OLS, 2SLS instrumental variable, Heckman 2-stage treatment effect, and MLE treatment effect regressions of Tobin's q or industry-adjusted Tobin's q. The sample consists of non-dual class S&P 1500 firms during the period 1998-2006 with relevant non-missing data. IDB_CC is a dummy variable that equals one if there is at least one IDB who sits on the board's compensation committee in a given firm-year (if the firm has no compensation committee, the entire board serves on the compensation committee); zero otherwise. Covariates in the OLS regression are: IDB or IDB_CC, Market-adjusted stock return_{t-1}, Market adjusted stock return_t, ROA_{t-1}, ROA_t,, Standard deviation of stock return_t, Log market cap_t, R&D to sales_t, Advertising expenses to sales_t, Sales growth, Fraction of independent directors, Board size, G-index and Log CEO stock ownership. Regressions of Tobin's q include year dummies and Fama-French 12 industry dummies. All other variables are defined in Appendix 3. To reduce the influence of outliers, some variables, indicated in Appendix 3, are winsorized at the top and bottom 0.5% of the sample. Robust standard errors are clustered by the CEO-firm level. The second stage of the 2SLS instrumental variables estimation uses the same covariates as the OLS, but instruments IDB (or IDB_CC) by IDB state-density and IDB industry-density. IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. The table reports the p-value of Wooldridge's (1995) over-identification test, the p-value of Durbin-Wu-Hausman test for exogeniety, and the F-test for the IVs of the first stage estimation; standard errors are clustered at the CEO-firm level. The second stage of Heckman 2-stage treatment effects regression uses the same covariates as the OLS and the inverse Mill's ratio (Lambda). Lambda is computed in the first stage by regressing IDB (IDB_CC) by the variables shown in Model #2 (#7) in Table 2.4. Standard errors of the Heckman 2-stage treatment effect model are estimated using 1,000 bootstrap replications. The MLE treatment effect model estimates the main and selection equations simultaneously. The main equation is the same as the OLS and the selection is for IDB (IDB_CC) with the variables shown in Model #2 (#7) in Table 2.4. It reports the p-value of Wald test for rho (correlation between first and second stage error terms); standard errors are clustered at the CEO-firm level. Panel B of the table reports the average treatment effect for the treated (i.e., ATT) of either Tobin's q or industry-adjusted Tobin's q of IDB (or IDB_CC) using four different methods. ATTs are estimated based on simple matching and bias-corrected matching using Abadie et al.'s (2004) method for covariate matching (CM), and radius caliper matching and kernel matching using Leuven and Sianesi's (2003) method for propensity score matching (PSM). For CM and PSM, all variables in Model #2 (#7) are used as covariates for estimating the ATT of IDB (IDB_CC); the same set of variables is also used for bias-correction in CM. A maximum of four nearest neighbors are used for CM. Common support is imposed and standard errors are estimated using 100 bootstrap replications for PSM. Caliper is set at 0.02 for radius caliper matching. Bandwidth is set at 0.06 and Epanechnikov kernel is used for kernel matching.

Table 2.8 (cont.)

Panel A: Regression results

	Tobin's q								Industry adjusted Tobin's q							
	OLS		Instrumental variable 2SLS		Treatment effects 2-Stage		Treatment effects MLE		OLS		Instrumental variable 2SLS		Treatment effects 2-Stage		Treatment effects MLE	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	0.196	0.000	0.363	0.044	1.130	0.000	1.590	0.000	0.202	0.000	0.474	0.005	1.034	0.000	1.645	0.000
N	10,264		10,261		10,054		10,054		10,264		10,261		10,054		10,054	
Adjusted R-square / [chi-square p-value]	0.4626		0.4609		[0.000]		[0.000]		0.2977		0.2919		[0.000]		[0.000]	
Over-identification test (p-value)			0.9479								0.4750					
Test for exogeneity (p-value)			0.3472								0.1053					
F-statistic for first-stage IVs			91.99								102.09					
Lambda					-0.561	0.000							-0.507	0.000		
Wald test for rho (p-value)							0.000								0.000	
IDB_CC (1/0)	0.206	0.001	0.677	0.054	2.166	0.000	1.669	0.000	0.205	0.001	0.896	0.009	1.885	0.000	1.726	0.000
N	10,177		10,174		10,054		10,054		10,177		10,174		10,054		10,054	
Adjusted R-square / [chi-square p-value]	0.4637		0.4545		[0.000]		[0.000]		0.2955		0.2710		[0.000]		[0.000]	
Over-identification test (p-value)			0.9718								0.5993					
Test for exogeneity (p-value)			0.1728								0.0365					
F-statistic for first-stage IVs			26.38								29.77					
Lambda					-1.051	0.000							-0.905	0.000		
Wald test for rho (p-value)							0.000								0.000	

Panel B: Matching results on average treatment effect for the treated

	Tobin's q								Industry adjusted Tobin's q							
	Simple matching		Bias-adjusted matching		Radius caliper matching		Kernel matching		Simple matching		Bias-adjusted matching		Radius caliper matching		Kernel matching	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	0.053	0.136	0.060	0.096	0.080	0.000	0.073	0.001	0.077	0.028	0.072	0.046	0.076	0.002	0.078	0.001
IDB_CC (1/0)	0.186	0.000	0.218	0.000	0.122	0.000	0.122	0.000	0.210	0.000	0.223	0.000	0.105	0.002	0.111	0.000

results, both mean and median values of industry-adjusted or unadjusted q are significantly higher in IDB_CC firm-years than in non- IDB_CC firm-years. While these univariate results are generally consistent with the IDB monitoring hypothesis, they do not control for other determinants of Tobin's q and do not account for the endogeneity of IDB presence, a task we turn to next.

Panel A of Table 2.8 shows estimates of regressions of q and industry-adjusted q on either IDB or IDB_CC and other covariates. We use contemporaneous and lagged market-adjusted stock return and contemporaneous standard deviation of stock return to control for stock performance and volatility. Following Yermack (1996), we also control for contemporaneous and lagged industry-adjusted ROA, firm size (measured by log of market capitalization), CEO ownership, the proportion of independent directors, and board size. Since Tobin's q also reflects growth opportunities, we control for R&D to sales, advertising expenses to sales, and sales growth rate. We control for anti-shareholder rights by Gompers, Ishii and Metrick's (2003) G-index. In addition, regressions of q include year dummies and Fama-French 12 industry dummies, and the regressions of industry-adjusted Tobin's q include year dummies.

Using OLS, we find that IDB is significantly and positively related to Tobin's q. The adjusted-R^2 of the regression is 0.463. Coefficient estimates of the other explanatory variables (not reported in the table to save space) are generally consistent with prior studies; except for G-index, all are highly significant. The proportion of independent directors is negatively related to q, consistent with the findings of Yermack (1996) and Agrawal and Knoeber (1996). Board size is also negatively related to Tobin's q, a finding consistent with Yermack (1996). The remaining significant explanatory variables are positively related to q, consistent with the findings of recent studies (e.g., Coles, Daniel and Naveen (2007)). The results are quite similar for the OLS regression of industry-adjusted q. Both OLS regressions suggest that after controlling for its other determinants, q is about 0.20 higher in firms with an IDB than in firms without an IDB. The results are quite similar for OLS regressions where we replace IDB by IDB_CC.

To account for the potential endogeneity of IDB or IDB_CC presence in a firm, we estimate 2SLS regressions using IDB state-density and IDB industry-density as instruments. In all of the 2SLS regressions, we find that the over-identifying restriction holds, and the F-statistics for the joint significance of the IVs in the first-stage regressions are quite large; both results indicate that the IVs are not weak. But the test for exogeneity is insignificant in three out of the four 2SLS regressions, suggesting that IDB is not endogenous. This implies that OLS estimates are preferable to 2SLS, as the former estimates are unbiased and more efficient. The test for exogeneity in the regression of industry-adjusted q on IDB_CC is significant. In all four regressions, the 2SLS results are qualitatively similar to the OLS regressions, except that the coefficient estimate of IDB or IDB_CC is much higher in the 2SLS regressions.

We next employ Heckman's treatment effect model to account for a possible selection bias. The identification of this model is mainly derived from the exclusion criteria, especially from the two IVs: IDB state-density and IDB industry-density. Using the two-stage treatment effect model, we find that all of the estimated coefficients on the inverse Mills ratio (Lambda) are negative, and are significant at the 1% level. This result indicates that self-selection is important here. That is, characteristics that cause an IDB to be present in a firm-year are negatively related to firm value. The coefficients of both IDB and IDB_CC are highly significant and positive. This is similar to the OLS results, except that the coefficients are substantially larger. The sign and significance of the coefficients of IDB, IDB_CC and Lambda strongly suggest that IDBs play an important monitoring role. We also use joint estimation of the main and selection equation using MLE and get similar results.

We also measure ATTs of both IDB and IDB_CC for industry-adjusted and unadjusted Tobin's q. As discussed in Section 2.5.2, models (2) and (7) in Table 2.4 perform well in estimating propensity scores that ensure random assignment based on observables. We use the same set of variables for estimating ATTs using both covariate and propensity score matching methods. Panel B of Table 2.8 shows that in almost all the cases, the estimated ATTs are significantly positive, suggesting that the presence of an IDB increases firm valuation. The estimated ATTs are quite similar across the four matching methods. For IDBs, the ATT ranges between 0.053 and 0.08 for unadjusted q, and between 0.072 and 0.078 for adjusted q. Compared to IDB presence, the ATTs are substantially larger when an IDB sits on the compensation committee.

In other words, these results suggest that the presence of an IB on the board or the compensation committee leads to higher firm valuation. This finding is consistent with the IDB monitoring hypothesis, i.e., IDB monitoring adds value to a firm and on the net, IDB presence benefits all shareholders. A larger magnitude of Tobin's q when the IDB sits on the compensation committee suggests that part of the value added by an IDB comes from arms-length bargaining in setting CEO compensation contracts.

2.9 Robustness checks

In this section, we examine whether our results on the level and composition of CEO pay and on firm valuation are sensitive to several alternate definitions of our main explanatory variable, IDB; changes in disclosure rules on executive pay; the adoption of Sarbanes-Oxley Act; and an alternate method of computing industry-adjusted Tobin's q. We take advantage of the fact that the OLS results in Tables 2.5 and 2.8 and the Tobit results in Panel B.1 of Table 2.6 are qualitatively similar to the results from more sophisticated and involved methodologies. So for the purpose of these robustness checks, we use OLS regressions of CEO pay level and Tobin's q, and Tobit regressions of the percentage of a CEO's option and equity-based compensation. In addition, we examine whether the effects of IDB presence persist after controlling for the presence of an outside blockholder or a majority independent board. Finally, we examine changes in the level and composition of CEO pay and in Tobin's q when a firm switches from IDB = 0 to 1, or from 1 to 0.

2.9.1 IDB defined by dollar holdings

In the analysis so far, we have defined an IDB as an independent director who owns 1% of a firm's outstanding equity. Consider two firms, A and B, which have market caps of $10 billion and $100 million, respectively. Then an IDB owns an equity stake of at least $100 million in firm A, but only $1 million in firm B. These substantial differences in an IDB's dollar stakes can have different incentive effects. So we next consider an alternate definition of an IDB based on dollar, rather than percentage, holdings. We define IDB$15m as an independent director who owns an equity stake of at least $15 million in constant 2000 dollars, which represents about 1% of the median market cap of the firm-years in our sample (see Appendix 3).[23] About 14.9% of the firm-years in the sample have an IDB by this definition. We then estimate OLS regressions of CEO pay level (Log total compensation and Log cash compensation) corresponding to columns 1 and 5 in Panel A of Table 2.5, Tobit regressions of CEO pay composition (option compensation ratio and equity compensation ratio) similar to columns 1 and 3 in Panel B.1 of Table 2.6, and OLS regressions of Tobin's q and industry-adjusted Tobin's q similar to columns 1 and 5 in Panel A of Table 2.8, after replacing the IDB variable by IDB$15m. Column 1 of Panel A in Table 2.9 shows these results. The results are quite similar to our baseline results in Tables 2.5, 2.6 and 2.8. After controlling for other factors, IDB presence results in the CEO

[23] The results are similar using IDB$20m, defined using an equity stake of $20 million.

having lower total pay, cash pay, and proportion of pay via options, and the firm having substantially higher Tobin's q (unadjusted or industry-adjusted).

2.9.2 IDB defined by percentage holdings based on firm size

We next consider another alternate definition of an IDB to account for differences in firm size. We define a binary variable IDB%Variable that equals one if a firm-year has an independent director who owns at least 1% (3%) [5%] of the outstanding equity and the firm is in the top (middle) [bottom] tercile of all the firm-years in the sample, based on market capitalization in constant 2000 dollars; it equals zero otherwise. About 9.9% of the firm-years in the sample have an IDB by this definition. Column 2 in Panel A of Table 2.9 shows that the results generally mirror those described in section 2.9.1 above.

2.9.3 Changes in disclosure rules on executive pay

There was a major change in SEC disclosure rules on executive compensation for fiscal years ending after December 2005, which has changed the format and content of executive compensation reporting in proxy statements. In response to these changes, Execucomp changed the definition of its total compensation (TDC1) variable starting in fiscal 2006. For example, Execucomp replaced its Black-Scholes valuation of option grants by company-reported option values under FAS 123R. These changes have shifted the reported levels of compensation somewhat. To examine whether these changes in compensation reporting affect our results, we re-estimate our baseline results on the level and composition of CEO pay in Tables 2.5 and 2.6 after omitting the 2006 fiscal year. The results, reported in the last column of Panel A in Table 2.9, are essentially unchanged.

Table 2.9: Robustness checks

Panel A reports the regression coefficient and p-value of IDB using two alternate definitions of IDB (i.e., IDB$15m and IDB%Variable) or after omitting the 2006 fiscal year (i.e., 1998-2005) from regressions in Table 2.5 (OLS regressions of Log total compensation and Log cash compensation), Table 2.6 (Tobit regressions of Option compensation ratio and Equity compensation ratio) and Table 2.8 (OLS regressions of Tobin's q and industry-adjusted Tobin's q). IDB$15m is a binary variable that equals one if a firm-year has an independent director whose equity holdings equal $15 million or more in constant 2000 dollars; it equals zero otherwise. IDB%Variable is a binary variable that equals one if a firm-year has an independent director who owns at least 1%, 3% or 5% of the outstanding equity of a firm in the top, middle or bottom tercile of all the firm-years in the sample, respectively, based on market capitalization in constant 2000 dollars; it equals zero otherwise. The last two rows report the maximum sample size among the six regressions for a given column, and the number of firm-years with IDB=1 in this regression. Panel B reports the coefficient estimates and p-values from regressions similar to those in Panel A, where IDB and year dummy variables are replaced by IDB*Pre-SOX and IDB*Post-SOX. Pre-SOX (Post-SOX) is a binary variable that equals one for an observation from fiscal years 1998-2002 (2003-2006); it equals zero otherwise. The last column of Panel B reports the p-value of the F-test for the equality of the coefficients of IDB*Pre-SOX and IDB*Post-SOX.

Panel A: Alternate definitions of IDB and omission of 2006 fiscal year

	IDB$15m		IDB%Variable		1998-2005	
	coeff.	p-value	coeff.	p-value	coeff.	p-value
Log total compensation	-0.098	0.034	-0.117	0.002	-0.131	0.021
Log cash compensation	-0.104	0.053	-0.065	0.046	-0.105	0.053
Option compensation ratio	-0.025	0.059	-0.028	0.061	-0.036	0.011
Equity compensation ratio	-0.018	0.151	-0.023	0.101	-0.026	0.050
Tobin's q	0.212	0.000	0.164	0.001		
Industry adjusted Tobin's q	0.231	0.000	0.160	0.002		
Maximum sample size (firm-years)	10,921		10,921		9,735	
Firm-years with IDB=1	1,627		1,084		1,545	

Panel B: Pre- and post-Sarbanes Oxley Act

	IDB*Pre-Sox		IDB*Post-Sox		p-value of F-test
	coeff.	p-value	coeff.	p-value	
Log total compensation	-0.107	0.054	-0.194	0.009	0.123
Log cash compensation	-0.088	0.098	-0.105	0.116	0.731
Option compensation ratio	0.037	0.028	-0.125	0.000	0.000
Equity compensation ratio	0.025	0.113	-0.079	0.000	0.000
Tobin's q	0.169	0.002	0.235	0.000	0.312
Industry adjusted Tobin's q	0.280	0.000	0.107	0.060	0.011
Maximum sample size	10,921				
Firm-years with IDB=1	915		664		

2.9.4 Adoption of the Sarbanes-Oxley Act

The adoption of Sarbanes-Oxley Act in 2002 and concurrent changes in listing requirements of NYSE, AMEX and Nasdaq have changed the structure of many corporate boards. The literature (e.g., Chhaochharia and Grinstein (2009)) has also documented a structural break in CEO compensation around that time. So we next examine whether IDBs are as important post-SOX as they were before it. We estimate regressions similar to those in section 2.9.1 above, except that we replace IDB and year dummy variables by IDB*Pre-SOX and IDB*Post-SOX. Pre-SOX (Post-SOX) is a binary variable that equals one for an observation from fiscal years 1998-2002 (2003-2006); it equals zero otherwise. Panel B of Table 2.9 shows the coefficient estimates and p-values of IDB*Pre-SOX and IDB*Post-SOX from these regressions, followed by the p-value of the F-test for the equality of the two coefficients. The results are quite interesting. First, after controlling for other determinants, CEOs' total compensation is substantially and significantly lower in the presence of IDBs both pre- and post-SOX, and there is no significant difference in the magnitude of this effect between the two periods. Second, pre-SOX, the proportion of CEO pay via options is about 3.7% higher in the presence of an IDB; post-SOX, this proportion is about 12.5% lower with IDB presence. The difference is statistically significant. A similar pattern holds with the proportion of equity-based pay. Third, Tobin's q (both unadjusted and industry-adjusted) is significantly higher in the presence of an IDB both pre- and post-SOX. The magnitude of this effect is significantly lower post-SOX for industry-adjusted q. All these results support the IDB monitoring hypothesis. The second result supports the IDB monitoring-complements hypothesis pre-SOX and IDB monitoring-substitutes hypothesis post-SOX. Pre-SOX, IDB monitoring appears to complement CEO incentives. With the tightening of governance rules under SOX, IDB monitoring appears to have become a substitute for CEO equity incentives.

2.9.5 Alternate method of computing industry-adjusted Tobin's q

In section 8 and Table 2.8, we compute industry-adjusted Tobin's q as Tobin's q of a firm-year minus the median Tobin's q of the firm's Fama and French 48 industry among all firms on Compustat in that year. Since firms in our sample (S&P 1500) are generally larger than firms on Compustat, the median Tobin's q of firms in an industry on Compustat may differ from Tobin's q of the median firm in the industry within our sample. To account for this possibility, we recompute industry-adjusted Tobin's q using the median q in each industry for each year within the set of S&P 1500 firms. We then reestimate the regressions in the last four columns of Panel A of Table 2.8. The results are essentially unchanged.

2.9.6 Controlling for outside blockholder presence

We next examine whether our results on IDB presence hold after controlling for the presence of an outside blockholder in the firm. There is no disclosure requirement for 1% blockholdings for non-directors and reliable data on 5% blockholdings, reported in corporate proxy statements, is not available in machine-readable form. But Dlugosz, et al. (2006) have compiled and cleaned the data on 5% blockholdings for S&P 1500 firms for annual meeting dates during 1996-2001. We use their database to obtain data on the presence of an outside blockholder (OBH) for the subset of our sample that overlaps with their database.[24] After matching annual meeting dates with fiscal years, we have data on OBH presence for 4,743 firm-years in our sample during 1998-2002.[25] We estimate two sets of regressions for this sub-sample. First, we estimate regressions similar to those in Tables 2.5 through 2.8 to examine whether our main results hold for this sub-sample. Second, we add a binary variable for OBH presence (or OBH*Market-adjusted stock return in Table 2.7) as an explanatory variable in the regressions.

[24] We are grateful to Andrew Metrick for sharing this database.

[25] This sample includes 76 firms for the 2002 fiscal year whose annual meeting took place in 2001.

Our results on the level of CEO pay, CEO turnover-performance sensitivity and firm valuation for this sub-sample are quite similar to the results for our full sample reported in Panel A of Tables 2.5 and 2.8, and in Table 2.7. When we add the OBH (or OBH*Market-adjusted stock return in Table 2.7) variable to these regressions, the coefficient of the added variable is statistically insignificant in all cases, except in regressions of log total compensation (Table 2.5), where it is significantly positive in OLS and both treatment effects models. Importantly, the addition of the OBH variable leaves the signs, significance and magnitudes of the IDB (or IDB*Market-adjusted stock return in Table 2.7) variable essentially unchanged. In regressions similar to Panel B.1 of Table 2.6 (option or equity compensation ratio), the coefficient of IDB is statistically insignificant for this sub-sample. The addition of the OBH variable does not change this result; the coefficient of OBH is significantly positive in the Tobit model of option compensation ratio and significantly negative (positive) in the ML Tobit model of option (equity) compensation ratio.

2.9.7 Controlling for majority independent board

We next examine whether our main result in Table 2.7, that CEO turnover-performance sensitivity is greater in the presence of an IDB, holds after controlling for the existence of a majority independent board. To the regressions in Table 2.7, we add an interaction term, MIB*Market-adjusted stock return, where MIB is a binary variable that equals one for a majority independent board and equals zero otherwise. The coefficient of this interaction term is insignificant in all four models. The sign, significance and magnitude of our IDB*Market-adjusted stock return variable is essentially unchanged.

2.9.8 Switches to and from IDB presence

Our sample of 11,547 firm-years over 1998-2006 contains 247 firm-years that switched from having no IDB to having an IDB (0 → 1 switch), and 334 firm-years that experienced an opposite (1 → 0) switch. We take advantage of these switches to examine whether the level and composition of CEO pay and Tobin's q change in the year of the switch in a manner consistent with our main results. In untabulated results, we find that the CEO's median total pay reduces by 1% in the year of a 0 → 1 switch, while it increases by about 8% in the year of an opposite switch. The former change is statistically insignificant, but the latter is highly significant. The difference between the two changes is significant at the 5% level based on the Mann-Whitney U-test. The mean percentage of option compensation reduces by a statistically significant 4.7% in the year of a 0 → 1 switch, and by an insignificant 1.7% in the year of the opposite switch, although the difference between the two changes is insignificant. Finally, the mean industry-adjusted Tobin's q reduces by a statistically insignificant 0.035 in the year of a 0 → 1 switch, while it reduces by a highly significant -0.204 in the year of an opposite switch. The difference between the two changes has a p-value of 0.06. These results are generally consistent with the substitute version of the IDB monitoring hypothesis and add to our evidence that IDB presence leads to lower CEO pay, lower equity incentives for the CEO and higher firm valuation.

2.10 Summary and conclusions

While numerous studies examine the relation between board independence or outside blockholdings on CEO compensation, turnover or firm valuation, no prior study has examined these issues in the presence of an independent director who is a blockholder (i.e., an IDB). An IDB has strong incentives and the ability to monitor the CEO. But whether the IDB uses his position to pursue the interests of all shareholders or to extract private benefits from the firm is an empirical question. Moreover, the presence of an IDB is likely endogenous, as blockholders decide which firm to invest in and whether to try to obtain a board seat. Therefore, to answer questions like whether the presence of an IDB influence CEO compensation, turnover, or firm performance requires analytical frameworks that account for endogeneity of an IDB's presence in a firm. In this paper, we address these questions using a variety of methods that account for different sources of endogeneity.

We find that IDBs are more prevalent in smaller firms and firms that have higher growth rates, worse prior performance, less powerful CEOs, bigger and more independent boards, more shareholder rights, and lower institutional ownership. These findings indicate that an IDB's presence in a firm is not a random occurrence. After controlling for CEO characteristics, other governance mechanisms and relevant firm attributes, we find that CEOs of firms with IDBs have: (1) lower levels of cash and total compensation, and (2) lower proportions of pay via stock and options. These results are robust across several methodologies that account for the potential endogeneity of IDB presence. While CEO turnover-performance sensitivity is unrelated to the presence of an IDB in OLS and probit regressions, this relation is significantly positive after accounting for endogeneity. Finally, firms with an IDB have higher valuation, as measured by Tobin's q. The magnitudes of these effects are substantial, and are generally stronger when an IDB serves on the board's compensation committee. Our results on the level and structure of CEO pay and on firm valuation are robust to several alternative definitions of IDB presence in a firm, changes in disclosure rules on executive pay, the adoption of Sarbanes-Oxley Act, and an alternate method of computing industry-adjusted Tobin's q. Our results are also generally robust to controlling for the presence of an outside blockholder or a majority independent board. Finally, an analysis of firms that switched to or from having IDB presence further lends credence to these results. Our findings suggest that the presence of an independent blockholder on the board promotes better incentives and monitoring of the CEO, and consequently leads to higher firm valuation.

Finally, our findings inform the current policy debate on director elections (see, e.g., Bebchuk (2007) and Virginia Law Review (2007); see Cai, Garner, and Walkling (2009) for related empirical work). The SEC recently proposed proxy access rules that would allow holders of 1% of a large company's shares for one year to place a director-nominee on the corporate proxy statement (see McCracken and Scannell (2009) and SEC (2009)). Our findings that the presence of an independent blockholder on the board is beneficial for shareholders imply that this rule can improve corporate governance. Finally, the newly proposed rules omit the requirement in the 2003 rule proposal that the shareholder nominee be independent of the nominating shareholder. Our findings also support the SEC's decision to omit this requirement from the newly proposed rules.

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APPENDIX

Appendix 1: Firm, year, and firm-year distributions

Panel A: Number of IDBs with either at least 1% or 5% ownership of voting or cash flow rights

Count	1% ownership of voting or cash flow right		5% ownership of voting or cash flow right	
	Firm-year frequency	Percentage	Firm-year frequency	Percentage
0	9,757	84.50	11,015	95.39
1	1,309	11.34	295	2.55
2	362	3.14	176	1.52
3	79	0.68	32	0.28
4	17	0.15	11	0.10
5	20	0.17	16	0.14
6	2	0.02	1	0.01
7	1	0.01	1	0.01
> 0	1,790	15.50	532	4.61

Panel B: Number of IDBs on compensation committee with either at least 1% or 5% ownership of voting or cash flow right

Count	IDBs (1% ownership) on compensation committee		IDBs (5% ownership) on compensation committee	
	Firm-year frequency	Percentage	Firm-year frequency	Percentage
0	10,411	90.90	11,073	96.68
> 0	1,042	9.10	380	3.32

Panel C: Number of years a firm is present in the sample

Number of years	Number of firms	Percentage
1	275	13.38
2	245	11.92
3	139	6.76
4	171	8.32
5	150	7.30
6	128	6.23
7	121	5.89
8	127	6.18
9	700	34.05
Total	2,056	100

Panel D: Percentage of firm-years of a firm that has IDBs

Percentage of firm-years (pct)	Number of firms	Percentage
pct = 0	1,477	71.84
0.00 < pct <=12.5	53	2.58
12.5 < pct <= 25.0	76	3.70
25.0 < pct <= 37.5	49	2.38
37.5 < pct <= 50.0	80	3.89
50.0 < pct <= 62.5	28	1.36
62.5 < pct <= 75.0	44	2.14
75.0 < pct <= 87.5	34	1.65
87.5 < pct < 100	12	0.58
pct = 100	203	9.87
Total	2,056	100

Panel E: Year distribution

Year	Full sample		IDB firm-years		Non-IDB firm-years		Proportion	
	Number of firm-years	Percentage	Number of firm-years	Percentage	Number of firm-years	Percentage	IDB	Non-IDB
1998	1,317	11.41	220	12.29	1,097	11.24	16.70	83.30
1999	1,297	11.23	215	12.01	1,082	11.09	16.58	83.42
2000	1,293	11.20	220	12.29	1,073	11.00	17.01	82.99
2001	1,340	11.60	234	13.07	1,106	11.34	17.46	82.54
2002	1,282	11.10	216	12.07	1,066	10.93	16.85	83.15
2003	1,305	11.30	203	11.34	1,102	11.29	15.56	84.44
2004	1,272	11.02	177	9.89	1,095	11.22	13.92	86.08
2005	1,229	10.64	158	8.83	1,071	10.98	12.86	87.14
2006	1,212	10.50	147	8.21	1,065	10.92	12.13	87.87
Total	11,547	100	1,790	100	9,757	100	15.50	84.50

Appendix 2: Industry distribution and geographic distribution of headquarters

Panel A: Industry distribution

Fama-French 48 industry classification	Full sample		IDB firm-years		Non-IDB firm-years		(D-F)	B*(D-F)	(C)/(A) in %
	Freq. (A)	Pct. (B)	Freq. (C)	Pct. (D)	Freq. (E)	Pct. (F)			
44. Banking	900	7.08	221	11.25	679	6.32	4.93	34.93	24.56
34. Business services	1165	9.17	200	10.18	965	8.98	1.20	11.00	17.17
40. Transportation	378	2.98	82	4.18	296	2.76	1.42	4.22	21.69
2. Food products	212	1.67	69	3.51	143	1.33	2.18	3.64	32.55
17. Construction materials	276	2.17	65	3.31	211	1.96	1.35	2.92	23.55
12. Medical equipment	293	2.31	60	3.06	233	2.17	0.89	2.04	20.48
9. Consumer goods	249	1.96	51	2.60	198	1.84	0.75	1.48	20.48
37. Measuring and control equipment	242	1.91	49	2.50	193	1.80	0.70	1.33	20.25
41. Wholesale	431	3.39	73	3.72	358	3.33	0.38	1.30	16.94
47. Trading	339	2.67	60	3.06	279	2.60	0.46	1.22	17.70
43. Restaurants, hotels, motels	268	2.11	50	2.55	218	2.03	0.52	1.09	18.66
19. Steel works etc.	291	2.29	51	2.60	240	2.23	0.36	0.83	17.53
11. Healthcare	182	1.43	35	1.78	147	1.37	0.41	0.59	19.23
7. Entertainment	85	0.67	25	1.27	60	0.56	0.71	0.48	29.41
38. Business supplies	268	2.11	45	2.29	223	2.08	0.22	0.45	16.79
10. Apparel	175	1.38	32	1.63	143	1.33	0.30	0.41	18.29
28. Non-metallic and industrial metal mining	55	0.43	22	1.12	33	0.31	0.81	0.35	40.00
32. Communications	139	1.09	26	1.32	113	1.05	0.27	0.30	18.71
20. Fabricated products	41	0.32	19	0.97	22	0.21	0.76	0.25	46.34
16. Textiles	52	0.41	18	0.92	34	0.32	0.60	0.25	34.62
39. Shipping containers	59	0.46	14	0.71	45	0.42	0.29	0.14	23.73
48. Almost nothing	61	0.48	14	0.71	47	0.44	0.28	0.13	22.95
33. Personal services	123	0.97	21	1.07	102	0.95	0.12	0.12	17.07
4. Beer and liquor	26	0.21	8	0.41	18	0.17	0.24	0.05	30.77
25. Shipbuilding, railroad equipment	29	0.23	8	0.41	21	0.20	0.21	0.05	27.59
6. Recreation	74	0.58	12	0.61	62	0.58	0.03	0.02	16.22
3. Candy and soda	23	0.18	5	0.26	18	0.17	0.09	0.02	21.74
46. Real estate	3	0.02	1	0.05	2	0.02	0.03	0.00	33.33
29. Coal	16	0.13	2	0.10	14	0.13	-0.03	0.00	12.50
1. Agriculture	24	0.19	3	0.15	21	0.20	-0.04	-0.01	12.50
27. Precious metals	25	0.20	3	0.15	22	0.21	-0.05	-0.01	12.00
26. Defense	27	0.21	3	0.15	24	0.22	-0.07	-0.02	11.11
24. Aircraft	57	0.45	8	0.41	49	0.46	-0.05	-0.02	14.04
15. Rubber and plastic products	73	0.58	10	0.51	63	0.59	-0.08	-0.04	13.70
5. Tobacco products	26	0.21	0	0.00	26	0.24	-0.24	-0.05	0.00
8. Printing and publishing	77	0.61	3	0.15	74	0.69	-0.54	-0.33	3.90
22. Electrical equipment	157	1.24	16	0.82	141	1.31	-0.50	-0.62	10.19
18. Constructions	162	1.28	8	0.41	154	1.43	-1.03	-1.31	4.94
30. Petroleum and natural gas	489	3.85	68	3.46	421	3.92	-0.46	-1.76	13.91
21. Machinery	532	4.19	75	3.82	457	4.25	-0.44	-1.82	14.10
45. Insurance	599	4.71	85	4.33	514	4.79	-0.46	-2.15	14.19
23. Automobile and trucks	220	1.73	12	0.61	208	1.94	-1.33	-2.29	5.45
14. Chemicals	376	2.96	42	2.14	334	3.11	-0.97	-2.87	11.17
35. Computers	406	3.20	44	2.24	362	3.37	-1.13	-3.61	10.84
13. Pharmaceutical products	449	3.53	28	1.43	421	3.92	-2.49	-8.81	6.24
36. Electronic equipments	784	6.17	84	4.28	700	6.52	-2.24	-13.82	10.71
42. Retail	868	6.83	78	3.97	790	7.35	-3.38	-23.11	8.99
31. Utilities	900	7.08	56	2.85	844	7.86	-5.01	-35.46	6.22
Total	12,706	100	1,964	100	10,742	100			15.46

Appendix 2 (cont.)

Panel B: Geographic distribution of headquarters

State	Full sample		IDB firm-years		Non-IDB firm-years		(D-F)	B*(D-F)	(C)/(A) in %
	Freq. (A)	Pct. (B)	Freq. (C)	Pct. (D)	Freq. (E)	Pct. (F)			
Texas	1228	9.66	251	12.78	977	9.10	3.68	35.60	20.44
Illinois	723	5.69	154	7.84	569	5.30	2.54	14.48	21.30
Georgia	342	2.69	81	4.12	261	2.43	1.69	4.56	23.68
North Carolina	264	2.08	59	3.00	205	1.91	1.10	2.28	22.35
Indiana	179	1.41	45	2.29	134	1.25	1.04	1.47	25.14
Washington	236	1.86	49	2.49	187	1.74	0.75	1.40	20.76
Tennessee	257	2.02	49	2.49	208	1.94	0.56	1.13	19.07
Iowa	67	0.53	23	1.17	44	0.41	0.76	0.40	34.33
Arkansas	85	0.67	23	1.17	62	0.58	0.59	0.40	27.06
Louisiana	83	0.65	20	1.02	63	0.59	0.43	0.28	24.10
Oregon	125	0.98	23	1.17	102	0.95	0.22	0.22	18.40
Nebraska	59	0.46	16	0.81	43	0.40	0.41	0.19	27.12
Colorado	194	1.53	32	1.63	162	1.51	0.12	0.19	16.49
South Carolina	65	0.51	16	0.81	49	0.46	0.36	0.18	24.62
New Hampshire	38	0.30	13	0.66	25	0.23	0.43	0.13	34.21
Delaware	49	0.39	12	0.61	37	0.34	0.27	0.10	24.49
Oklahoma	90	0.71	16	0.81	74	0.69	0.13	0.09	17.78
Hawaii	33	0.26	10	0.51	23	0.21	0.30	0.08	30.30
North Dakota	15	0.12	12	0.61	3	0.03	0.58	0.07	80.00
Kentucky	74	0.58	13	0.66	61	0.57	0.09	0.05	17.57
Utah	60	0.47	11	0.56	49	0.46	0.10	0.05	18.33
Puerto Rico	12	0.09	9	0.46	3	0.03	0.43	0.04	75.00
Nevada	85	0.67	14	0.71	71	0.66	0.05	0.03	16.47
West Virginia	8	0.06	8	0.41	0	0.00	0.41	0.02	100.00
Montana	8	0.06	2	0.10	6	0.06	0.05	0.00	25.00
Alaska	1	0.01	1	0.05	0	0.00	0.05	0.00	100.00
New Mexico	13	0.10	0	0.00	13	0.12	-0.12	-0.01	0.00
South Dakota	20	0.16	0	0.00	20	0.19	-0.19	-0.03	0.00
Maine	34	0.27	3	0.15	31	0.29	-0.14	-0.04	8.82
Mississippi	28	0.22	1	0.05	27	0.25	-0.20	-0.04	3.57
Vermont	26	0.20	0	0.00	26	0.24	-0.24	-0.05	0.00
Non US (Bermuda and Quebec)	48	0.38	4	0.20	44	0.41	-0.21	-0.08	8.33
Alabama	138	1.09	20	1.02	118	1.10	-0.08	-0.09	14.49
Idaho	42	0.33	0	0.00	42	0.39	-0.39	-0.13	0.00
Kansas	59	0.46	4	0.20	55	0.51	-0.31	-0.14	6.78
Maryland	138	1.09	19	0.97	119	1.11	-0.14	-0.15	13.77
Rhode Island	47	0.37	0	0.00	47	0.44	-0.44	-0.16	0.00
District of Columbia	55	0.43	0	0.00	55	0.51	-0.51	-0.22	0.00
Arizona	170	1.34	20	1.02	150	1.40	-0.38	-0.51	11.76
Missouri	311	2.45	41	2.09	270	2.51	-0.43	-1.04	13.18
Michigan	272	2.14	30	1.53	242	2.25	-0.73	-1.55	11.03
Florida	432	3.40	57	2.90	375	3.49	-0.59	-2.00	13.19
Connecticut	324	2.55	36	1.83	288	2.68	-0.85	-2.16	11.11
Wisconsin	263	2.07	22	1.12	241	2.24	-1.12	-2.33	8.37
New Jersey	489	3.85	63	3.21	426	3.97	-0.76	-2.92	12.88
Virginia	302	2.38	19	0.97	283	2.63	-1.67	-3.97	6.29
Minnesota	445	3.50	43	2.19	402	3.74	-1.55	-5.44	9.66
Pennsylvania	573	4.51	68	3.46	505	4.70	-1.24	-5.59	11.87
Massachusetts	545	4.29	60	3.05	485	4.51	-1.46	-6.26	11.01
Ohio	657	5.17	78	3.97	579	5.39	-1.42	-7.33	11.87
California	1910	15.03	284	14.46	1626	15.14	-0.68	-10.17	14.87
New York	985	7.75	130	6.62	855	7.96	-1.34	-10.39	13.20
Total	12,706	100	1,964	100	10,742	100			15.46

Appendix 3: Descriptive statistics and variable definitions

Variable: Definition and explanations	Obs.	Mean	Q1	Median	Q3	Std.
Dependent variables						
Total compensation: ExecuComp data item TDC1 that includes sum of salary, bonus, the value of stock options and restricted stock granted during the year, long-term incentive payouts, and other miscellaneous compensation; converted to 2000 constant dollars and expressed in thousands.	11,547	5,584	1,285	2,695	5,669	22,484
Cash compensation: ExecuComp data item TOTAL_CURR that includes sum of salary and bonus; converted to 2000 constant dollars and expressed in thousands.	11,547	1,428	606	972	1,686	1,681
Log total compensation: Log (total compensation + 1)	11,547	7.908	7.159	7.899	8.643	1.166
Log cash compensation: Log (cash compensation + 1)	11,547	6.883	6.408	6.881	7.431	1.000
Option compensation ratio: Option compensation / Total compensation; in %. Data obtained from ExecuComp	11,538	0.3249	0	0.2969	0.5578	0.2966
Equity compensation ratio: Equity based compensation / Total compensation; in %. Data obtained from ExecuComp	11,538	0.3953	0	0.4196	0.6479	0.3060
Cash compensation ratio: Salary and bonus / Total compensation; in %. Data obtained from ExecuComp	11,538	0.4669	0.2467	0.4129	0.6539	0.2797
Salary compensation ratio: Salary / Total compensation; in %. Data obtained from ExecuComp	11,538	0.2929	0.1262	0.2245	0.3895	0.2336
CEO turnover: A change of CEO as shown in ExecuComp (0/1)	11,547	0.1239				
Tobin's q: (Book value of total assets + Market value of equity - Book value of equity) / Book value of total assets; from Compustat. †	11,533	1.959	1.146	1.467	2.154	1.444
Industry adjusted Tobin's q: Tobin's q - median Tobin's q for the firm's Fama-French 48 industry; from Compustat. †	11,533	0.4312	-0.1514	0.0633	0.5606	1.3019
Independent variables: Board characteristics						
Board size: Number of directors on the board; calculated from RM Directors	11,547	9.46	7	9	11	2.86
Fraction of independent directors: Fraction of independent directors on the board; calculated from RM Directors	11,547	0.671	0.570	0.700	0.800	0.169
CEO co-option: Fraction of directors joined the board after the CEO appointment; calculated from RM Director and Execucomp	11,406	0.387	0.091	0.333	0.667	0.324
Outside CEO-directors: Fraction of non-employee directors that are active CEOs; calculated from RM Director	11,547	0.145	0	0.125	0.222	0.134
CEO is chairman: CEO is also the chairman of the board; obtained from ExecuComp (1/0)	11,547	0.6359				
CEO is the only insider: CEO is the only employee-director; based on RM Director and Execucomp (1/0)	11,267	0.4860				
CEO on nominating committee: CEO is on the nominating committee or on the corporate governance committee when there is no nominating committee; based on RM Director and Execucomp (1/0)	11,453	0.2972				
Independent variables: CEO characteristics						
CEO age: CEO's age on fiscal year *t*; based on Execucomp data	11,519	54.71	50	55	59	7.24
CEO ag64: (0/1) CEO's age is 64 or above based on Execucomp data	11,519	0.0951				
Tenure as CEO: Number of years as CEO; calculated from Execucomp data	11,069	7.54	3	5	10	7.08
CEO's board tenure: Number of years as on the board; calculated from RM Directors	11,518	9.84	3	7	14	8.68
Max (CEO's board tenure, tenure as CEO): Higher of the number of years as CEO (calculated from Execucomp) and the number of years as on the board (calculated from RM Directors)	11,543	10.41	4	8	15	8.62
CEO stock ownership %: CEO ownership percentage as the ratio of shares held by CEO and the number of shares outstanding; based on ExecuComp data. †	11,088	2.234	0.094	0.306	1.130	5.714
Log CEO stock ownership: Log ((CEO stock ownership*100) +1) †	11,088	3.649	2.338	3.454	4.182	1.874

Appendix 3 (cont.)

Variable: Definition and explanations	Obs.	Mean	Q1	Median	Q3	Std.
Independent variables: Firm characteristics						
Firm age: Max(CRSP listing age, Compustat listing age)	11,547	28.37	12	22	41	19.88
Market cap$_{t-1}$: Market value of equity, in millions of constant 2000 dollars; obtained from Compustat. †	11,533	7,272	626	1,570	4,975	20,190
Total assets$_{t-1}$: in millions of constant 2000 dollars; obtained from Compustat. †	11,545	11,284	574	1,649	6,010	41,426
Sales$_{t-1}$: in millions of constant 2000 dollars; obtained from Compustat. †	11,542	4,497	504	1,276	3,881	9,487
Log market cap$_{t-1}$: Log (market cap$_{t-1}$ + 1) †	11,533	7.53	6.44	7.36	8.51	1.54
Log total assets$_{t-1}$: Log (total assets$_{t-1}$ + 1) †	11,545	7.62	6.35	7.41	8.70	1.68
Log sales$_{t-1}$: Log (sales$_{t-1}$ + 1) †	11,542	7.27	6.23	7.15	8.26	1.49
G-index: Governance Index equals the number of anti-takeover provisions in a firm out of 24 different bylaw, charter provisions, and state laws from Gompers, Ishii, and Metrick (2003); original data from RM Governance	10,775	9.39	8	9	11	2.62
E-index: Entrenchment Index consists of 6 different anti-takeover provisions from bylaws and charter amendments, from Bebchuk, Cohen, and Ferrell (2009) ; original data from RM Governance	10,775	2.32	1	2	3	1.27
Classified board: Firm has a classified or staggered board; original data from RM Governance (1/0)	10,775	0.6195				
Net E-index: E-index excluding classified board; original data from RM Governance	10,775	1.70	1	2	2	1.03
Total institutional ownership$_{t-1}$ %: Percentage of the total shares outstanding held by institutional investors; data from TFN Institutional. †	11,547	58.86	45.82	64.00	78.02	26.44
Sales growth % : It is the mean of yearly sales growth rate of the past 3 year (i.e., sales growth is computed as $\frac{1}{3}\sum_{s=1}^{3} log\left(\frac{sales_{t-s}}{sales_{t-s-1}}\right)$ and expressed in percentage); from Compustat. †	11,538	12.69	3.13	9.74	18.91	16.63
Tobin's q$_{t-1}$: (Book value of total assets + Market value of equity - Book value of equity) / Book value of total assets; from Compustat.†	11,530	2.07	1.16	1.50	2.24	1.66
Market-adjusted stock return$_{t-1}$ % : The average market-adjusted daily stock returns. Adjusted by subtracting the daily return on the CRSP (NYSE, AMEX and Nasdaq) equal-weighted market index. †	11,385	-0.0142	-0.1178	-0.0241	0.0715	0.1764
Standard deviation of stock retuns$_{t-1}$ % : Standard deviation of daily stock returns over the fiscal year *t-1*. We require that at least two thirds of the daily stock returns over this period be available on CRSP. †	11,385	2.7694	1.8237	2.4501	3.3966	1.3366
Independent variables: Financial ratios						
ROA$_{t-1}$: Net income / Total assets; from Compustat. †	11,545	0.0393	0.0130	0.0422	0.0823	0.0966
Industry adjusted ROA$_{t-1}$: ROA$_{t-1}$ minus Fama-French 48 industry median ROA$_{t-1}$ †	11,545	0.0449	-0.0004	0.0267	0.0809	0.1122
OPS$_{t-1}$: Earnings before depreciation, interest, and tax / Sales; from Compustat. †	11,394	0.1808	0.0948	0.1566	0.2580	0.1722
Industry adjusted OPS$_{t-1}$: OPS$_{t-1}$ minus Fama-French 48 industry median OPS$_{t-1}$ †	11,394	0.0288	-0.0010	0.0512	0.1298	3.5838
Cash holding$_{t-1}$: Cash and short term investment / Total assets; form Compustat. †	11,544	0.1314	0.0192	0.0561	0.1810	0.1674
Cash flow$_{t-1}$: (Income before extraordinary items + Depreciation and amortization) / Sales; from Compustat. †	11,542	0.1082	0.0595	0.1059	0.1685	0.1747
R&D to sales$_{t-1}$: R&D expense / Sales; form Compustat. Any missing value of R&D expenditure is replaces with zero. †	11,542	0.0422	0	0	0.0330	0.1093
Advertising expenses to sales$_{t-1}$: Advertising expenses / Sales; form Compustat. †	11,542	0.0088	0	0	0.0065	0.0219
Capital expenditure to total assets$_{t-1}$: Capital expenditure / Total assets; from Compustat. †	11,542	0.0752	0.0196	0.0403	0.0810	0.1216
Dividend yield$_{t-1}$ % : Common dividend / Market value of common stock; from Compustat. †	11,533	1.2414	0	0.5200	1.9800	1.6702

† Top and bottom half percent values of the variables are winsorized.

Appendix 4: Correlations

The table presents Pearson product moment correlations (bottom left corner) and Spearman rank correlations (top right corner, *italicized*) among variables that measure firm age, firm size, CEO power, board characteristics and shareholder rights. The sample size is 9,970 firm-years. Correlations with absolute values of 0.25 or higher (unrelated to statistical significance) are indicated in bold face.

Spearman's correlations / Pearson's product moment correlations	Firm age	Log market cap$_{t-1}$	Log total assets$_{t-1}$	Log sales$_{t-1}$	Log CEO stock ownership	Max (CEO's board tenure, tenure as CEO)	Board size	Fraction of independent directors	CEO co-option	Fraction of outside CEO-directors	CEO is chairman (0/1)	CEO is the only insider (0/1)	CEO on the nominating committee (0/1)	Classified board (0/1)	G-index	Net E-index
Firm age		***0.292***	***0.417***	***0.456***	***-0.255***	*-0.062*	***0.406***	*0.244*	*-0.145*	*0.199*	*0.166*	*0.081*	*-0.236*	*0.001*	***0.335***	*0.116*
Log market cap$_{t-1}$	**0.326**		***0.818***	***0.759***	***-0.325***	*-0.018*	***0.458***	*0.129*	*-0.014*	*0.168*	*0.165*	*-0.055*	*-0.196*	*-0.044*	*0.114*	*-0.037*
Log total assets$_{t-1}$	**0.408**	**0.818**		***0.833***	***-0.305***	*-0.037*	***0.596***	*0.190*	*-0.031*	*0.183*	*0.198*	*-0.047*	*-0.241*	*0.017*	*0.218*	*0.068*
Log sales$_{t-1}$	**0.480**	**0.777**	**0.835**		***-0.298***	*-0.071*	***0.528***	*0.180*	*-0.064*	*0.210*	*0.206*	*-0.022*	*-0.242*	*0.018*	*0.232*	*0.041*
Log CEO stock ownership	**-0.266**	**-0.310**	**-0.287**	**-0.282**		***0.569***	*-0.236*	*-0.245*	***0.383***	*-0.163*	*0.121*	*-0.122*	*0.244*	*0.028*	*-0.105*	*-0.105*
Max (CEO's board tenure, tenure as CEO)	-0.096	-0.036	-0.050	-0.076	**0.580**		*-0.034*	*-0.205*	***0.625***	*-0.100*	***0.255***	*-0.197*	*0.188*	*-0.017*	*-0.083*	*-0.124*
Board size	**0.335**	**0.465**	**0.606**	**0.495**	-0.217	-0.013		*0.119*	*-0.051*	*0.170*	*0.114*	*-0.191*	*-0.215*	*0.110*	***0.279***	*0.132*
Fraction of independent directors	**0.254**	0.123	0.183	0.168	**-0.267**	**-0.249**	0.095		*-0.035*	*0.185*	*0.131*	***0.485***	***-0.321***	*0.057*	*0.212*	*0.222*
CEO co-option	-0.162	-0.025	-0.033	-0.071	**0.394**	**0.562**	-0.035	-0.062		*-0.062*	***0.271***	*-0.052*	*0.105*	*0.005*	*-0.075*	*-0.062*
Fraction of outside CEO-directors	0.226	0.176	0.199	0.210	-0.161	-0.114	0.166	0.187	-0.068		*0.111*	*0.080*	*-0.048*	*0.037*	*0.141*	*0.053*
CEO is chairman (0/1)	0.188	0.166	0.196	0.203	0.133	0.217	0.100	0.123	**0.261**	0.119		*0.047*	*-0.014*	*0.038*	*0.139*	*0.073*
CEO is the only insider (0/1)	0.089	-0.065	-0.052	-0.027	-0.138	-0.218	-0.212	**0.453**	-0.064	0.087	0.047		*-0.161*	*0.005*	*0.069*	*0.111*
CEO on the nominating committee (0/1)	-0.234	-0.197	-0.235	-0.241	**0.256**	0.201	-0.172	**-0.349**	0.115	-0.043	-0.014	-0.161		*-0.048*	*-0.200*	*-0.186*
Classified board (0/1)	-0.004	-0.063	-0.007	0.001	0.023	-0.012	0.091	0.059	0.007	0.041	0.038	0.005	-0.048		***0.497***	***0.298***
G-index	**0.294**	0.083	0.175	0.194	-0.114	-0.072	0.233	0.211	-0.078	0.147	0.138	0.070	-0.198	**0.491**		***0.630***
Net E-index	0.088	-0.066	0.042	0.016	-0.134	-0.134	0.107	0.228	-0.061	0.048	0.072	0.106	-0.181	**0.298**	**0.635**	

3. CORPORATE FINANCIAL AND INVESTMENT POLICIES IN THE PRESENCE OF A BLOCKHOLDER ON THE BOARD

3.1 Introduction

Separation of ownership and control creates agency problems between managers and shareholders (see, e.g., Berle and Means (1932) and Jensen and Meckling (1976)). These problems can affect a firm's financial and investment policies (see, e.g., Easterbrook (1984), Jensen (1996), and La Porta et al. (2000)). Several control mechanisms, both internal and external to the firm, work to reduce these agency problems (see, e.g., Shleifer and Vishny (1986, 1997), Agrawal and Knoeber (1996), and Becht, Bolton and Röell (2007)). In this paper we examine the role of a potentially potent governance mechanism, an independent director who is also a blockholder (IDB).[26]

The crux of agency problems between managers and shareholders is weak monitoring and inefficient contracting with managers. In firms with dispersed shareholdings, free-rider problems impede monitoring by shareholders. Moreover, CEO compensation contracts are inherently incomplete and require continuous monitoring and re-contracting (see, e.g., Zingales (1998)). Shareholders, therefore, would be wealthier if there was a mechanism that could overcome this free-rider problem. The presence of an IDB in a firm can serve as a powerful control mechanism because an IDB has both the incentive and the ability to monitor managers

[26] We define a blockholder as an individual who owns at least \$15 million of a firm's equity in 2000 dollars. This value is roughly equal to 1% of the median market capitalization (\$1.6 billion) of our sample firm-years.

because of his substantial shareholdings in the firm, his board seat, and not having his career or business interests depend on the CEO.

An IDB can affect a firm's value in various ways. For instance, Agrawal and Nasser (2009) find that IDBs play a significant role in efficient monitoring and contracting with the CEO. Although an IDB's influence on CEO pay and contracting is intuitively more obvious, it is less obvious whether an IDB plays a significant role in corporate financial and investment policies. It is, nevertheless, an important question. Although a large literature, briefly reviewed later in this section, examines the relations between various governance mechanisms and agency problems manifested in corporate financial and investment policies, no prior study has examined the role of a large stockholder on the board in this context. We attempt to fill this gap in the literature.

An IDB may influence a firm's investment and financial policies in several ways. First, the CEO is mainly responsible for corporate financial and investment policies. These major decisions are strategic and therefore may be subject to board approval, giving an IDB a direct say in key financial and investment policies that can affect firm value.[27] Second, even if an IDB does not directly influence these policy choices, his presence as a powerful governance mechanism may help the firm to change the levels of financial and investment policies from the levels that it had to maintain to signal governance quality in the absence of an IDB (see, e.g., La Porta et al. (2000)). A third possibility is that an IDB tries to mitigate agency problems by efficient contracting with the CEO and leaves the decision on corporate financial and investment policies

[27] The internal functioning of a board is largely a black box (see, e.g., Agrawal and Chen (2009)). Hence, it is difficult to observe from outside how an IDB influences corporate financial and investment policies. However, anecdotal evidence suggests that IDBs can influence these policies. Consider, for instance, the success of Kirk Kerkorian in forcing changes at Chrysler by disgorging about $8 billion of cash holdings in the forms of dividends and share repurchases (see Henderson and Stern (1996)). Similarly, Carl Icahn was successfully able to pressure Time Warner to carry out a $20 billion stock repurchase program (see Siklos and Sorkin (2006)). In addition, Cronqvist and Fahlenbrach (2009) find that large shareholders matter to firms' financial and investment policies.

to the CEO. The IDB, in this case, does not want to take the role of a 'back seat driver' and second-guess management on corporate policies. Under this hands-off approach, there would be no relationship between IDB presence and a firm's financial and investment policies, but the presence of an IDB would still be valuable.

Managers tend to be risk-averse because they have a substantial part of their personal wealth, including their human capital, tied up in their firms (see, e.g., Amihud and Lev (1981) and Agrawal and Mandelker (1987)). Hence, they may pass up on riskier projects, even if they have positive NPVs. In contrast, atomistic shareholders with diversified portfolios of stocks are concerned only with a firm's non-diversifiable risk and want managers to take all positive NPV projects. Since an IDB, like managers, also has a substantial ownership stake in the firm and likely holds an under-diversified portfolio, his risk tolerance may be lower than that of well-diversified shareholders. An IDB's interests may differ from those of other shareholders in other ways as well, and the IDB can use his unique position in the firm to extract private benefits. Thus, whether an IDB acts to reduce agency problems or exacerbate them is an empirical issue.

In this paper, we examine the effect of IDB presence on four key corporate financial and investment policy choices: the levels of cash holdings, payout, investment, and financial leverage. We also examine how IDB presence affects firm risk. Agrawal and Nasser (2009) find that IDB presence results in higher firm valuation, measured as Tobin's q. In this paper, we try to infer whether IDB presence reduces agency problems by examining the market valuation of the effect of IDB presence on each of the four policy choices.

First, cash and marketable securities comprise a significant portion of firms' total assets in the U.S. Several recent papers find that firms' cash holdings are affected by an agency motive, in addition to transactions, precautionary and tax motives (see, e.g., Dittmar and Mahrt-Smith

(2007) and Bates, Kahle, and Stulz (2009)). Mangers are risk-averse because their personal wealth portfolios are under-diversified (Amihud and Lev (1981)). Consequently, they may hold excessive levels of cash to reduce the risk of bankruptcy and to extract private benefits (Jensen (1986)). So, after controlling for other factors, IDB presence can decrease the level of cash holdings. On the other hand, Harford, Mansi and Maxwell (2008) find that firms with weaker governance hold a lower level of cash. They argue that managers with weaker governance hold less cash to avoid external discipline and change in corporate control. Under such a scenario, the presence of an IDB increases the level of cash holdings.

Second, both Easterbrook (1984) and Jensen (1986) argue, for different reasons, that paying dividends reduces agency problems. Easterbrook argues that paying out more dividends increases a firm's dependence on external capital and results in greater scrutiny from capital markets. Similarly, La Porta et al. (2000) argue, in what they call the 'substitute model' of dividends, that firms planning future equity issues pay dividends to create a reputation for good governance. A large shareholder on the board can substitute for capital market monitoring, enabling a firm with profitable investment opportunities to hold off on paying dividends. This argument implies that IDB presence should decrease the level of dividends. Alternatively, Jensen (1986) argues that when firms have large free cash flows, low dividend payments are a symptom of agency problems. To reduce the agency problem, the IDB may force the firm to pay higher dividends to increase firm value. This argument is similar to the 'outcome model' outlined by La Porta et al. (2000) and implies that IDB presence increases the level of dividends.

Third, both Jensen (1986) and Stulz (1990) argue that overinvestment is a manifestation of agency problems. Overinvestment is associated with empire building (see, e.g., Shleifer and Vishny (1997)), excessive perquisite consumption (Jensen and Meckling (1976)), diversifying acquisitions (see, e.g., Morck, Shleifer and Vishny (1990)), and subsidizing poorly performing divisions (see, e.g., Lamont (1997)). Managers of firms with high free cash flows are more inclined to overinvest. Hence, if overinvestment is a manifestation of agency problems in a firm, IDB presence should reduce investment levels. Alternatively, Bertrand and Mullainathan (2003) argue that mangers' preference for a 'quiet life' can lead firms to underinvest. In addition, managers of firms with low free cash flows may have to give up profitable projects because they may be unable to credibly signal project quality to raise external capital (see, e.g., Myers (1977) and Stulz (1990)). So IDB presence can increase capital expenditure because IDB monitoring forces managers to increase investment or makes it easier for the firm raise capital to invest in positive NPV projects.

Fourth, weak governance allows managers to choose less than the optimal level of debt (see, e.g., Berger, Ofek and Yermack (1997)). Managers are risk-averse and underdiversified in terms of their human capital; hence, they prefer lower level of leverage to reduce the firm's bankruptcy risk (see, e.g., Agrawal and Mandelker (1987)). IDB presence may pressure managers to increase debt to the optimal level. Alternatively, John and Knyazeva (2008)) argue that firms with weaker governance need to use more debt to signal fewer agency problems. IDB monitoring can substitute for debt's monitoring role, implying a negative relation between IDB presence and debt level.

Fifth, a blockholder is likely to underinvest in monitoring when the benefits of his monitoring are divided pro rata among all stockholders while he alone bears the costs. But the firm becomes more valuable when this free rider problem can be resolved. Huddart (1993) argues that blockholder monitoring works best when returns are not too risky. Hence, a blockholder would want to reduce firm risk. But different type of blockholders may be averse to different types of risk. For instance, institutional shareholders may not be too concerned about idiosyncratic risk because they hold well-diversified portfolios, but would be concerned about systematic risk. IDBs' portfolios, on the other hand, are likely to be under-diversified (see, e.g., Faccio, Marchica and Mura (2009)), so they would be concerned about total risk (i.e., the sum of systematic and unsystematic risk).

Finally, a nascent literature examines how the market evaluates changes in corporate financial and investment policies associated with various firm and governance attributes. This literature uses a methodology developed by Faulkender and Wang (2006), who examine how the marginal value of a firm's cash holdings is affected by its other financial policies. Dittmar and Mahrt-Smith (2007), for instance, examine how shareholder rights and institutional ownership impact firm value through a firm's cash holdings. Similarly, Brockman et al. (2009) examine how changes in cash holdings in family firms with founder-CEOs are valued by the market. Masulis, Wang and Xie (2009) extend this analysis to dual-class firms and examine how the divergence between insiders' voting rights and cash flow rights changes corporate cash holdings and capital expenditures, and how the market values these changes. We use this methodology to examine the market valuation of each of the financial and investment policy choices associated with IDB presence. This allows us to examine whether IDBs pursue private benefits through corporate financial and investment policies.

An imporatant concern in this paper is the potential endogeneity of IDB presence in a firm. We attempt to address this concern in several ways. First, we are able to instrument for the presence of IDB based on the fact that there is substantial variation in IDB presence across industries and geographic locations of firms' headquarters. We use lagged IDB-industry density and lagged IDB-state density as instruments for IDB presence in a two-stage least squares regression framework. Second, due to the binary nature of IDB, our main explanatory variable of interest, we are able to address selection bias concerns using Heckman two-stage and MLE treatment effect models. Identification of these models is achieved through exclusion restrictions, a much less demanding way of identification than the instrumental variables approach. Finally, although not reported in most tables, we use the lagged dependent policy choice variable as an additional regressor to account for possible omitted variables bias. Our results are qualitatively unchanged compared to specifications where the lagged dependent variable is excluded.

After controlling for other variables and accounting for the potential endogeneity of IDB presence, we find that firms with IDBs have significantly lower levels of cash holdings, dividend yields, repurchases, and total payout, and higher levels of capital expenditures. IDB presence has no significant impact on the levels of a firm's financial leverage and R&D expenditures. We also find that firms with IDBs have lower total, systematic and unsystematic risk. While IDB presence enhances overall firm valuation and the market appears to value a decrease in dividend yields associated with IDB presence, changes in other corporate policy choices associated with IDB presence do not appear to affect firm valuation.

These results have three implications. First, IDBs appears to take a 'hands-off' approach for firms' financial leverage and R&D activities but take an active role in reducing cash holdings and increasing investment spending. Second, lower dividends in firms with IDB and their higher market valuation suggest that IDB presence 'substitutes' costly signals for a firm's governance quality. Third, while IDB presence reduces firm risk, the market values IDB presence positively. This suggests that IDBs play a valuable role in reallocation of corporate resources and expunging dead-weight costs. As a whole, IDB presence appears to reduce agency costs.

This paper contributes to the literature in several ways. First, we examine whether a particular type of director, namely an IDB, influences a firm's financial and investment policies. Although numerous papers examine how boards of directors and other governance mechanisms affect executive compensation policies and acquisition performance, relatively few papers examine the influence on firms' financial and investment policies. Harford et al. (2008) examine how certain governance mechanisms (in particular, shareholder rights and ownership concentration) influence the level of a firm's cash holdings, dividends and capital expenditures. They find that firms with weaker governance hold smaller cash reserves, prefer repurchases over dividends, and increase capital expenditures in the presence of excess cash. Richardson (2006) finds that firms with activist investors are less likely to overinvest their free cash flows. However, these papers do not examine how these governance mechanisms affect agency costs via various corporate policies.

Second, a large literature examines the monitoring and contracting roles of blockholders, but few papers directly examine the influence of blockholders on firms' financial and investment policies, and agency problems emanating from these policies. Cronqvist and Fahlenbrach (2009) find that large shareholders matter to firm financial and investment policies because different large shareholders (e.g., activist and pension funds, corporations, individuals, mutual funds, hedge funds, etc.) exhibit distinct fixed effects on firm policies. In a blockholder-firm panel data framework they estimate blockholder fixed effects, and find that large shareholders with board representation have significantly larger blockholder fixed effects on dividend policy. However, they do not examine the level and valuation of various financial policies in the presence of blockholders, an issue we analyze here.

Third, prior literature examines the use of corporate financial policies as signals good governance. For example, Smith and Watts (1992) find that cross-sectional variations in firms' debt and dividend policies can be attributed to firms signaling their quality. John and Knyazeva (2008) find that weakly (internally and externally) governed firms are more likely to pre-commit to cash distributions through dividends and debt to signal lower agency problems. La Porta et al. (2000) argue in their 'substitute' model of dividends that the payment of dividends replaces other governance mechanisms when managers try to assure investors of lower agency problems in the firm. Officer (2006) finds that within a sample of firms that are predicted to pay dividends based on a firm's fundamentals, firms with weak governance are more likely to pay than their strongly governed counterparts. Our study informs whether the presence of IDBs helps managers substitute the costly signals that they provide to the market via corporate financial and investment policies that the firm has good governance.

Finally, our paper complements Masulis et al. (2009), which examines agency problems at dual-class firms; we use the same analytical framework to examine the magnitude of agency problems in the presence of an IDB in single-class firms. Furthermore, we generalize Faulkender and Wang's (2006) methodology to measure the market valuation of different corporate policy changes associated with IDB presence.

The rest of the paper proceeds as follows. Section 3.2 discusses the sample, data and methodology. Section 3.3 presents the results on levels of cash holdings, dividends, investments, and leverage. Section 3.4 presents the results on firm risk. Section 3.5 presents the results on the valuation of corporate financial and investment policies associated with IDB presence. Section 3.6 concludes.

3.2 Sample, data and methodology

Our sample comes from firm-years that are common in three databases—RiskMetrics Directors (RM Directors), Center for Research in Securities Prices (CRSP) and Compustat—over fiscal years 1998-2006 and meet our data requirements. Our main sample of IDBs comes from RM Directors database, which compiles its data from corporate proxy statements. In addition, we use RiskMetrics Governance (RM Governance), Thomson Reuters Institutional Ownership Data (TFN Institutional), ExecuComp, corporate proxy statements (via Livedgar), news stories (from Factiva), Wikipedia, and other Internet sources. Firms in our sample belong to the S&P 1500. We exclude finance and utility firms.

3.2.1 Main variable and sample construction

We define a blockholder as an individual who owns at least $15 million of firm's equity in 2000 dollars.[28] This value is roughly equal to 1% of the median market capitalization ($1.6 billion) of our sample firm-years.[29] We define independent directors as directors classified as independent or designated in RM Directors.[30] So an IDB is an independent director who is (or represents) a blockholder. The main variable of interest for our analysis is *IDB*, which is a binary

[28] All variables that are that represent dollar value are expressed in 2000 constant dollars. We use the CPI – All Urban Consumer series from the US Department of Labor inflation-adjusted.

[29] Agrawal and Nasser (2009) define a blockholder as an individual who either controls 1% or more of the equity's voting power or owns 1% or more of the equity cash flow rights; but for robustness purpose they also examine a dollar threshold definition of blockholder, same as ours. We follow a dollar threshold definition instead of a percentage threshold definition because a blockholder is less likely to follow a 'hands off' approach in corporate financial and investment policies when a significant portion of his personal wealth (which, unfortunately, we cannot measure due to data limitations) is invested in the firm, rather than significant portion of the firm's market capitalization.

[30] RM Directors defines as independent a director who is neither a current company employee nor is 'affiliated'. An affiliated director is a director who is a former employee of the company or of a majority-owned subsidiary; a provider of professional services — such as legal, consulting or financial — to the company or an executive of the service provider; a customer of or supplier to the company; a designee (i.e., a designated director) under a documented agreement between the company and a group, such as a significant shareholder; a director who controls more than 50% of the company's voting power; a family member of an employee; an interlocking director or an employee of an organization or institution that receives charitable gifts from the company.

variable that equals one if there is at least one IDB in a given firm-year, and equals zero otherwise.

Table 3.1 explains the construction of our sample. RM Directors obtains its data from proxy statements for shareholder meeting dates starting in 1996. Some of the key variables needed to compute a director's shareholdings are missing in the database for 1996. Also, some variables required for our analysis were not available after 2006. Hence, our analysis makes use of data for 1997-2006.

Table 3.1: Sample construction

This table shows the steps in obtaining the base sample for our analysis from S&P 1500 firms for the period 1998-2006.

Number of firm-year in the sample *Reason for dropping firm-years from the sample*	Number of firm-years dropped	Number of firm-years remaining
Firm-years available in RM Directors during calendar years 1997-2006		15,967
Firm-years missing in CRSP	0	
		15,967
Firm-years missing in Compustat	490	
		15,477
After conversion to fiscal year, number of firms-years that belongs to fiscal year 2007	83	
		15,394
Firm-years missing in ExecuComp	1,465	
		13,929
Exclude dual-class firms based on RM Governance	1,158	
Exclude additional dual-class firms based on CRSP data	65	
		12,706
Exclude fiscal year 1997	1,159	
		11,547
Exclude finance and utility firms	2,440	
Number of firm-years in the final sample		9,107

During 1997-2006, there are 15,967 distinct firm-calendar years in RM Directors.[31] We find all 15,967 firm-calendar years on CRSP. Since we use a fiscal year as the unit of time, we match each annual shareholder meeting date for a firm with the fiscal year in which the meeting is held. We obtain the fiscal year ending month for each firm from Compustat. We next match these 15,967 firm-fiscal years (henceforth, firm-years) with Compustat, and find 15,477 matches. After matching the annual meeting dates to the appropriate fiscal year, 83 firm-years fall under the 2007 fiscal year. Due to data limitations, we drop these observations. That leaves us with 15,394 RM Directors-CRSP-Compustat matched firm-years. Out of these, we find 13,929 firm-years with non-missing CEO data in execucomp. Our main analysis omits observations for the 1997 fiscal year because, as discussed in section 3.2.2 below, we use instrumental variables that are lagged by one year. In addition, we exclude 1,223 firm-year observations on dual-class firms because they tend to be family-controlled (see, e.g., DeAngelo and DeAngelo (1985)). After excluding financial and utility firms from our sample, our final sample for the main analysis consists of 9,107 firm-years over 1998-2006.

Appendix 1 provides an overview of our sample. Of the 9,107 firm-years in our sample, 1,229 or 13.5% of the firm-years have an IDB. Panel A reports the distribution of the number of fiscal years a firm is present in our sample. Over the 1998-2006 period, our sample contains 1,621 unique firms. Of these, there are 545 firms that are present in all nine years during 1998-2006 and 1,223 firms that are present in at least three years. Panel B shows the distribution of the proportion of a given firm's fiscal years that have an IDB. For example, 1,197 firms have no IDB for all the fiscal years that they are present in our sample. Panel C presents the number of firm-years in each fiscal year for IDB, non-IDB, and all firms in the sample. The sample size ranges

[31] A single firm-calendar year often includes data from multiple proxy statements. Since directors are usually elected at the annual general meeting of shareholders, typically held three months after the end of a fiscal year, we use the list of directors from the proxy statement for this meeting.

from 943 in 2006 to 1,070 in 2001. The percentage of firms with IDBs ranges from 12.31 in 1998 to 15.24 in 2000.

3.2.2 Instrumental variables and empirical methodology

Our main variable of interest, IDB, is likely endogenous. Individuals decide which firms to invest in and whether to try to obtain a board seat. This endogeneity can affect our analysis through either omitted variables or selection bias. We employ three different approaches to mitigate concerns about the endogeneity of IDB presence in a firm. First, we use the two-stage least squares (2SLS) estimation to account for potential endogeneity caused by unobservable omitted variables. Although the potential endogenous variable is binary, we use the linear probability model (LPM) in the first stage. We develop instruments for IDB based on the fact that there are significant variations in IDB density by geographic location and industry. Becker, Cronqvist and Fahlenbrach (2008) find that wealthy individuals tend to cluster more in certain geographic areas and invest in public companies located nearby, either due to better monitoring ability or lower asymmetric information.[32] Similarly, wealthy investors may tend to congregate in certain industries, either because they have specific industry-expertise or have skills that are more useful to certain industries. These factors can give rise to variations in blockholder and IDB presence by state and industry. While state- and industry-level densities of IDBs can explain IDB presence in a firm, these factors would not explain our main dependent variables (i.e., levels of cash holdings, dividends, investment, and leverage, firm risk and excess return) except via their effects on IDB presence in a firm.

We compute the state-level density of IDBs (denoted as IDB state-density) as the average value of the IDB dummy for all the public companies in our sample headquartered in a state in a

[32] The tendency of wealthy individuals to invest locally is consistent with the literature on local bias in investing (see, e.g., Lerner (1995), Coval and Moskowitz (1999), and Bailey, Kumar and Ng (2008)).

given fiscal year. For instance, an IDB density of 0.05 in California for fiscal year 2008 means that 5% of the public companies headquartered there in that year had an IB on their boards. We define the industry density of IDBs (denoted as IDB industry-density) for each of the 48 Fama and French (1997) industries similarly. We use these variations to develop instrumental variables for identification. Similar variables have been employed in other contexts by Villalonga (2004) and John and Kadyrzhanova (2009).

We use lagged IDB state-density and lagged IDB industry-density as instruments for IDB. By design, these instrumental variables (IVs) are highly correlated with IDB. Using lagged IDB-state and lagged IDB-industry densities as instruments helps us to remove any look-ahead bias in creating IVs and further reduces the possibility of the IVs being related to our main dependent variables. We calculate these instruments for fiscal years 1997-2006. The use of lagged densities forces us to exclude the 1997 data from our main analysis.

While the 2SLS estimator is potentially biased, it is consistent; and having a large sample makes the 2SLS results more reliable. We test for exogeneity using the Durbin-Wu-Hausman test, which examines the statistical difference between OLS and 2SLS coefficient estimates of the suspect endogenous variable. With two different IVs, we are also able to conduct an over-identification test. We use Wooldridge's (1995) over-identification test since we compute robust standard errors clustered at either the firm-level or the CEO-firm-level.[33] In addition, Bound, Jeager and Baker (1995) caution about weak instruments and suggest that one should not rely solely on the over-identifying restriction. Staiger and Stock (1997) suggest that the F-statistic of the IVs used in the first-stage regression should be reasonably high (more than 10).

[33] We compute robust standard errors clustered at the CEO-firm level because each CEO brings in distinct skills, strategy, and corporate culture to a firm. Bertrand and Schoar (2003) find that there are systematic differences in corporate decision-making across individual CEOs, which are related to differences in firm performance.

Some of our main dependent variables in section 3.3 below take on a limited range of values. Given that our main explanatory variable, IDB, is potentially endogenous, we use IV-probit or IV-Tobit methodology in those regressions. When the dependent variable is censored (as in the case of dividends, R&D expenditures or financial leverage), we use the IV-Tobit maximum likelihood estimator (MLE). In this framework, the main set of equations has a typical Tobit structure (i.e., the structural equation and the selection equation). In addition, we regress a linear equation for the endogenous variable on all exogenous variables from the structural equation and the IVs. We also conduct a Wald test for the exogeneity of the instrumented variable. When the dependent variable is binary (as in the case of dividend dummy regressions), we use the MLE of the probit model with an endogenous explanatory variable, namely IV-probit (see Wooldridge (2002, p. 476).

Second, we control for endogeneity in the form of selection bias of IDB by using treatment effect models. Heckman's (1979) two-stage treatment effect model is appropriate for estimating the average treatment effect and correcting for sample selection bias. In this model, the inverse Mill's ratio (Lambda), computed from the first-stage probit regression, is added as a covariate in the second-stage regression to account for any selection bias. We also use a MLE treatment effect model to estimate the selection and main equations simultaneously. We use the likelihood ratio (LR) test for the correlation between the error terms of the two equations to check for endogeneity.

We follow Agrawal and Nasser (AN, 2009) to develop the first-stage selection equation. However, they define a blockholder as an individual who either controls 1% or more of the equity's voting power or owns 1% or more of the equity cash flow rights ($IDB_{\%}$). Hence, we report the descriptive statistics and regressions of determinants of IDB presence in a firm based

Table 3.2: Determinants of IDB

Panel A shows univariate comparisons of mean and median values of some explanatory variables of IDB, followed by t-statistics for differences in means and z-statistics of the Wilcoxon test for differences in distributions, between non-IDB and IDB firms. Statistical significance at the 1%, 5%, and 10% levels in two-tailed tests is indicated by ***, **, and *, respectively. The last four columns report the Pearson product-moment correlation and Spearman rank correlation, and their p-values in two-tailed tests, between IDB and each variable. The sample consists of non-dual class S&P 1500 firms, except finance and utility firms, during the period 1998-2006 with relevant non-missing data. IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. Panel B of the table shows estimates of the linear probability model, logit and probit regressions of IDB. IDB is a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. The regressions include year dummies, Fama-French 12 industry dummies and an intercept term. P-values of the regression coefficients are computed using robust standard errors clustered at the CEO-firm level. All other variables are defined in Appendix 2. To reduce the influence of outliers, some variables, indicated in Appendix 2, are winsorized at the top and bottom 0.5% of the sample.

Panel A: Univariate tests and correlations

	Non-IDB firm-years				IDB firm-years				t-test	z-value	Pearson's correlation		Spearman's correlation	
	N	Mean	S.D.	Median	N	Mean	S.D.	Median			ρ	p-value	ρ	p-value
CEO is chairman (1/0)	7,878	0.630			1,229	0.565			4.393 ***		-0.046	0.000		
CEO on nomination comm. (1/0)	7,796	0.307			1,229	0.318			-0.779		0.008	0.436		
Outside CEO-directors	7,878	0.143	0.132	0.125	1,229	0.136	0.119	0.125	1.791 *	1.130	-0.019	0.073	-0.012	0.259
Board size	7,878	8.78	2.37	9	1,229	9.88	2.55	10	-15.009 ***	-14.546 ***	0.155	0.000	0.153	0.000
Fraction of independent directors	7,878	0.664	0.173	0.670	1,229	0.664	0.163	0.670	0.039	0.775	0.000	0.968	-0.008	0.439
Classified board (1/0)	7,392	0.618			1,117	0.556			3.972 ***		-0.043	0.000		
Net E index	7,392	1.696	0.997	2	1,117	1.499	1.090	2	6.084 ***	6.007 ***	-0.066	0.000	-0.065	0.000
Firm age	7,878	27.16	20.08	20	1,229	28.28	19.85	22	-1.830 *	-2.534 **	0.019	0.067	0.027	0.011
Market capitalization$_{t-1}$($ mill.)	7,866	7,117	22,457	1,430	1,228	16,011	36,141	3,242	-11.713 ***	-16.853 ***	0.122	0.000	0.177	0.000
Cash holdings$_{t-1}$	7,875	14.761	17.636	6.960	1,229	13.381	17.518	5.630	2.553 **	3.928 ***	-0.027	0.011	-0.041	0.000
Dividend yields$_{t-1}$	7,866	0.867	1.327	0	1,228	0.912	1.315	0.227	-1.111	-2.567 ***	0.012	0.267	0.027	0.010
OPS$_{t-1}$	7,851	14.441	17.412	13.490	1,221	18.249	18.505	17.840	-7.048 ***	-10.903 ***	0.074	0.000	0.115	0.000
R&D expenditures$_{t-1}$	7,876	3.475	5.649	0.470	1,229	2.927	5.172	0.170	3.198 ***	2.743 ***	-0.034	0.001	-0.029	0.006
Sales growth	7,857	13.025	16.464	9.676	1,223	17.715	20.966	12.802	-8.901 ***	-7.322 ***	0.093	0.000	0.077	0.000
Tobin's q$_{t-1}$	7,863	2.194	1.701	1.654	1,228	2.718	2.291	1.937	-9.527 ***	-9.205 ***	0.099	0.000	0.097	0.000
Stock return voaltility$_{t-1}$	7,771	3.007	1.335	2.709	1,210	2.760	1.226	2.475	6.047 ***	6.291 ***	-0.064	0.000	-0.067	0.000
Institutional ownership$_{t-1}$	7,878	0.617	0.265	0.680	1,229	0.560	0.262	0.607	7.012 ***	8.495 ***	-0.073	0.000	-0.089	0.000
IDB state-density $_{t-1}$	7,877	0.137	0.073	0.130	1,229	0.167	0.088	0.156	-12.959 ***	-11.631 ***	0.135	0.000	0.122	0.000
IDB industry density $_{t-1}$	7,877	0.127	0.075	0.117	1,229	0.162	0.112	0.135	-14.068 ***	-11.456 ***	0.146	0.000	0.120	0.000

Table 3.2 (cont.)

Panel B: Regressions								
	1		2		3		4	
	OLS		Logit		Probit		Probit	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
CEO is chairman (1/0)	-0.0473	0.000	-0.435	0.000	-0.229	0.000	-0.226	0.000
CEO on nominating committee (1/0)	0.0186	0.170	0.223	0.100	0.120	0.091	0.131	0.065
Outside CEO-directors	-0.1213	0.003	-1.333	0.002	-0.680	0.003	-0.662	0.004
Fraction of independent directors	0.0910	0.007	0.926	0.007	0.452	0.013	0.402	0.026
Board size	0.0177	0.000	0.150	0.000	0.084	0.000	0.084	0.000
Classified board (1/0)	-0.0268	0.042	-0.253	0.046	-0.139	0.037	-0.128	0.053
Net E index	-0.0079	0.257	-0.053	0.415	-0.031	0.358	-0.031	0.361
Firm age	-0.0011	0.004	-0.010	0.007	-0.005	0.009	-0.006	0.004
Log market capitalization$_{t-1}$	0.0265	0.000	0.237	0.000	0.127	0.000	0.133	0.000
Cash holdings$_{t-1}$	-0.0004	0.268	-0.005	0.249	-0.003	0.189		
Dividend yields$_{t-1}$	0.0002	0.667	0.003	0.557	0.001	0.674		
OPS$_{t-1}$	-0.0030	0.510	-0.052	0.300	-0.026	0.315		
R&D expenditures$_{t-1}$	-0.0003	0.766	-0.005	0.717	-0.002	0.760		
Tobin's q$_{t-1}$	0.0107	0.020	0.074	0.026	0.046	0.014	0.037	0.038
Sales growth	0.0015	0.000	0.014	0.000	0.008	0.000	0.008	0.000
Stock return volatility$_{t-1}$	-0.0140	0.010	-0.168	0.009	-0.090	0.007	-0.100	0.002
Institutional ownership $_{t-1}$	-0.0947	0.000	-0.787	0.000	-0.439	0.000	-0.430	0.000
IDB state-density $_{t-1}$	0.5058	0.000	4.245	0.000	2.316	0.000	2.298	0.000
IDB industry density $_{t-1}$	0.4619	0.000	3.025	0.000	1.733	0.000	1.777	0.000
N	8,300		8,300		8,300		8,330	
Adjusted R^2 /Pseudo R^2	0.103		0.128		0.129		0.127	

on our dollar threshold definition of a blockholder ($IDB_\$$ or IDB) in Table 3.2. Panel A presents univariate tests of the determinants of IDB for firm-years with and without IDBs. Both mean and median differences between IDB and non-IDB firms are significantly different for all except two variables.[34]

[34] These two variables are CEO on the nomination committee and the fraction of independent directors. In the regression framework, the fraction of independent directors is highly significant. Although CEO on the nominating committee variable is insignificant in the regression framework, we still include this variable as a measure of CEO power. In the case of CEO power, there are two opposing forces at work. Since independent blockholders (IBs) have strong incentives and the ability to monitor the CEO, powerful CEOs are likely to resist IBs' appointment to the board, making IDB presence less likely in firms with powerful CEOs. But firms with strong (and perhaps entrenched) CEOs are precisely the ones that stand to benefit more from IDB presence, increasing an investor's incentive to acquire a large block and seek a board seat.

Panel B presents regression results of IDB on potential determinants of IDB presence. Models 1, 2 and 3 implement OLS, Logit and Probit regressions, respectively, and include as covariates the set of variables shown in Panel A. The results are similar to AN, except for a few interesting differences. First, firms with $IDB_{\$}$ are larger in size, while firms with $IDB_{\%}$ (in AN) are smaller. Second, $IDB_{\$}$ firms have significantly higher Tobin's q but are unrelated to past performance measured by operating performance to sales (OPS); $IDB_{\%}$ firms, on the other hand, are unrelated to Tobin's q but have significantly lower OPS. Finally, corporate policy variables such as cash holdings, dividend yields and R&D expenditures are unrelated to $IDB_{\$}$ presence but are significantly negatively related to $IDB_{\%}$ presence. All these differences, to a certain extent, are natural concomitants of the dollar threshold definition of a blockholder.

Model 4 is the same as model 3, except that we exclude cash holdings, dividend yields, R&D expenditures and OPS as ovariates. Using either model 3 or 4 as the selection model of the treatment effect models shows no qualitative differences in results. Hence, for reporting purpose we use model 3 as the selection equation for all treatment effect models.

Third, following Harford, Mansi and Maxwell (2008), we use the lagged dependent variable as a covariate to mitigate a potential omitted variable bias in policy choice regressions. Our results are similar with or without the inclusion of lagged dependent variable. Hence, in most cases we report results without the lagged dependent variable as a covariate. In addition, we include a large set of covariates that can explain the relevant dependent variables in an attempt to mitigate the potential endogeneity caused by omitted variables.

3.2.3 Dependent variables

We construct all of the financial and investment policy variables of a firm using Compustat data. To measure the level of cash, we define cash holdings as cash plus marketable securities divided by total assets. We use four different variables to measure firms' payout policies: dividend yield, dividend dummy, repurchases and total payout. Dividend yield is defined as common dividends divided by market capitalization; dividend dummy is a binary variable that equals one if a firm pays dividends in a given fiscal year, and equals zero otherwise. We define repurchases as the total expenditure on the purchase of common and preferred stock divided by equity market capitalization. Total payout is sum of dividend yield and repurchases. We measure the level of a firm's investment as capital expenditures or R&D expenditures, both scaled by total assets. We also examine total investment, measured as the sum of capital expenditures and R&D expenditures. Finally, we measure a firm's debt level as leverage, which equals total debt as a percentage of total assets.

We use three measures of equity risk: total risk, systematic risk and unsystematic risk. Using CRSP data, we measure total risk as the variance of daily stock returns over a fiscal year. We then decompose total risk using a market model. Variance of the predicted portion of the market model is defined as the systematic risk and variance of the residual of the market model is defined as unsystematic risk. Since all of these risk measures have skewed distributions, we use their natural logarithm in the regressions. For valuation regressions, we use excess return as the dependent variable. We define excess return as a firm's buy and hold stock return over a fiscal-year minus the return on the corresponding Fama and French (1993) 5×5 size and market-to-book value portfolio.[35]

Appendix 2 provides descriptive statistics of these variables. The median cash holding is 7.12% of total assets. About 50% of our sample firm-years pay no dividends and the median dividend yield is about 1.44%. Similarly, 41.86% (25.43%) of the sample firm-years have no

[35] We obtain Fama and French 5×5 size and book-to-market portfolio returns from Professor Kenneth French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. We also obtain Fama and French industry classifications from this website.

repurchases (payouts). The median capital expenditures, R&D expenditure and total debt are about 7.33%, 4.69% and 33.38% of the book value of total assets, respectively. In our sample, about 12.10% of the firm-years have no debt and 46.50% of the firm-years incur no R&D expenditures.

3.2.4 Independent variables

In addition to IDB, our main explanatory variable of interest, the independent variables in our analysis consist of financial ratios and characteristics of boards, CEOs, and firms. We also include year dummies and Fama and French 12 industry dummies.[36] We winsorize the top and bottom one-half percent of the observations of all financial variables, ownership and compensation variables, firm size variables, sales growth, Tobin's q, stock returns and volatility. Appendix 2 provides definitions and descriptive statistics of these variables.

The typical firm in the sample is fairly large, with median market capitalization and total assets of about $1.65 billion and $1.46 billion, respectively, in 2000 dollars. The median firm age (using earliest of CRSP and Compustat listing dates) is 20 years. The median board size is 9 and the median fraction of independent directors is 0.67. The median total ownership of a firm's top-five executives is 1.68% and the median institutional ownership is 70%. The ratio of incentive pay to total pay for the top-five mangers has a median value of 42%.

3.3 IDB presence and corporate financial and investment policies

This section examines the relations between IDB presence in a firm and levels of cash holdings (section 3.3.1), dividends and payout (section 3.3.2), investment (section 3.3.3), and financial leverage (section 3.3.4). Panel A of Table 3.3 shows univariate comparisons of mean and median

[36] Finer classifications, such as Fama and French (1997) 48 industries, result in partitions with many industries having only one or two firms in our sample. Since many of the board characteristic variables (e.g., IDB, board size) are highly persistent over time, using industry dummies based on finer industry classifications would be tantamount to including firm-specific dummies.

Table 3.3: Univariate tests and correlations

Panel A (B) shows univariate comparisons of mean and median values of dependent (independent) variables, followed by t-statistics for differences in means and z-statistics of the Wilcoxon test for differences in distributions, between non-IDB and IDB firms. Statistical significance at the 1%, 5%, and 10% levels in two-tailed tests is indicated by ***, **, and *, respectively. The last four columns report the Pearson product-moment correlation and Spearman rank correlation, and their p-values in two-tailed tests, between IDB and each variable. The sample consists of non-dual class S&P 1500 firms, except finance and utility firms, during the period 1998-2006 with relevant non-missing data. All variables are defined in Appendix 3, which also indicates the variables winsorized at the top and bottom 0.5% of the sample.

	Non-IDB firm-years				IDB firm-years				t-test	z-value	Pearson's correlation		Spearman's correlation	
	N	Mean	S.D.	Median	N	Mean	S.D.	Median			ρ	p-value	ρ	p-value
Panel A: Dependent variables														
Cash holdings$_t$	7,874	14.869	17.390	7.347	1,229	12.906	16.185	5.960	3.697 ***	3.948 ***	-0.039	0.000	-0.042	0.000
Dividend yields$_t$	7,868	0.892	1.389	0	1,229	0.931	1.347	0.261	-0.919	-2.784 ***	0.010	0.358	0.029	0.005
Dividend dummy$_t$ (1/0)	7,877	0.489			1,229	0.548			-3.868 ***		0.041	0.000		
Repurchases$_t$	7,868	2.201	4.124	0.270	1,229	1.949	3.570	0.316	2.028 **	0.167	-0.021	0.043	-0.002	0.867
Total payout$_t$	7,868	3.124	4.535	1.717	1,229	2.917	4.044	1.696	1.512	-0.548	-0.016	0.131	0.006	0.584
Capital expenditures$_t$	7,877	5.688	5.120	4.150	1,229	6.062	5.535	4.330	-2.358 **	-2.173 **	0.025	0.018	0.023	0.030
R&D expenditures$_t$	7,877	3.443	5.567	0.470	1,229	2.840	4.883	0.200	3.585 ***	2.734 ***	-0.038	0.000	-0.029	0.006
Investment expenditures$_t$	7,877	9.169	7.166	7.300	1,229	8.938	7.109	6.890	1.053	1.522	-0.011	0.292	-0.016	0.128
Leverage$_t$	7,877	21.925	17.604	21.400	1,229	23.243	18.008	21.920	-2.433 **	-2.396 **	0.026	0.015	0.025	0.017
Total risk$_t$	7,872	-7.222	0.867	-7.277	1,228	-7.378	0.847	-7.419	5.854 ***	5.543 ***	-0.061	0.000	-0.058	0.000
Systematic risk$_t$	7,872	-9.339	1.340	-9.276	1,228	-9.461	1.276	-9.414	2.966 ***	3.800 ***	-0.031	0.003	-0.040	0.000
Unsystematic risk$_t$	7,872	-7.418	0.889	-7.468	1,228	-7.578	0.867	-7.618	5.855 ***	5.495 ***	-0.061	0.000	-0.058	0.000
Excess return$_t$	7,818	2.782	55.930	-3.146	1,219	9.801	56.992	1.363	-4.065 ***	-4.528 ***	0.043	0.000	0.048	0.000
Panel B: Independent variables														
Market capitalization$_t$ ($ mill.)	7,868	7,352	23,231	1,464	1,229	16,900	37,171	3,616	-12.179 ***	-18.699 ***	0.127	0.000	0.195	0.000
Total asset$_t$ ($ mill.)	7,877	5,184	12,924	1,316	1,229	8,668	14,848	2,636	-8.605 ***	-14.734 ***	0.090	0.000	0.154	0.000
Sales$_t$ ($ mill.)	7,876	4,968	11,429	1,374	1,229	7,672	13,676	2,367	-7.500 ***	-11.443 ***	0.078	0.000	0.120	0.000
PPE$_t$	7,859	28.639	21.570	22.57	1,229	30.695	22.606	25.745	-3.087 ***	-2.972 ***	0.032	0.002	0.031	0.003
NWC$_t$	7,875	7.379	14.479	6.590	1,229	5.668	14.143	3.667	3.863 ***	4.851 ***	-0.041	0.000	-0.051	0.000
Acquisition$_t$	7,877	2.895	6.311	0	1,229	2.872	6.170	0.122	0.121	-1.386	-0.001	0.904	0.015	0.166
Cash flow$_t$	7,859	8.390	8.185	8.668	1,224	9.182	8.119	9.044	-3.153 ***	-3.304 ***	0.033	0.002	0.035	0.001
Cash flow volatility	7,878	5.047	6.004	3.132	1,224	4.883	6.505	2.937	0.880	4.001 ***	-0.009	0.379	-0.042	0.000
Loss indicator (1/0)	7,875	0.198			1,229	0.142			4.694 ***		-0.049	0.000		
Bond rating (1/0)	7,878	0.510			1,229	0.613			-6.743 ***		0.071	0.000		

Table 3.3 (cont.)

Panel B: Independent variables (cont.)

	Non-IDB firm-years				IDB firm-years				t-test	z-value	Pearson's correlation		Spearman's correlation	
	N	Mean	S.D.	Median	N	Mean	S.D.	Median			ρ	p-value	ρ	p-value
ROA_{t-1}	7,876	4.036	11.068	5.255	1,229	5.429	10.097	5.710	-4.152 ***	-4.403 ***	0.044	0.000	0.046	0.000
Stock $return_{t-1}$ ($\times 10^4$)	7,768	8.523	18.494	7.919	1,210	9.714	18.086	8.330	-2.090 **	-1.975 **	0.022	0.037	0.021	0.048
Return $volatility_t$	7,853	2.977	1.384	2.633	1,226	2.744	1.273	2.447	5.554 ***	5.669 ***	-0.058	0.000	-0.060	0.000
Net equity $issuance_t$	7,876	-1.012	6.894	0.005	1,229	-1.575	6.721	0	2.657 ***	2.063 **	-0.028	0.008	-0.022	0.039
Net debt $issuance_t$	7,842	1.240	9.522	0	1,229	1.704	9.490	0	-1.590	-1.424	0.017	0.112	0.015	0.155
Percentage of option-based pay_t	7,878	39.849	28.002	41.768	1,229	40.426	29.610	41.381	-0.667	-0.330	0.007	0.505	0.004	0.742
Insider $ownership_t$	7,870	3.438	7.245	0.706	1,229	3.164	7.060	0.635	1.278	3.398 ***	-0.013	0.216	-0.036	0.001
Institutional $ownership_t$	7,878	0.648	0.260	0.705	1,229	0.601	0.252	0.650	5.946 ***	7.800 ***	-0.062	0.000	-0.082	0.000
Firm age	7,878	27.16	20.08	20	1,229	28.28	19.85	22	-1.830 *	-2.534 **	0.019	0.067	0.027	0.011
Altman Z	7,675	2.034	1.385	2.040	1,187	1.928	1.250	2.003	1.311	2.148 **	-0.014	0.120	-0.023	0.032
G index	7,392	9.32	2.59	9	1,117	9.16	2.65	9	1.855 *	1.963 **	-0.020	0.064	-0.021	0.050
Number of business segments	7,264	3.26	2.58	3	1,102	3.66	3.11	3	-4.591 ***	-2.730 ***	0.050	0.000	0.030	0.000
Herfindahl segment sales	7,264	0.680	0.303	0.678	1,102	0.658	0.319	0.665	2.175 **	2.462 **	-0.024	0.030	-0.027	0.138
Delta/total compensation	7,870	76.123	140.210	44.047	1,228	121.082	239.584	56.044	-9.314 ***	-8.490 ***	0.097	0.000	0.089	0.000
Vega ($ 000)	7,878	56.621	118.254	23.536	1,229	94.557	242.052	27.179	-8.746 ***	-4.064 ***	0.091	0.000	0.043	0.000
Δ Cash $holdings_t$	7,861	1.264	8.764	0.414	1,228	1.142	6.983	0.371	0.469	-0.032	-0.005	0.639	0.000	0.975
Δ $Dividends_t$	7,851	0.005	0.587	0	1,226	0.039	0.598	0	-1.883 *	-4.929 ***	0.020	0.060	0.052	0.000
Δ $Capex_t$	7,865	-0.162	5.085	0.123	1,228	0.281	4.342	0.124	-2.898 ***	-0.808	0.030	0.004	0.009	0.419
Δ $R\&D_t$	7,865	0.049	1.351	0	1,228	0.133	1.035	0	-2.076 **	-1.481	0.022	0.038	0.016	0.139
Δ $Debt_t$	7,865	0.981	13.503	0	1,228	1.272	12.421	0	-0.709	-1.906 *	0.007	0.478	0.020	0.057
Δ $Equity_t$	7,865	-0.390	5.373	0.009	1,228	-0.507	4.962	0	0.718	1.515	-0.008	0.473	-0.016	0.130
Δ $Interests_t$	7,865	0.142	1.292	0	1,228	0.150	0.993	0.002	-0.226	-1.239	0.002	0.821	0.013	0.216
Δ $Earnings_t$	7,863	0.656	14.027	0.679	1,228	1.185	10.162	0.716	-1.272	-1.663 *	0.013	0.204	0.017	0.096
Δ Net $assets_t$	7,861	4.912	31.040	3.455	1,228	8.154	28.402	3.636	-3.442 ***	-2.328 **	0.036	0.001	0.024	0.020
C_{t-1}	7,865	11.566	15.805	6.044	1,228	7.586	11.210	4.278	8.496 ***	9.742 ***	-0.089	0.000	-0.102	0.000
L_t	7,867	20.139	19.984	14.824	1,229	18.108	18.053	13.715	3.355 ***	2.284 **	-0.035	0.001	-0.024	0.022

values between IDB and non-IDB firms. The mean (median) levels of cash holdings of IDB and non-IDB firms are 12.91% (5.96%) and 14.87% (7.35%), respectively. Univariate tests show that firms with IDB presence hold significantly lower levels of cash than firms without an IDB. A significantly higher proportion of IDB firms pay dividends than non-IDB firms, about 55% as opposed to 49%; this is reflected in the higher median dividend yields in IDB firms. But the mean difference in dividends yields between IDB and non-IDB firms is statistically insignificant. Although the mean ratio of repurchases to market capitalization is significantly lower in IDB firms than in non-IDB firms, total payout is not significantly different. As indicated by univariate tests, firms with IDB presence are associated with lower R&D expenditures but higher capital expenditures. However, the levels of investment expenditures (sum of R&D and investment expenditures) are not significantly different in IDB and non-IDB firms. Finally, both the mean and median levels of financial leverage are significantly higher in IDB firms than in non-IDB firms. Based on the univariate evidence, it appears that IDBs play a significant role in firms' financial and investment policies. But this evidence is preliminary, because it does not control for other determinants of financial and investment policy choices and does not account for the potential endogeneity of IDB presence, issues we deal with next.

3.3.1 IDB presence and the level of cash holdings

In this section, we examine how the presence of an IDB influences the level of a firm's cash holdings using several regression-based methodologies. The results of these regressions are presented in Table 3.4. We follow prior studies (e.g., Opler et al. (1999), Harford et al. (2008), Bates et al. (2009) among others) to identify the control variables for cash holdings.

To some extent, cash holdings measure the internal capital available to a firm, and provide a cushion against bankruptcy risk. We control for a firm's liquidity and bankruptcy risk via net working capital net of cash, cash flow, leverage, and a loss indicator variable (i.e., whether the firm has suffered a negative net income in a given fiscal year). Firms with stronger growth opportunities and limited access to capital markets carry higher cash holdings. We control for growth opportunities via the average sales growth rate over the prior five years, Tobin's q and R&D expenditures. We control for a firm's ability to access capital markets via firm size (log of market capitalization). In addition, we include a bond rating dummy, a variable that equals one if a firm has S&P long-term bond ratings, and zero otherwise. Bates et al. (2009) argue that a firm has more cash immediately after raising capital; reduces cash as it pays back debt or repurchases stock. Hence, we control for firms' net equity issuance and net debt issuance. Firms with greater precautionary needs require higher levels of cash holdings. We control for a firm's business condition via cash flow volatility, measured as the standard deviation of cash flows over the prior ten years. Firms with higher levels of capital expenditures and acquisition activity tend to have lower levels of cash holdings; we also control for these.

Table 3.4: Levels of cash holdings

This table shows estimates of OSL, 2SLS instrumental variable, Heckman 2-stage treatment effect, and MLE treatment effect regressions of cash holdings. The sample consists on non-dual class S&P 1500 excluding financial utility firms during the period 1998-2006 with relevant non-missing data. Cash holdings variable is defined as cash plus marketable securities scaled by total asset and expressed in percentage. IDB is a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. In addition to all explanatory variables presented in the table, all regressions include year dummies, Fama-French 12 industry dummies and a constant term. All variables are defined in Appendix 2. To reduce the influence of outliers, some variables, indicated in Appendix 2, are winsorized at the top and bottom 0.5% of the sample. We use robust standard errors clustered at the CEO-firm level for the OLS regression. The second stage of the 2SLS instrumental variable estimation instruments IDB by lagged IDB state-density and lagged IDB industry-density. Lagged IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. Lagged IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. The table reports the p-value of Wooldridge's (1995) over-identification test, the p-value of Durbin-Wu-Hausman test for exogeniety, and the F-test for the IVs of the first stage estimation; standard errors are clustered at the CEO-firm level. The second stage of Heckman's 2-stage treatment effect model uses the same covariates as the OLS and the inverse Mills ratio (Lambda). Lambda is computed in the first stage by regressing IDB on the variables in Model #3 in Panel B of Table 3.2. The MLE treatment effect model estimates the main and selection equations simultaneously. The main equation is the same as the OLS and the selection equation is for IDB with the variables in Model #3 in Panel B of Table 3.2. The table reports the p-value of LR test for rho (correlation between first and second stage error terms); standard errors are clustered at the CEO-firm level.

Table 3.4 (cont.)

	OLS (1)		OLS (2)		IV-2SLS (3)		Treatment effect two-stage (4)		Treatment effect MLE (5)	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	-0.502	0.304	-0.165	0.463	-2.206	0.073	-1.754	0.041	-2.773	0.016
Cash holdings $_{t-1}$			0.805	0.000	0.804	0.000	0.804	0.000	0.803	0.000
Sales growth	-0.015	0.346	-0.008	0.224	-0.005	0.535	-0.004	0.524	-0.002	0.828
Tobin's q $_{t-1}$	2.026	0.000	0.076	0.461	0.102	0.322	0.125	0.042	0.142	0.186
R&D expenditures$_t$	0.661	0.000	0.086	0.008	0.085	0.008	0.080	0.000	0.078	0.016
NWC net of cash/TA $_t$	-0.242	0.000	-0.094	0.000	-0.092	0.000	-0.096	0.000	-0.097	0.000
Cash flow $_t$	-0.186	0.000	0.092	0.000	0.089	0.000	0.086	0.000	0.085	0.000
Leverage $_t$	-0.237	0.000	-0.048	0.000	-0.047	0.000	-0.049	0.000	-0.049	0.000
Capital expenditures $_t$	-0.537	0.000	-0.339	0.000	-0.335	0.000	-0.338	0.000	-0.337	0.000
Acquisitions $_t$	-0.422	0.000	-0.487	0.000	-0.485	0.000	-0.494	0.000	-0.492	0.000
Dividend indicator $_t$ (1/0)	-1.718	0.001	-0.273	0.121	-0.328	0.067	-0.267	0.127	-0.268	0.129
Loss indicator$_t$ (1/0)	-1.022	0.043	-0.890	0.001	-0.895	0.001	-0.919	0.000	-0.919	0.001
Log market capitalization$_t$	-0.588	0.006	-0.137	0.103	-0.049	0.632	-0.093	0.214	-0.073	0.418
Cash flow volatility	25.261	0.000	1.957	0.349	1.837	0.376	2.443	0.109	2.371	0.259
Bond rating (1/0)	-1.369	0.025	-0.299	0.157	-0.357	0.102	-0.302	0.130	-0.300	0.158
Net equity issuance$_t$	0.087	0.006	0.252	0.000	0.249	0.000	0.255	0.000	0.255	0.000
Net debt issuance$_t$	0.151	0.000	0.131	0.000	0.130	0.000	0.136	0.000	0.135	0.000
G Index	-0.245	0.008	-0.032	0.286	-0.042	0.189	-0.048	0.125	-0.055	0.086
Board size	-0.692	0.000	-0.191	0.000	-0.161	0.000	-0.165	0.000	-0.146	0.002
Fraction of independent directors	-0.414	0.770	0.727	0.132	0.782	0.109	0.858	0.064	0.883	0.076
Institutional ownership $_t$	1.811	0.056	0.476	0.179	0.292	0.426	0.343	0.288	0.253	0.500
Log insider ownership	0.073	0.602	0.006	0.898	0.007	0.888	0.007	0.879	0.008	0.869
Percentage of option-based pay$_t$	0.004	0.601	0.002	0.648	0.000	0.956	0.001	0.783	0.001	0.832
N	8,426		8,426		8,426		8,260		8,260	
Adjusted R^2 / [χ^2 p-value]	0.558		0.858		0.857		[0.000]		[0.000]	
Over-identification test p-value					0.111					
Test for exogeneity p-value					0.091					
F-statistic for first-stage IVs					43.176					
Inverse Mills ratio							0.910	0.055		
LR test for rho (p-value)									0.027	

In addition to IDB presence in a firm, we control for other internal and external governance mechanisms such as board structure (board size and fraction of independent directors on the board), institutional ownership, managers' option-based pay (i.e., the percentage of total pay for the top five managers that is option-based), and G index (Gompers et al.'s (2003) shareholder rights index). Following Harford el al. (2008), we include the lagged value of cash holdings as an independent variable. The regressions also include year dummies and Fama and French 12 industry dummies.

Models 1 and 2 are both OLS regressions of cash holdings; model 1 excludes lagged cash holdings as a covariate. We find that IDB presence is unrelated to a firm's cash holdings in both models. Not surprisingly, lagged cash holdings explain a significant proportion of a firm's current levels of cash holdings (untabulated t-statistic = 77.23). Most of the control variables in the OLS regression take their expected signs when the lagged cash holdings variable is excluded. Firms with lower cash holdings are larger, tend to have higher leverage and net working capital, pay dividends, have a bond rating, and make more investments via capital expenditures and acquisitions. On the other hand, firms with higher cash holdings have greater growth opportunities (Tobin's q and R&D expenditures), cash flow volatility, net debt issuance, and net equity issuance. Consistent with the prior literature (e.g., Harford et al. (2008)), lower G index and higher institutional ownership, as measures of better governance, are associated with higher cash holdings. In model 2, some of the control variables lose statistical significance. Interestingly, while cash flow is significant in both models, it has opposite signs.

When we instrument for IDB presence using IDB industry-density and IDB state-density in 2SLS framework, we find IDB presence to be endogenous. The results from the over-identification test and the F-test for the IVs in the first-stage regression mitigate the concern about weak IVs. After accounting for endogeneity, IDB presence significantly reduces the level of cash holdings by more than 2%. This amounts to a 15% decrease from the unconditional mean cash holdings of 14.60%.

We also estimate Heckman's two-stage treatment effects (model 4) and MLE treatment effects (model 5) models to account for possible selection bias. Model 4 shows that the inverse Mills ratio is significantly positive, consistent with endogenous selection of IDB. Similarly, in model 5, the LR test for rho is highly significant, indicating selection bias. In both models 4 and 5, IDB presence reduces the level of cash holdings by 1.75% and 2.77%, respectively. Hence, after accounting for potential endogeneity of IDB presence, results are consistent with the idea that IDB presence mitigates agency problems by reducing excess cash holdings.

3.3.2 IDB presence and the levels of dividends and payout

We examine the influence of IDB on four measures of firms' payout (dividend yield, dividend dummy, repurchases and total payout) in regression frameworks. In all regressions, we control for the same set of variables. Young growth firms are less prone to pay out cash (see, e.g., Grullon and Michaely (2002), Fama and French (2002) and Grullon et al. (2009)). Hence, we control for firm age, size, sales growth, and future growth options via Tobin's q and R&D expenditures. Among firms that pay out cash, riskier firms use repurchases whereas safer firms use dividends (e.g., Jagannathan et al. (2000), Guay and Harford (2000), and Grullon and Michaely (2002)); and we use a firm's cash flow volatility to control for this effect. Following the prior literature, we also control for stock return volatility as an additional measure of risk (see, e.g., Grullon and Michealy (2007) and Grullon et al. (2009)). John and Knyazeva (2008) find that dividends are preferred over repurchases when agency problems are severe. Hence, in addition to IDB presence, we control for firms' governance via the G index, institutional

Table 3.5: Levels of dividends and payout

Panel A shows estimates of tobit and IV-tobit regressions of dividend yields and probit and IV-probit regressions of dividend dummy. The sample consists on non-dual class S&P 1500 excluding financial utility firms during the period 1998-2006 with relevant non-missing data. Dividend yield is defined as common dividends divided by the firm's market capitalization and expressed in percentage. Dividend dummy is a binary variable that equals one if the firm pays dividend in that fiscal year; it equals zero otherwise. IDB is also a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. In addition to all explanatory variables presented in this table, all regressions include year dummies, Fama-French 12 industry dummies and a constant term. All variables are defined in Appendix 2. Both the second stage of the MLE IV-tobit model and MLE IV-probit model use the same covariates as the tobit and probit regressions, respectively, but instrument for possible endogeneity of IDB by lagged IDB state-density and lagged IDB industry-density. Lagged IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. Lagged IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. Panel B shows estimates of tobit and IV-tobit regressions of repurchases and total payout. Repurchases variable is defined as purchases of common and preferred stock scaled by the firm's market capitalization and expressed in percentage. Total payout is dividend yields plus repurchases. Both IV-tobit and IV-probit regressions report the Wald test for exogeneity. Both tobit and IV-tobit regressions in Panel B are identical to that of Panel A, except for the dependent variables. We use robust standard errors clustered at the CEO-firm level for all regressions. To reduce the influence of outliers, some variables, indicated in Appendix 2, are winsorized at the top and bottom 0.5% of the sample.

Panel A: Dividends	Dividend yield				Dividend dummy			
	Tobit		IV-Tobit		Probit		IV-Probit	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	-0.154	0.072	-0.314	0.564	-0.073	0.310	-0.211	0.673
Sales growth	-0.025	0.000	-0.024	0.000	-0.012	0.000	-0.012	0.000
Tobin's q_{t-1}	0.010	0.736	0.014	0.678	0.066	0.004	0.069	0.006
R&D expenditures $_t$	0.018	0.000	0.018	0.000	0.014	0.000	0.014	0.000
Firm age	0.035	0.382	0.037	0.364	0.134	0.000	0.135	0.000
Log sales $_t$	-0.036	0.010	-0.036	0.010	-0.017	0.100	-0.017	0.100
ROA $_t$	0.008	0.071	0.008	0.070	0.015	0.000	0.015	0.000
Leverage $_t$	0.002	0.405	0.002	0.401	-0.003	0.124	-0.003	0.126
Cash flow volatility	-0.050	0.000	-0.050	0.000	-0.041	0.000	-0.041	0.000
Return volatility $_t$	-0.679	0.000	-0.681	0.000	-0.441	0.000	-0.443	0.000
G index	0.043	0.007	0.043	0.011	0.026	0.052	0.026	0.066
Board size	0.087	0.000	0.090	0.000	0.066	0.000	0.069	0.000
Fraction of independent directors	0.617	0.013	0.620	0.013	0.251	0.201	0.254	0.197
Institutional ownership $_t$	-0.785	0.000	-0.801	0.000	-0.320	0.024	-0.332	0.028
Log insider ownership	-0.020	0.391	-0.020	0.379	0.016	0.360	0.016	0.376
Percentage of option-based pay$_t$	-0.012	0.000	-0.012	0.000	-0.007	0.000	-0.007	0.000
N	8,466		8,466		8,466		8,466	
Pseudo R^2 / [χ^2 p-value]	0.189		[0.000]		0.374		[0.000]	
Test for exogeneity (p-value)			0.762				0.777	

Table 3.5 (cont.)

Panel B: Repurchase and total payout

	Repurchases				Total payout			
	Tobit		IV-Tobit		Tobit		IV-Tobit	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	-0.487	0.039	-3.636	0.017	-0.394	0.033	-2.847	0.023
Sales growth	-0.015	0.059	-0.008	0.332	-0.019	0.009	-0.014	0.075
Tobin's q_{t-1}	-0.226	0.000	-0.156	0.030	-0.228	0.000	-0.174	0.006
R&D expenditures $_t$	-0.026	0.000	-0.029	0.000	0.001	0.823	-0.001	0.845
Firm age	0.254	0.005	0.296	0.002	0.132	0.085	0.164	0.044
Log sales $_t$	0.032	0.229	0.032	0.231	0.003	0.903	0.003	0.903
ROA $_t$	0.076	0.000	0.076	0.000	0.059	0.000	0.059	0.000
Leverage $_t$	-0.006	0.343	-0.006	0.367	0.006	0.325	0.006	0.305
Cash flow volatility	0.055	0.001	0.050	0.003	0.026	0.091	0.022	0.156
Return volatility $_t$	-1.080	0.000	-1.133	0.000	-1.231	0.000	-1.272	0.000
G index	-0.040	0.288	-0.057	0.153	0.017	0.577	0.004	0.911
Board size	-0.040	0.387	0.025	0.648	0.018	0.641	0.069	0.139
Fraction of independent directors	0.791	0.201	0.857	0.170	1.186	0.025	1.236	0.020
Institutional ownership $_t$	-0.961	0.028	-1.261	0.008	-1.533	0.000	-1.764	0.000
Log insider ownership	-0.036	0.521	-0.047	0.400	-0.055	0.272	-0.065	0.208
Percentage of option-based pay$_t$	0.013	0.001	0.011	0.004	-0.001	0.820	-0.002	0.575
N	8,466		8,466		8,466		8,466	
Pseudo R^2 / [χ^2 p-value]	0.025		[0.000]		0.035		[0.000]	
Test for exogeneity (p-value)			0.036				0.046	

ownership, board size, the fraction of independent directors, insider ownership, and proportion of the top management's pay that is option based. We also control for firms' financial leverage and profitability. Finally, the regressions include year dummies and Fama and French 12 industry dummies.

Panel A of Table 3.5 reports the results of regressions of dividend yields and dividend dummy. Since about 50% of the firm-years in our sample have no dividends, we use the Tobit regression model to regress dividend yields and the probit regression model to regress the dividend dummy on IDB and other covariates. We find the coefficient estimate of IDB to be significantly negative in the Tobit regression but insignificant in the probit regression. This suggests that IDB presence does not induce a firm to pay or stop paying dividends but allows it to reduce dividend yield. This finding is consistent with La Porta et al.'s (2000) 'substitute model' of dividends. The idea that the monitoring effect of IDB presence substitutes for higher dividends is bolstered by the fact that the G index has significant positive coefficients in both the probit and Tobit models, which suggests that firms with lower shareholder rights pay dividends or increase dividend yields to signal governance quality.

The decrease in dividend yields in IDB presence is non-trivial. A coefficient of -0.154 represents a 17% reduction from the unconditional mean dividend yield of 0.898%. This result, however, does not account for the potential endogeneity of IDB presence in a firm in the context of dividend yields. Hence, we estimate an IV-Tobit model, where the potentially endogenous IDB variable is instrumented by IDB state-density and IDB industry-density. However, based on the Wald test of exogeniety, we find that IDB presence is not endogenous. Similarly, the Wald test for exogeneity in the IV-Probit model indicates that IDB presence is not endogenous.

We also examine the influence of IDB presence on repurchases and total payout. Similar to dividend yield, both of these variables contain a disproportionate mass at zero. Hence, we use Tobit regressions. Panel B of Table 3.5 reports these results. We find that IDB presence reduces both repurchases and total payout significantly. When we account for the potential endogeneity of IDB presence using IV-Tobit regressions, we find that IDB presence is endogenous in both repurchases and total payout regressions. But the results are even stronger in IV-Tobit regressions than in Tobit regressions.

Overall, the results in Table 3.5 suggest that in addition to IDB presence being a 'substitute' for higher dividends as a signal of governance quality, it also reduces repurchases. When we include the lagged dependent variable as an additional regressor in all the regressions (unreported), the results on IDB presence remain qualitatively unchanged. The results on the remaining covariates are mostly consistent with the prior literature. Larger, older, low growth and low risk firms have higher likelihood of paying dividends and have larger payouts. Firms with lower cash flow volatility, lower shareholder rights, lower option-based pay and larger board size have higher dividend yields but lower repurchases. Firms with a higher fraction of independent directors and lower institutional ownership have larger payouts. All of these results are statistically significant.

3.3.3 IDB presence and the levels of investment expenditures

In this section, we examine how the presence of an IDB affects a firm's investment policies using several regression-based methodologies. Specifically, we examine capital expenditures, R&D expenditures, and investment expenditures as the sum of capital and R&D expenditures. The regressions control for other determinants of investment expenditures. First, a firm incurs capital and R&D expenditures to exploit its future growth opportunities but is constrained by its funding limitations (see, e.g., Fazzari et al. (1988) and Hubbard (1998)). Hence, to assess the relation between IDB presence and a firm's investment policies, we need to control for its growth prospects and financial or liquidity constraints. We use lagged Tobin's q to control for a firm's growth opportunities; we control for firm size, cash flow, cash holdings and leverage to account for funding availability. Second, following the existing literature, we control for firm profitability via lagged ROA and stock returns (see, e.g., Coles et al. (2006)). We control

Table 3.6: Levels of investment

Panel A shows estimates of OSL, 2SLS instrumental variable, Heckman 2-stage treatment effect, and MLE treatment effect regressions of capital expenditures. The sample consists on non-dual class S&P 1500 excluding financial utility firms during the period 1998-2006 with relevant non-missing data. Capital expenditure variable is defined as capital expenditures scaled by total asset and expressed in percentage. IDB is a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. In addition to all explanatory variables presented in this table, all regressions include year dummies, Fama-French 12 industry dummies and a constant term. All variables are defined in Appendix 2. We use robust standard errors clustered at the CEO-firm level for the OLS regression. The second stage of the 2SLS instrumental variable estimation instruments IDB by lagged IDB state-density and lagged IDB industry-

Table 3.6 (cont.)

density. Lagged IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. Lagged IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. The table reports the p-value of Wooldridge's (1995) over-identification test, the p-value of Durbin-Wu-Hausman test for exogeniety, and the F-test for the IVs of the first stage estimation; standard errors are clustered at the CEO-firm level. The second stage of Heckman's 2-stage treatment effect model uses the same covariates as the OLS and the inverse Mills ratio (Lambda). Lambda is computed in the first stage by regressing IDB on the variables in Model #3 in Panel B of Table 3.2. The MLE treatment effect model estimates the main and selection equations simultaneously. The main equation is the same as the OLS and the selection equation is for IDB with the variables in Model #3 in Panel B of Table 3.2. The table reports the p-value of LR test for rho (correlation between first and second stage error terms); standard errors are clustered at the CEO-firm level. Panel B of this Table shows estimates of tobit and IV-tobit regressions of R&D expenditures. R&D expenditure variable is defined as R&D expenditures scaled by total asset and expressed in percentage. The second stage of the MLE IV-tobit uses the same covariates as the tobit regression, but instrument for possible endogeneity of IDB by lagged IDB state-density and lagged IDB industry-density. The IV-tobit regression reports the Wald test for exogeneity. Panel C shows estimates of OSL, 2SLS instrumental variable, Heckman 2-stage treatment effect, and MLE treatment effect regressions of investment expenditures. Investment expenditure variable is the sum of capital expenditure and R&D expenditure variables. Regressions in Panel C are identical to that of Panel A, except the dependent variable is investment expenditure. To reduce the influence of outliers, some variables, indicated in Appendix 2, are winsorized at the top and bottom 0.5% of the sample.

Panel A: Capital expenditure								
	OLS		IV-2SLS		Treatment effect two-stage		Treatment effect MLE	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	0.195	0.346	3.544	0.009	3.095	0.000	5.615	0.000
Leverage $_t$	0.007	0.165	0.007	0.204	0.008	0.013	0.005	0.284
Log sales $_t$	-0.380	0.000	-0.430	0.000	-0.435	0.000	-0.506	0.000
Cash flow $_t$	0.146	0.000	0.144	0.000	0.156	0.000	0.156	0.000
Tobin's q $_{t-1}$	0.070	0.222	-0.016	0.815	-0.008	0.843	-0.058	0.314
ROA $_{t-1}$	-0.011	0.129	-0.011	0.134	-0.012	0.023	-0.015	0.036
Stock return $_{t-1}$	1.172	0.000	1.165	0.000	1.198	0.000	1.087	0.000
G index	-0.126	0.001	-0.102	0.009	-0.099	0.000	-0.083	0.032
Board size	0.085	0.030	0.018	0.724	0.033	0.219	-0.002	0.955
Fraction of independent directors	-0.585	0.248	-0.559	0.288	-0.578	0.061	-0.498	0.365
Institutional ownership $_t$	0.183	0.557	0.430	0.204	0.442	0.038	0.640	0.047
Log insider ownership	0.048	0.348	0.050	0.354	0.035	0.212	0.038	0.439
Percentage of option-based pay$_t$	0.015	0.000	0.016	0.000	0.013	0.000	0.012	0.000
N	8,400		8,400		8,291		8,291	
Adjusted R^2 / [χ^2 p-value]	0.309		0.262		[0.000]		[0.000]	
Over-identification test p-value			0.783					
Test for exogeneity p-value			0.009					
F-statistic for first-stage IVs			43.459					
Inverse Mills ratio					-1.697	0.000		
LR test for rho (p-value)							0.000	

Table 3.6 (cont.)

Panel B: R&D Expenditure

	Tobit		IV-Tobit	
	coeff.	p-value	coeff.	p-value
IDB (1/0)	-0.315	0.308	-0.892	0.631
Leverage $_t$	-0.063	0.000	-0.063	0.000
Log sales $_t$	-0.439	0.000	-0.431	0.000
Cash flow $_t$	-0.146	0.000	-0.146	0.000
Tobin's q $_{t-1}$	0.934	0.000	0.949	0.000
ROA $_{t-1}$	-0.083	0.000	-0.083	0.000
Stock return $_{t-1}$	-1.053	0.013	-1.051	0.013
G index	-0.021	0.694	-0.025	0.652
Board size	0.040	0.532	0.052	0.489
Fraction of independent directors	3.565	0.000	3.559	0.000
Institutional ownership $_t$	-0.285	0.610	-0.328	0.572
Log insider ownership $_t$	-0.338	0.000	-0.338	0.000
Percentage of option-based pay$_t$	0.025	0.000	0.025	0.000
N	8,400		8,400	
Adjusted R^2 / [χ^2 p-value]	0.189		[0.000]	
Test for exogeneity (p-value)			0.747	

Panel C: Investment expenditure

	OLS		IV-2SLS		Treatment effect two-stage		Treatment effect MLE	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	0.024	0.928	3.591	0.030	1.491	0.043	8.929	0.000
Leverage $_t$	-0.026	0.001	-0.026	0.001	-0.025	0.000	-0.021	0.006
Log sales $_t$	-0.809	0.000	-0.863	0.000	-0.840	0.000	-0.972	0.000
Cash flow $_t$	0.026	0.284	0.025	0.305	0.037	0.000	0.052	0.020
Tobin's q $_{t-1}$	0.833	0.000	0.741	0.000	0.795	0.000	0.592	0.000
ROA $_{t-1}$	-0.082	0.000	-0.082	0.000	-0.083	0.000	-0.066	0.000
Stock return	0.729	0.084	0.722	0.093	0.753	0.057	0.631	0.121
G index	-0.165	0.001	-0.140	0.005	-0.153	0.000	-0.096	0.049
Board size	0.069	0.220	-0.003	0.966	0.049	0.184	-0.091	0.154
Fraction of independent directors	0.504	0.466	0.532	0.453	0.561	0.182	0.919	0.229
Institutional ownership $_t$	0.347	0.463	0.610	0.221	0.521	0.074	0.908	0.055
Log insider ownership	-0.117	0.094	-0.115	0.110	-0.130	0.001	-0.071	0.256
Percentage of option-based pay$_t$	0.030	0.000	0.031	0.000	0.028	0.000	0.022	0.000
N	8,400		8,400		8,291		8,291	
Adjusted R^2 / [χ^2 p-value]	0.302		0.274		[0.000]		[0.000]	
Over-identification test p-value			0.396					
Test for exogeneity p-value			0.024					
F-statistic for first-stage IVs			43.458					
Inverse Mills ratio					-0.858	0.037		
LR test for rho (p-value)							0.000	

for other internal and external governance mechanisms via board structure (board size and fraction of the independent directors), institutional ownership, proportion of the top management's pay that is option based, and G index. Finally, we include year dummies and Fama and French 12 industry dummies.

We next use treatment effects models to account for the possible selection bias introduced by IDB presence in a firm. First, we employ Heckman's treatment effects model. Identification in this model is achieved via exclusion criteria, especially for the two IVs: IDB state-density and IDB industry-density. In both capital and investment expenditures regressions, the estimated coefficients of the inverse Mills ratios are negative and significant. This result indicates that self-selection is important here. That is, characteristics that cause an IDB to be present in a firm-year are negatively related to investment expenditures. The coefficients of IDB in both regressions are significantly positive. This is similar to 2SLS results, except that the coefficient of investment expenditures regression is slightly smaller. Next, we use joint estimation of the selection and main equation using MLE. LR tests find that the correlation between the error terms of the two equations is statistically significant. This result also suggests the presence of selection bias. The effects of IDB presence in both regressions are qualitatively similar to the effects in 2SLS regressions, but their magnitudes are substantially larger in the MLE treatment effects models.

As a whole, these findings suggest that IDBs self-select into firms where there is relative underinvestment and that their presence in the firms increases capital expenditures and investment. However, an important and a strategic component of firms' investment is R&D expenditures. We next examine whether IDB presence influences firms' R&D expenditures.

Panel B of Table 3.6 reports regression results of R&D expenditures on IDB and other covariates. Because significant numbers of firm incur zero R&D expenditures, we use the Tobit regression model in column (1). IDB presence is unrelated to R&D expenditures. To account for the possible endogeneity of IDB presence in a firm, we instrument for IDB presence with IDB state-density and IDB industry density in a Tobit framework using MLE. However, the Wald test for exogeneity indicates that IDB presence is not endogenous. These results imply that IDBs have no significant impact on the level of a firm's R&D spending.

The results on other covariates in the regressions are also interesting. While firm size measured as sales is negatively related to the levels of all three of our measures of investment spending, the proportion of option-based pay for top executives is positively related to them. Firms with lower debt level, higher Tobin's q, lower return on assets and lower insider ownership have higher levels of R&D and investment expenditures. Higher cash flows and higher stock returns are associated with higher levels of capital and investment expenditures but with lower levels of R&D expenditures. More shareholder rights, measured inversely with the G index, are associated with higher levels of capital and investment expenditures; a higher fraction of independent director is associated with higher R&D expenditures. In unreported regressions, when we include the lagged dependent variable as an additional regressor, the results on IDB presence remain qualitatively unchanged.

3.3.4 IDB presence and the level of financial leverage

In Table 3.7, we examine the influence of IDB presence on a firm's financial leverage in regression frameworks. The regressions control for following variables. First, Stulz (1990) argues that debt level is determined as a trade-off between the need for financial flexibility and the need to prevent the waste of free cash flow. Hence, we include cash holdings, firm size, fixed-to-total assets (PPE), and R&D expenditures as covariates (see, e.g., Persons and Titman (2008) for a discussion of the relevance of these variables to financial leverage). Second, firms with more volatile cash flows, which are exposed to a higher probability of bankruptcy for any given level of debt, should choose less debt. We use cash flow volatility as a measure of firm risk. Third, Faulkender and Petersen (2006) find that firms with access to public bond markets tend to have higher debt levels. We use the presence of S&P bond ratings for a firm as a proxy for the firm's access to public bond markets. Fourth, in trade-off models of financial leverage, firms choose their leverage by balancing the tax advantage and the bankruptcy cost of debt (see, e.g., Titman and Wessels (1988), and MacKie-Mason (1990)).[37] Ceteris paribus, firms with higher risk of bankruptcy tend to choose lower levels of debt, while firms with higher tax benefits choose higher levels of debt. We measure a firm's bankruptcy risk using the Altman (1968) Z-score, as modified by MacKie-Mason (1990). We also control for a firm's internal and external governance via board structure (board size and the fraction of independent directors), institutional ownership, managers' option-based pay, and G index. Finally, we include year and Fama and French 12 industry dummies.

We use the Tobit model to regress financial leverage on IDB and other covariates because about 12% of the firm-years in our sample have no debt. We find that IDB presence is unrelated to the level of financial leverage. The coefficients in other explanatory variables are mostly consistent with prior studiesand are generally statistically significant. To account for the possible endogeneity of IDB presence, we next estimate the IV-Tobit regression using IDB state-

[37] Graham, Lemmon and Schallheim (1998) find a positive relationship between a firm's simulated the marginal tax rate before financing (MTR_B) and its debt levels. When MTR_B is included as an explanatory variable (we thank Professor John Graham for providing this data), we find that it is unrelated to debt levels. Importantly, the inclusion of MTR_B leaves our main results essentially unchanged. Since the inclusion of this variable causes a loss of one-third of our observations, we do not report them as our baseline results in the table.

Table 3.7: Level of financial leverage

This table shows estimates of tobit and IV-tobit regressions of leverage. The sample consists on non-dual class S&P 1500 excluding financial utility firms during the period 1998-2006 with relevant non-missing data. Leverage is defined as total debt divided by the firm's market capitalization and expressed in percentage. IDB is a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. In addition to all explanatory variables presented in this table, all regressions include year dummies, Fama-French 12 industry dummies and a constant term. All variables are defined in Appendix 2. To reduce the influence of outliers, some variables, indicated in Appendix 2, are winsorized at the top and bottom 0.5% of the sample. The second stage of the MLE IV-tobit model uses the same covariates as the tobit regression, but instrument for possible endogeneity of IDB by lagged IDB state-density and lagged IDB industry-density. Lagged IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. Lagged IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. The IV-tobit regression reports the Wald test for exogeneity. We use robust standard errors clustered at the CEO-firm level for all regressions.

	Tobit		IV-Tobit	
	coeff.	p-value	coeff.	p-value
IDB (1/0)	0.844	0.308	-0.548	0.930
Cash holding $_t$	-0.313	0.000	-0.314	0.000
Log market capitalization $_t$	-2.218	0.000	-2.150	0.000
R&D expenditures $_t$	-0.247	0.005	-0.248	0.005
PPE $_t$	0.030	0.077	0.030	0.079
Cash flow volatility	0.195	0.091	0.196	0.090
Bond rating (1/0)	14.365	0.000	14.311	0.000
Altman-Z	-4.628	0.000	-4.639	0.000
G index	-0.070	0.539	-0.081	0.512
Board size	0.305	0.032	0.322	0.044
Fraction of independent directors	0.716	0.692	0.710	0.694
Institutional ownership $_t$	3.552	0.006	3.435	0.012
Log insider ownership $_t$	-0.099	0.546	-0.095	0.567
Percentage of option-based pay$_t$	0.006	0.507	0.005	0.606
N	8,267		8,267	
Adjusted R^2 / [χ^2 p-value]	0.077		[0.000]	
Test for exogeneity (p-value)			0.820	

density and IDB industry-density as instruments. However, the Wald test for exogeneity indicates that IDB presence is not endogenous in this context. As an additional measure to account for possible omitted variables, we use lagged leverage as a covariate, but find no changes in our results on IDB presence (not tabulated). Overall, our findings suggest that IDBs take a 'hands off' approach when it comes to financial leverage.

3.4 IDB presence and firm risk

In this section we examine firm risk in the presence of an IDB. We use three measures of risk: total risk, systematic risk and unsystematic risk. We measure total risk as the variance of daily stock returns over the fiscal year and require at least two-third of the daily return observations be present. We then decompose total risk into systematic risk and unsystematic risk by using the market model and with the CRSP equal-weighted market portfolio as the proxy for the market portfolio. Unsystematic risk is measured as the variance of the residuals from the market model. Systematic risk equals total risk minus unsystematic risk. All risk measures are annualized and transformed using natural log.

Panel A of Table 3.3 presents means and medians for non-IDB and IDB firms and the corresponding univariate tests. IDB firms have significantly lower mean and median values of all three measures of risk than non-IDB firms. The Pearson product-moment correlations between the IDB dummy variable and total risk, systematic risk, and unsystematic risk are -0.06, -0.03, and -0.06, respectively, and all are highly significant. While univariate tests and correlations are consistent with the hypothesis that IDB presence reduces firm risk, they do not control for other determinants of risk and do not account for the potential endogeneity of IDB presence, a task we turn to next.

Panels A, B and C of Table 3.8 show coefficient estimates from regressions of total risk, systematic risk and unsystematic risk, respectively, on IDB presence and other covariates. We control for the other determinants of risk found to be important by prior studies (see, e.g., Anderson and Reeb (2003), Coles, Daniel and Naveen (2006), and Low (2009)). We use the natural log of total assets to control for firm size, lagged Tobin's q as a proxy for investment opportunities and lagged return on assets to control for profitability. Firm risk can be affected by

Table 3.8: Firm risk

Panel A (B) [C] shows estimates of OSL, 2SLS instrumental variable, Heckman 2-stage treatment effect, and MLE treatment effect regressions of total risk (systematic risk) [unsystematic risk]. The sample consists on non-dual class S&P 1500 excluding financial utility firms during the period 1998-2006 with relevant non-missing data. Total risk is the natural log value of the annualized variance of daily stock returns over firm-fiscal year. Systematic risk is the natural log value of the annualized variance of the predicted portion of the market model. Unsystematic risk is the natural log value of the annualized variance of the residual of the market model. IDB is a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. In addition to all explanatory variables presented in the table, all regressions include year dummies, Fama-French 12 industry dummies and a constant term. All variables are defined in Appendix 2. To reduce the influence of outliers, some variables, indicated in Appendix 2, are winsorized at the top and bottom 0.5% of the sample. We use robust standard errors clustered at the CEO-firm level for the OLS regression. The second stage of the 2SLS instrumental variable estimation instruments IDB by lagged IDB state-density and lagged IDB industry-density. Lagged IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. Lagged IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. The table reports the p-value of Wooldridge's (1995) over-identification test, the p-value of Durbin-Wu-Hausman test for exogeniety, and the F-test for the IVs of the first stage estimation; standard errors are clustered at the CEO-firm level. The second stage of Heckman's 2-stage treatment effect model uses the same covariates as the OLS and the inverse Mills ratio (Lambda). Lambda is computed in the first stage by regressing IDB on the variables in Model #3 in Panel B of Table 3.2. The MLE treatment effect model estimates the main and selection equations simultaneously. The main equation is the same as the OLS and the selection equation is for IDB with the variables in Model #3 in Panel B of Table 3.2. The table reports the p-value of LR test for rho (correlation between first and second stage error terms); standard errors are clustered at the CEO-firm level.

Panel A: Total Risk

	OLS		IV-2SLS		Treatment effect two-stage		Treatment effect MLE	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	-0.055	0.032	0.014	0.924	-0.344	0.000	-0.865	0.000
Log total assets $_t$	-0.154	0.000	-0.157	0.000	-0.144	0.000	-0.114	0.000
Tobin's q $_{t-1}$	0.016	0.011	0.015	0.039	0.025	0.000	0.037	0.000
ROA $_{t-1}$	-0.018	0.000	-0.018	0.000	-0.018	0.000	-0.017	0.000
Leverage $_t$	0.001	0.183	0.001	0.173	0.001	0.019	0.001	0.202
R&D expenditures $_t$	0.018	0.000	0.018	0.000	0.018	0.000	0.019	0.000
Capital expenditures $_t$	0.002	0.348	0.002	0.375	0.002	0.124	0.002	0.268
Log business segments	0.019	0.527	0.019	0.547	0.011	0.619	0.016	0.563
Herfindahl segment sales	0.185	0.021	0.183	0.023	0.164	0.004	0.139	0.056
Delta	-0.029	0.589	-0.038	0.518	-0.029	0.505	-0.032	0.480
Vega	0.380	0.000	0.382	0.000	0.376	0.000	0.278	0.000
G index	-0.028	0.000	-0.028	0.000	-0.030	0.000	-0.032	0.000
N	7,781		7,781		7,592		7,592	
Adjusted R^2 / [χ^2 p-value]	0.565		0.564		[0.000]		[0.000]	
Over-identification test p-value			0.592					
Test for exogeneity p-value			0.640					
F-statistic for first-stage IVs			48.055					
Inverse Mills ratio					0.171	0.000		
LR test for rho (p-value)							0.000	

Table 3.8 (cont.)

Panel B: Systematic Risk								
	OLS		IV-2SLS		Treatment effect two-stage		Treatment effect MLE	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	-0.070	0.108	-0.106	0.698	-0.766	0.000	-1.706	0.000
Log total assets $_t$	-0.071	0.000	-0.069	0.000	-0.043	0.000	-0.006	0.756
Tobin's q $_{t-1}$	0.080	0.000	0.081	0.000	0.099	0.000	0.122	0.000
ROA $_{t-1}$	-0.016	0.000	-0.016	0.000	-0.016	0.000	-0.015	0.000
Leverage $_t$	-0.002	0.038	-0.002	0.037	-0.003	0.002	-0.003	0.010
R&D expenditures $_t$	0.031	0.000	0.031	0.000	0.031	0.000	0.031	0.000
Capital expenditures $_t$	0.004	0.228	0.004	0.224	0.004	0.109	0.005	0.148
Log business segments	0.030	0.563	0.031	0.556	0.008	0.857	0.013	0.790
Herfindahl segment sales	0.186	0.178	0.187	0.175	0.126	0.247	0.076	0.553
Delta	0.068	0.524	0.073	0.518	0.081	0.336	0.062	0.491
Vega	0.419	0.001	0.418	0.001	0.392	0.000	0.327	0.001
G index	-0.030	0.000	-0.030	0.000	-0.034	0.000	-0.034	0.000
N	7,781		7,781		7,592		7,592	
Adjusted R^2 / [χ^2 p-value]	0.319		0.319		[0.000]		[0.000]	
Over-identification test p-value			0.109					
Test for exogeneity p-value			0.892					
F-statistic for first-stage IVs			48.055					
Inverse Mill's ratio					0.411	0.000		
Wald test for rho (p-value)							0.000	
Panel C: Unsystematic Risk								
IDB (1/0)	-0.051	0.049	0.115	0.457	-0.252	0.000	-0.840	0.000
Log total assets $_t$	-0.170	0.000	-0.176	0.000	-0.163	0.000	-0.131	0.000
Tobin's q $_{t-1}$	0.008	0.187	0.004	0.539	0.014	0.005	0.028	0.000
ROA $_{t-1}$	-0.017	0.000	-0.017	0.000	-0.017	0.000	-0.016	0.000
Leverage $_t$	0.001	0.050	0.001	0.043	0.001	0.001	0.001	0.053
R&D expenditures $_t$	0.017	0.000	0.017	0.000	0.017	0.000	0.017	0.000
Capital expenditures $_t$	0.002	0.295	0.002	0.352	0.002	0.109	0.002	0.239
Log business segments	0.019	0.535	0.017	0.580	0.013	0.574	0.016	0.566
Herfindahl segment sales	0.192	0.017	0.189	0.020	0.177	0.002	0.153	0.038
Delta	-0.037	0.459	-0.058	0.306	-0.040	0.371	-0.039	0.374
Vega	0.344	0.000	0.348	0.000	0.345	0.000	0.255	0.000
G index	-0.027	0.000	-0.027	0.000	-0.028	0.000	-0.031	0.000
N	7,781		7,781		7,592		7,592	
Adjusted R^2 / [χ^2 p-value]	0.580		0.576		[0.000]		[0.000]	
Over-identification test p-value			0.972					
Test for exogeneity p-value			0.264					
F-statistic for first-stage IVs			48.055					
Inverse Mills ratio					0.118	0.002		
LR test for rho (p-value)							0.000	

the levels of financial leverage, capital expenditures and R&D expenditures; hence we include them as controls. Characteristics of managers' option-based compensation, in particular, the sensitivity of CEO wealth to stock volatility (vega) affects firm risk (Guay (1999)). Coles et al. (2006) argue that the sensitivity of CEO wealth to stock price (delta) should also be used alongside vega in explaining firm risk. We use both delta and vega as controls. We measure delta as the dollar change in CEO wealth for a one percent change in stock price and scaled by the CEO's total compensation.[38] We measure vega as the dollar change in a CEO's option holdings for a one percent change in stock return volatility. In calculating both delta and vega, we follow the Core and Guay (2002) methodology. Firm risk is also affected by firm focus as measured by both the number of business segments and the Herfindahl index (for sales across segments); and we control for these. Since a more entrenched management may take less risk, we control for governance characteristics, in addition to IDB, via G index. We also include year and Fama and French 12 industry dummies.

First, we examine the results from OLS regressions. In Panel A, total risk is significantly negatively related to IDB presence. In firms with IDB, total risk is 5.35% [= $e^{-0.055} - 1$] lower than the total risk in non-IDB firms, after controlling for its other determinants. Panel B shows that IDB presence is unrelated to systematic risk. In Panel C, unsystematic risk is 4.97% [= $e^{-0.051} - 1$] lower in IDB firms than in non-IDB firms. Consistent with prior studies, all risk these measures are significantly negatively related to firm size and the return on assets, and positively related to Tobin's q, R&D expenditures, Herfindahl index of segment sales, and vega. Leverage

[38] The literature on executive compensation measures delta either as the dollar change in CEO wealth for a dollar change in firm value as in Jensen and Murphy (1990) or the dollar change in CEO wealth for a percentage change in stock price as in Core and Guay (1999). But neither measure compares the size of this wealth change to the level of CEO wealth, which is what ultimately matters to the CEO (see, e.g., Agrawal and Mandelker (1987) and Edmans, Gabaix and Landier (2009)). Since CEO wealth is unobservable, we use the CEO's total compensation as a proxy that is likely to be correlated with his wealth.

is negatively related to systematic risk and positively related to unsystematic risk. As expected, higher G index is negatively related to all these types of risk. These relations continue to hold under other regression methodologies below.

Second, we employ an instrumental variables approach to account for the potential endogeneity of IDB using 2SLS regressions with IDB state-density and IDB industry-density as IVs. In 2SLS regressions, IDB presence is unrelated to all three measures of firm risk. Although the results of the over-identification test and the F-test for the IV in the first-stage suggest IVs are not weak, the tests for endogeneity do not find IDB to be endogenous in all these 2SLS regressions. This suggests that the OLS is potentially unbiased. Given that OLS is more efficient, the OLS results are preferable to 2SLS.

Finally, we account for the possible selection bias in IDB presence using treatment effect models. We estimate Heckman's two-stage treatment effect models, where the first-stage probit regression is model 3 in Table 3.2. The inverse Mills ratio in the regression of each of the three risk measures is positive and significant at the 1% level, consistent with endogenous selection of IDB. Positive coefficient estimates of the inverse Mill's ratio imply that factors that induce IDBs to self-select into particular firm years are related to higher risk. The treatment effects of IDB imply that IDB presence significantly reduces total risk, systematic risk and unsystematic risk by about 29% [= $e^{-0.344} - 1$], 54% [= $e^{-0.766} - 1$] and 22% [= $e^{-0.252} - 1$], respectively. We also jointly estimate the treatment effect model using MLE. The LR test from these models also suggests endogenous selection of IDB in all three risk categories. Estimates from these treatment effect models suggest IDB presence reduces total risk, systematic risk and unsystematic risk by about 58% [= $e^{-0.865} - 1$], 82% [= $e^{-1.706} - 1$] and 57% [= $e^{-0.840} - 1$], respectively. The estimates of risk reduction due to IDB presence from treatment effects models are substantially larger than the estimates from OLS regressions. Overall, the evidence presented here strongly suggests that IDB presence reduces risk.

3.5 IDB presence and the valuation of firm policy choices

In this section, we examine the market valuation of various policy choices of a firm in presence of an IDB. To achieve this, we build on the framework developed by Faulkender and Wang (2006). Masulis et al. (2009) use this methodology to examine the influence of the excess control rights of dual class firms on cash holdings and capital expenditures. However, they use separate regressions to measure the influence of cash holdings and capital expenditures. We modify their model to examine the impact of IDB presence on five different policy choices in the same regression. Specifically, our main regression equation is specified as follows:

$$r_{i,t} - R_{i,t}^{B} = \alpha_0 + \alpha_1 \cdot IDB_{i,t} + \sum_{j=1}^{5} \beta_j \cdot IDB_{i,t} \cdot \frac{\Delta X_{j,i,t}}{Mktcap_{i,t-1}} + \sum_{j=1}^{5} \gamma_j \cdot \frac{\Delta X_{j,i,t}}{Mktcap_{i,t-1}}$$

$$+ \delta \cdot \frac{\mathbb{X}}{Mktcap_{i,t-1}} + \text{industry and year fixed effects} + \varepsilon_{i,t} \qquad (2)$$

The dependent variable is stock *i*'s excess return over the fiscal year, defined as its return over fiscal year *t* minus the return on its benchmark portfolio, $R_{i,t}^{B}$, during fiscal year *t*. Following prior studies, we use the Fama and French (1993) size and book-to-market portfolio (5×5) return as the benchmark portfolio. We follow the procedure outlined in Faulkender and Wang (2006) to estimate $R_{i,t}^{B}$.

In equation (2), in addition to the IDB dummy variable, there are three sets of variables whose coefficients are represented by β_j, γ_j, and δ. There are five variables associated with the coefficient vector γ; each of them represents the change in the variable from year t -1 to t and are scaled by lagged market capitalization. The variables are: 1) cash holdings, 2) dividends, 3) capital expenditures, 4) R&D expenditures, and 5) total debt. The variable set associated with the vector β are the same five change variables associated with γ_j, but interacted with the IDB dummy variable. The vector $\mathbb{X}$ (associated with the coefficient vector δ) represents the control variables: change in equity, change in interest expense, change in earnings, change in net asset, lagged cash holdings, and total debt, all scaled by lagged market capitalization. The regressions also control for year and Fama and French 12industry dummies.

The main coefficients of interest are α_1 and β_j. Since, the dependent variable measures excess return and all of the non-binary variables are scaled by lagged market capitalization, the coefficients $(\beta_j + \gamma_j)$ and γ_j measure the dollar change in shareholder wealth for a one-dollar change in the policy variables for firms with and without IDB presence, respectively.

Panel A of Table 3.3 reports that mean (median) excess returns are 9.80% (1.36%) and 2.78% (-3.15%) for firms with and with an IDB, respectively; these differences are highly significant. Hence, univariate tests suggest that market values IDB presence significantly. Panel B of Table 3 reports mean and median values of covariates of equation (1) for IDB and non-IDB firm-years and tests for differences between them. Mean changes in dividends, capital expenditure and R&D expenditures are significantly higher in IDB firms than in non-IDB firms; but mean changes in cash holdings and debts are not statistically different. We next present regression based evidence on how market values IDB presence and the changes in policy choices in presence of an IDB.

Table 3.9 presents regression results based on several variants of equation (1). We begin with model 1, which is equation (1) except that it does not have the interaction terms. Using OLS estimation, we find that IDB presence increases excess returns by 5%. The coefficient of IDB is statistically significant. The adjusted-R^2 of the regression is 0.106. The coefficient estimates of other covariates are consistent with prior studies.[39] Increases in cash holdings, dividends, capital expenditures, equity, earnings, and net assets increase excess returns significantly; and increases in interest expenses decrease excess returns significantly. However, changes in debt and R&D expenditures do not significantly affect excess returns. These results hold up in all the regression models.

To account for the potential endogeneity of IDB, we estimate 2SLS regressions using IDB state density and IDB industry-density as instruments. Model 2 is same as model 1, except that it is estimated in 2SLS framework. In this regression, the over-identifying restriction holds,

Table 3.9: Market valuation of IDB presence and policy choices

This table shows estimates of OSL, 2SLS instrumental variable, Heckman 2-stage treatment effect, and MLE treatment effect regressions of excess return. The sample consists on non-dual class S&P 1500 excluding financial utility firms during the period 1998-2006 with relevant non-missing data. Excess return is defined as stock return minus Fama-French size and book-to-market matched portfolio (5×5) returns over firm-fiscal year. IDB is a binary variable that equals one if there is at least one IDB in a given firm-year; it equals zero otherwise. Models 5 and 6 include interaction variables, other variables interacting with IDB. In addition to all explanatory variables presented in the table, all regressions include year dummies, Fama-French 12 industry dummies and a constant term. All variables are defined in Appendix 2. We use robust standard errors clustered at the CEO-firm level for the OLS regression. The second stage of the 2SLS instrumental variable estimation instruments IDB by lagged IDB state-density and lagged IDB industry-density. Lagged IDB state-density is computed as the average value of the IDB dummy for all public companies headquartered in a state in fiscal year *t*-1. Lagged IDB industry-density is computed as the average value of the IDB dummy for each of the 48 Fama and French (1997) industries in fiscal year *t*-1. The table reports the p-value of Wooldridge's (1995) over-identification test, the p-value of Durbin-Wu-Hausman test for exogeniety, and the F-test for the IVs of the first stage estimation; standard errors are clustered at the CEO-firm level. The second stage of Heckman's 2-stage treatment effect model uses the same covariates as the OLS and the inverse Mills ratio (Lambda). Lambda is computed in the first stage by regressing IDB on the variables in Model #3 in Panel B of Table 3.2. The MLE treatment effect model estimates the main and selection equations simultaneously. The main equation is the same as the OLS and the selection equation is for IDB with the variables in Model #3 in Panel B of Table 3.2. The table reports the p-value of LR test for rho (correlation between first and second stage error terms); standard errors are clustered at the CEO-firm level. To reduce the influence of outliers, some variables, indicated in Appendix 2, are winsorized at the top and bottom 0.5% of the sample.

[39] We compare our results against studies by Faulkender and Wang (FW, 2006), Dittmar and Mahrt-Smith (DM, 2007), Masulis et al. (MWX, 2009) and Brockman et al. (BMWZ, 2009). However, MWX deal with only dual-class firms, so there is no overlap between our samples. Also, there are a few differences between the covariates in our paper and prior studies. For instance, FW, DM, MWX, and BMWZ include the variable net financing, which is total equity issuance minus repurchases plus debt issuance minus debt redemption. But we decompose this variable into two variables: changes in debt (ΔDebt) and changes in equity (ΔEquity). Also, DM, MWX, and BMWZ include two interaction variables in their analysis (ΔCash holdings$_t$*L_t and ΔCash holdings$_t$*C_{t-1}) that are not included in the regressions reported in Table 3.9. In unreported regressions, we use these two interaction variables and our results remain the same in various specifications.

Table 3.9 (cont.)

	1		2		3		4		5		6	
	OLS		IV-2SLS		Treatment effect two-stage		Treatment effect MLE		OLS		OLS	
	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value	coeff.	p-value
IDB (1/0)	5.000	0.003	-1.524	0.848	3.817	0.436	3.432	0.755	4.773	0.003	5.149	0.002
IDB * Δ Cash holdings$_t$									0.346	0.377		
IDB * Δ Dividends$_t$									-3.863	0.033	-3.813	0.032
IDB * Δ Capex$_t$									0.332	0.366		
IDB * Δ R&D$_t$									-1.093	0.596		
IDB * Δ Debts$_t$									0.045	0.781		
Δ Cash holdings$_t$	0.597	0.000	0.590	0.000	0.541	0.000	0.540	0.000	0.566	0.000	0.596	0.000
Δ Dividends$_t$	3.024	0.000	3.046	0.000	3.319	0.001	3.324	0.000	3.592	0.000	3.570	0.000
Δ Capex$_t$	0.820	0.000	0.826	0.000	0.737	0.000	0.737	0.000	0.782	0.000	0.816	0.000
Δ R&D$_t$	0.968	0.126	0.991	0.117	0.665	0.133	0.665	0.297	1.060	0.121	0.968	0.126
Δ Debts$_t$	-0.054	0.392	-0.054	0.400	-0.042	0.434	-0.042	0.506	-0.058	0.377	-0.053	0.407
Δ Equity$_t$	0.547	0.000	0.546	0.000	0.441	0.000	0.441	0.003	0.546	0.000	0.549	0.000
Δ Interests$_t$	-3.173	0.000	-3.173	0.000	-2.985	0.000	-2.984	0.000	-3.161	0.000	-3.175	0.000
Δ Earnings$_t$	0.326	0.000	0.329	0.000	0.344	0.000	0.344	0.000	0.329	0.000	0.326	0.000
Δ Net assets$_t$	0.206	0.000	0.206	0.000	0.196	0.000	0.196	0.000	0.205	0.000	0.205	0.000
C_{t-1}	-0.077	0.112	-0.090	0.078	-0.039	0.341	-0.039	0.460	-0.075	0.122	-0.076	0.115
L_t	-0.422	0.000	-0.426	0.000	-0.408	0.000	-0.408	0.000	-0.422	0.000	-0.421	0.000
N	9,014		9,013		8,281		8,281		9,014		9,014	
Adjusted R^2 / [χ^2 p-value]	0.106		0.104		[0.000]		[0.000]		0.106		0.106	
Over-identification test p-value			0.163									
Test for exogeneity p-value			0.423									
F-statistic for first-stage IVs			53.080									
Inverse Mills ratio					0.002	0.938						
LR test for rho (p-value)							0.945					

and F-statistics of joint significance of the IVs in the first-stage regressions are quite large; both results indicate that the IVs are not weak. But the test of exogeniety is insignificant, suggesting that IDB is not endogenous. This implies that the OLS estimate is preferable to 2SLS, as the former estimate is unbiased and more efficient.

Next, we employ Heckman's treatment effect model to account for possible selection bias. The identification of the model is mainly derived from exclusion criteria. Using the two-stage treatment effect model (model 3 in Table 3.9), we find that the estimated coefficient of inverse Mill's ratio is insignificant with a p-value of 0.938. This suggests that there is no selection bias. Model 4 in Table 3.9 jointly estimates the main equation and selection equation using MLE and yields a similar result; the LR test for the null hypothesis that the two error terms are uncorrelated cannot be rejected with a p-value of 0.944. Models 2, 3 and 4 suggest that IDB presence is neither endogenous nor suffers from selection bias vis-à-vis excess returns.

Model 5 is the same as equation (2) in OLS framework. Since we have sufficiently eliminated the possibility of endogeneity or selection bias of IDB presence in the context of excess returns, we can rely on OLS estimates. In Model 5, we find that IDB presence increases excess return by 4.77% with a p-value of 0.003. Among all the interaction variables, only the interaction of changes in dividends with the IDB dummy variable is significant with a p-value of 0.03 and has a coefficient of -3.86. The coefficient of change in dividend is 3.59 and is significant at the 1% level. Together, these coefficients suggest that a one dollar decrease in dividends in the presence of IDB increases shareholder wealth by 27 cents. Since, in section 3.3.2 we find IDB presence decreases dividends, this corroborates the idea that IDB presence increases shareholder wealth via dividend policy.

In Model 6, we keep the interaction of the changes in dividends and the IDB dummy and drop other interaction variables. The coefficients in this model suggest that a one dollar decrease in dividends in the presence of IDB increases shareholder wealth by 24 cents, a result similar to model 5. In unreported regressions, we also examined each interactions variable in the absence of other interactions, and the results remain the same as in model 5.

3.6 Conclusion

The presence of an independent blockholder on the board (IDB) can serve as a powerful control mechanism because an IDB has both the incentive and the ability to monitor managers because of his substantial shareholdings in the firm, his board seat, and not having his career or business interests depend on the CEO. But an IDB can use his power to extract private benefits from the firm at the expense of other shareholders and his risk preferences can differ from those of other shareholders. One way to examine the agency implications of IDB presence is to empirically examine whether and how IDB presence influences firms' financial and investment policies and risk.

Although a large literature examines the relations between various governance mechanisms and agency problems manifested in corporate financial and investment policies, no prior study has examined the role of a large blockholder on the board in this context. We attempt to fill this gap in the literature by examining the effect of IDB presence on four key corporate financial and investment policy choices: the levels of cash holdings, payout, investment, and financial leverage. We also examine how IDB presence affects firm risk. Finally, using a recent methodological development, we examine whether IDB presence reduces agency problems by examining the market valuation of the effect of IDB presence on each of the four policy choices.

IDB presence in a firm is potentially endogenous and we address this concern in several ways. After controlling for other variables and accounting for possible endogeneity of IDB presence, we find that firms with IDBs have significantly lower levels of cash holdings, dividend yields, repurchases, and total payout, but higher levels of capital expenditures. IDB presence, however, has no significant impact on the levels of a firm's financial leverage and R&D expenditures. We also find that firms with IDBs have lower total risk, systematic risk and unsystematic risk. While IDB presence enhances overall firm valuation and the market appears to value a decrease in dividend yields in the presence of an IDB, changes in other policy choices associated with IDB presence do not appear to affect firm valuation.

These results suggest that IDBs largely take a 'hands-off' approach for firms' financial leverage and R&D activities but take an active role in reducing cash holdings and increasing investment expenditures. Also, lower dividends in firms with IDB suggest that IDB presence is a 'substitute' for costly signals for a firm's governance quality as evidenced by the market valuation of this dividend decrease. Furthermore, while IDB presence reduces firm risk, the market values IDB presence positively. This suggests that IDBs play a valuable role in reallocation of corporate resources and expunging dead-weight costs. Overall, IDB presence appears to reduce agency problems between managers and shareholders.

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APPENDIX

Appendix 1: Firm, year, and firm-year distributions

Panel A: Number of years a firm is present in the sample

Number of years	Number of firms	Percentage
1	204	12.58
2	194	11.97
3	108	6.66
4	146	9.01
5	124	7.65
6	111	6.85
7	96	5.92
8	93	5.74
9	545	33.62
Total	1,621	100

Panel B: Percentage of firm-years of a firm that has IDBs

Percentage of firm-years (pct)	Number of firms	Percentage
pct = 0	1,197	73.84
0.00 < pct <=12.5	63	3.89
12.5 < pct <= 25.0	77	4.75
25.0 < pct <= 37.5	47	2.90
37.5 < pct <= 50.0	70	4.32
50.0 < pct <= 62.5	27	1.67
62.5 < pct <= 75.0	23	1.42
75.0 < pct <= 87.5	15	0.93
87.5 < pct < 100	18	1.11
pct = 100	84	5.18
Total	1,621	100

Panel C: Year distribution

	Full sample		IDB firm-years		Non-IDB firm-years		Proportion	
Year	Number of firm-years	Percentage	Number of firm-years	Percentage	Number of firm-years	Percentage	IDB	Non-IDB
1998	1,048	11.51	129	10.50	919	11.67	12.31	87.69
1999	1,026	11.27	146	11.88	880	11.17	14.23	85.77
2000	1,030	11.31	157	12.77	873	11.08	15.24	84.76
2001	1,070	11.75	139	11.31	931	11.82	12.99	87.01
2002	1,020	11.20	133	10.82	887	11.26	13.04	86.96
2003	1,017	11.17	144	11.72	873	11.08	14.16	85.84
2004	997	10.95	133	10.82	864	10.97	13.34	86.66
2005	956	10.50	125	10.17	831	10.55	13.08	86.92
2006	943	10.35	123	10.01	820	10.41	13.04	86.96
Total	9,107	100	1,229	100	7,878	100	13.50	86.50

Appendix 2: Descriptive statistics and variable definitions

Variable: Definition and explanations	Obs.	Mean	Q1	Median	Q3	Std.
Dependent variables						
Cash holdings: (Cash and marketable securities / total assets)*100; from Compustat. †	9,103	14.604	2.180	7.120	21.110	17.332
Dividend yield: (Common dividends / Market capitalization)*100; from Compustat. †	9,097	0.898	0	0	1.439	1.383
Dividend dummy: Dummy variable equal to one if the firm paid a common dividend in that year, and zero if it did not; from Compustat (1/0)	9,106	0.497				
Repurchase: (Purchases of common and preferred stock / Market capitalization)*100; from Compustat. †	9,097	2.167	0	0.278	2.730	4.054
Total payout: (Common dividend plus purchases of common and preferred stock / Market capitalization)*100; from Compustat. †	9,097	3.096	0	1.716	4.264	4.472
Capital expenditures: (Capital expenditures / total assets)*100; from Compustat. †	9,106	5.738	2.330	4.190	7.330	5.179
R&D expenditures: (R&D expenditures / total assets)*100; from Compustat. †	9,106	3.361	0	1.430	4.690	5.483
Investment expenditure: (Capital expenditures plus R&D expenditures / total assets)*100; from Compustat. †	9,106	9.138	4.140	7.240	12.130	7.158
Leverage: (Total debt / total assets)*100; from Compustat. †	9,106	22.103	6.030	21.480	33.380	17.663
Total risk: Log (variance of daily stock returns over firm-fiscal year, annualized); from CRSP.	9,100	-7.243	-7.851	-7.299	-6.681	0.866
Systematic risk: Log (variance of the predicted portion of the market model, annualized); from CRSP.	9,100	-9.356	-10.065	-9.294	-8.557	1.331
Unsystematic risk: Log (variance of the residual of the market model, annualized); from CRSP.	9,100	-7.440	-8.073	-7.485	-6.845	0.888
Excess return: Stock return minus Fama-French size and book-to-market matched portfolio (5×5) returns over firm-fiscal year. From CRSP and Ken French's website. †	9,037	3.729	-29.351	-2.690	26.466	56.123
Independent variables						
Market capitalization$_t$: Market value of equity, in millions of constant 2000 dollars; from Compustat. †	9,097	8,642	641	1,646	5,227	25,767
Total assets$_t$: in millions of constant 2000 dollars; from Compustat. †	9,106	5,564	597	1,457	4,367	13,253
Sales$_t$: in millions of constant 2000 dollars; from Compustat. †	9,105	5,333	591	1,478	4,427	11,793
PPE$_t$: (Property, plant and equipment / total assets)*100; from Compustat. †	9,087	28.92	12.28	22.87	40.55	21.72
NWC$_t$: (Net working capital net of cash holdings / total assets)*100; from Compustat. †	9,104	7.15	-1.68	6.16	15.95	14.45
Acquisitions$_t$: (Acquisitions / total assets)*100; from Compustat. †	9,106	2.89	0	0.02	2.60	6.29
Cash flow$_t$: (Cash flow / total assets)*100; from Compustat. †	9,083	8.50	5.41	8.73	12.36	8.18
Cash flow volatility: Standard deviation of (cash flow/ total assets) over 10 years with a minimum 4 years data; otherwise it is substituted by the mean of the standard deviations of (cash flow/ total assets) over 10 years for firms in the same industry, as defined by Fama-French 48 industries. Form Compustat. †	9,107	5.02	1.97	3.11	5.58	6.07
Loss indicator: A Dummy variable equal to one if net income is less than zero, and zero otherwise. From Compustat. (1/0)	9,104	0.190				

Appendix 2 (cont.)

Variable: Definition and explanations	Obs.	Mean	Q1	Median	Q3	Std.
Bond rating: A Dummy variable equal to one if a firm has long-term S&P ratings, and zero otherwise. From Compustat. (1/0)	9,107	0.523				
ROA$_{t-1}$: (Net income / total assets)*100; from Compustat. †	9,105	4.22	1.79	5.32	9.23	10.52
OPS$_{t-1}$: (Earnings before depreciation, interest, and tax / Sales)*100; from Compustat. †	9,072	14.95	8.45	13.91	21.27	17.61
Stock return$_{t-1}$: Average of daily stock returns during the fiscal year with minimum 2/3rd non-missing daily returns; from CRSP. † ($\times 10^4$)	8,978	8.684	-1.688	7.946	17.580	18.443
Return volatility$_t$: Standard deviation of daily stock returns during the fiscal year with minimum 2/3rd non-missing daily returns; from CRSP. †	9,079	2.95	1.97	2.60	3.55	1.37
Net equity issuance$_t$: (Equity sales minus equity purchases / total assets.)*100; from Compustat. †	9,105	-1.09	-2.38	0	0.78	6.87
Net debt issuance$_t$: (Total debt issuance minus debt retirement / total assets)*100; from Compustat. †	9,067	1.30	-2.17	0	3.80	9.52
Sales growth: It is the mean of yearly sales growth rate of the past 5 year (i.e., sales growth is computed as $\frac{1}{5}\sum_{s=1}^{5} log\left(\frac{sales_{t-s}}{sales_{t-s-1}}\right)$ and expressed in percentage); from Compustat. †	9,080	13.66	3.65	10.06	19.56	17.21
Tobin's q$_{t-1}$: (Book value of total assets + Market value of equity - Book value of equity) / Book value of total assets; from Compustat.†	9,091	2.27	1.27	1.68	2.52	1.80
Percentage of optiony-based pay$_t$: Percentage of total pay for the top five managers received in equity-based forms, as the ratio of stock option grants divided by the sum of stock option grants, salary and bonus; from Compustat. †	9,107	39.93	14.43	41.69	62.35	28.22
Insider ownership$_t$: Percentage of top-five insider holdings of common stocks to the total shares outstanding; from Compustat. †	9,099	3.40	0.22	0.70	2.49	7.22
Institutional ownership$_t$: Fraction of the total shares outstanding held by institutional investors; from TFN Institutional. †	9,107	0.641	0.535	0.698	0.821	0.260
Firm age: Max(CRSP listing age, Compustat listing age) in years	9,107	27.31	11	20	39	20.06
Altman Z: A modified version of the Altman (1968) Z-score, as in MacKie-Mason (1990), computed as ((3.3*EBIT + Sales + 1.4* Retained earnings + 1.2*Working Capital) / Total assets); from Compustat. †	8,862	2.03	1.34	2.04	2.75	1.37
Board size: Number of directors on the board; calculated from RM Directors.	9,107	8.93	7	9	10	2.42
Fraction of independent directors: Fraction of independent directors on the board; calculated from RM Directors.	9,107	0.66	0.56	0.67	0.80	0.17
Classified board: Firm has a classified or staggered board; data from RM Governance (1/0)	8,509	0.61				
G index: Governance Index equals the number of anti-takeover provisions in a firm out of 24 different bylaw, charter provisions, and state laws from Gompers, Ishii, and Metrick (2003). Missing values of G index in a given year are replaced by its value in the prior year. Data from RM Governance.	8,509	9.30	7	9	11	2.60
Net E index: Entrenchment Index minus classified board. Entrenchment index consists of 6 different anti-takeover provisions from bylaws and charter amendments, from Bebchuk, Cohen, and Ferrell (2009); data from RM Governance.	8,509	1.67	1	2	2	1.01
CEO is chairman: CEO is also the chairman of the board; obtained from ExecuComp (1/0)	9,107	0.62				
CEO on nominating committee: CEO is on the nominating committee or on the corporate governance committee when there is no nominating committee; based on RM Director and Execucomp (1/0)	9,019	0.31				
Outside CEO-directors: Fraction of non-employee directors that are active CEOs; calculated from RM Director	9,107	0.142	0	0.125	0.222	0.131

Appendix 2 (cont.)

Variable: Definition and explanations	Obs.	Mean	Q1	Median	Q3	Std.
Number of business segments: Number of business segments reported in Compustat Segment.	8,366	3.32	1	3	5	2.66
Herfindahl segment sales: $\sum_{i=1}^{N}(Segment\ sales_i / Firm\ sales)^2$ where i indexes segments; form Compustat Segment.	8,366	0.677	0.395	0.676	1	0.305
Delta: Dollar change in CEO stock and option portfolio for 1% change in stock price measured, using Core and Guay (2002) methodology, divided by CEO's total compensation. Data from ExecuComp. †	9,098	82.19	21.61	45.38	85.09	158.06
Vega: Dollar change in CEO option holdings for a 1% change in stock return volatility, in thousands of 2000 dollars, using Core and Guay (2002) methodology. Data from ExecuComp. †	9,107	61.741	6.571	24.043	64.438	142.006
Δ Cash holdings: ((Cash holdings$_t$ – cash holdings$_{t-1}$) / Market capitalization$_{t-1}$)*100; from Compustat. †	9,089	1.25	-0.11	0.41	3.14	8.54
Δ Dividends: ((Dividends$_t$ – dividends$_{t-1}$) / Market capitalization$_{t-1}$)*100; from Compustat. †	9,077	0.010	0	0	0.059	0.589
Δ Capex: ((Capital expenditures$_t$ – Capital expenditures$_{t-1}$) / Market capitalization$_{t-1}$)*100; from Compustat. †	9,093	-0.10	-0.73	0.12	1.02	4.99
Δ R&D: ((R&D expenditures$_t$ – R&D expendituress$_{t-1}$) / Market capitalization$_{t-1}$)*100; from Compustat. †	9,093	0.06	0	0	0.15	1.31
Δ Debts: (Debt issuance minus debt redepmtion/ Market capitalization$_{t-1}$)*100; from Compustat. †	9,093	1.02	-1.80	0	2.19	13.36
Δ Equity: (Equity issuance minus repurchases/ Market capitalization$_{t-1}$)*100; from Compustat. †	9,093	-0.41	-1.91	0	0.67	5.32
Δ Interests: ((Interest expense$_t$ – Interest expense$_{t-1}$) / Market capitalization$_{t-1}$)*100; from Compustat. †	9,093	0.14	-0.11	0	0.24	1.17
Δ Earnings: ((Earnings$_t$ – Earnings$_{t-1}$) / Market capitalization$_{t-1}$)*100; from Compustat. †	9,091	0.73	-1.65	0.68	2.89	13.57
Δ Net assets: (Total asset minus cash holdings$_t$ – total asset minus cash holdings$_{t-1}$ / Market capitalization$_{t-1}$)*100; from Compustat. †	9,089	5.35	-1.52	3.50	11.06	30.71
C_{t-1}: (Cash holdings$_{t-1}$) / Market capitalization$_{t-1}$)*100; from Compustat. †	9,093	11.03	2.11	5.75	13.44	15.33
L_t: (Total debt$_t$ / Market capitalization$_{t-1}$)*100; from Compustat. †	9,096	19.86	3.22	14.57	30.09	19.75

† Top and bottom half percent values of the variables are winsorized.

4. INSIDER TRADING IN TAKEOVER TARGETS

4.1 Introduction

In August 2006, the *New York Times* reported that securities of over 40 percent of the companies receiving buyout bids exhibited suspicious trading in the weeks before the deals became public (see Morgenson (2006)). Shortly after that, the Senate Judiciary Committee held a hearing on insider trading where Chairman Arlen Specter said, "I'm interested in indictments, even more interested in convictions, and most interested in jail sentences."[40] U.S. Securities and Exchange Commission (SEC) is responsible for enforcing insider trading laws. U.S. securities rules (section 10(b) of the Securities Exchange Act of 1934 (SEA) and SEC rule 10(b)-5) prohibit trades based on material, non-public information. Subsequent court rulings, such as U.S. Supreme Court (1969, 1980), have buttressed these rules. Insider trading rules have been strengthened by the Insider Trading Sanctions Act of 1984 (ITSA), which imposes monetary penalties of up to three times the illegal profits made or losses avoided by insiders. The sanctions have been further increased by the Insider Trading and Securities Fraud Enforcement Act of 1988 (ITSFEA). In insider trading cases that involve obstruction of justice, fraud, recidivism or egregious misconduct, the SEC may seek even harsher punishment, including incarceration.[41] In addition to penalties imposed by law, offenders face potential loss of reputational capital.

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[40] Transcript of Panel I of the Hearing of the Senate Judiciary Committee on "Illegal Insider Trading: How Widespread Is The Problem And Is There Adequate Criminal Enforcement?", September 26, 2006.

[41] See Seyhun (1992) and Bainbridge (1999) for excellent discussions of insider trading regulations and their enforcement.

In Congressional hearings on "Improper Activities of the Securities Industry" held on April 22, 1987, Edward Markey, then chairman of the House Telecommunications and Finance Subcommittee, stated: "In our current economic environment, corporate takeovers regularly provide a catalyst for insider trading." During 2001-2006, the SEC brought more than 300 cases against over 600 individuals and entities for insider trading violations.[42] A sizeable chunk of these cases is related to mergers, and many of the cases involve target firms' insiders. Thus, prevention of insider trading in takeover targets is a particular focus of regulatory efforts against insider trading. This regulatory focus on takeovers is driven by the fact that a great deal of insider trading takes place around takeovers.[43]

This paper provides systematic evidence on the level, pattern and prevalence of insider trading before takeovers during 1988-2006. This issue is important for at least five reasons. First, any corporate event that results in large changes in stock prices provides insiders with an opportunity either to make profits or to avoid losses by trading before public announcements of the events. Prior studies examine insider trading before a number of important corporate events such as announcements of dividend initiations, bankruptcies, earnings, and earnings restatements.[44] Since takeover announcements usually result in large increases in stock prices of target firms, target insiders have a strong incentive to trade on private knowledge of a forthcoming deal. While a number of prior studies (reviewed in section 4.3 below) have examined insider trading before takeovers, surprisingly, no prior study has examined whether the level and pattern of profitable insider trading before takeover announcements (i.e., increase in

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[42] Testimony by Linda C. Thomsen, Director, Division of Enforcement, U.S. Securities & Exchange Commission, before the U.S. Senate Committee on the Judiciary concerning insider trading, September 26, 2006.

[43] E.g., Meulbroek (1992, p.1669) reports that about 80% of the illegal insider trading episodes in her sample during 1980-1989 are related to corporate control transactions.

[44] See, e.g., John and Lang (1991), Seyhun and Bradley (1997), Huddart, Ke and Shi (2007), and Agrawal and Cooper (2008).

purchases or decrease in sales) is abnormal for a broad cross-section of targets of takeovers during modern times. This paper aims at filling this gap in the literature and provides large-sample evidence on this issue.

Second, stock market participants want to know if insider trading is widespread because it affects investors' willingness to trade, and consequently affects the liquidity of the stock (see Ausubel (1990)). Third, measuring the prevalence of insider trading is of interest to policy makers and regulators concerned with the effectiveness of existing insider trading regulations. Fourth, recent high-profile corporate scandals such as Enron, Worldcom and HealthSouth, and the consequent adoption of tough governance rules under the Sarbanes-Oxley Act and under listing requirements of the NYSE, Nasdaq and AMEX have focused investor, media and regulators' attention on the activities of insiders. This raises the question whether insiders change their trading behavior in response to greater scrutiny of their activities. Finally, large waves of takeovers in recent years provide an opportunity to analyze the behavior of insiders before this major corporate event.

We examine the level and pattern of insider trading in about 3,700 targets of takeovers announced during 1988-2006 and in two control samples: a cross-sectional control sample and a time-series control sample. We analyze open-market stock transactions of five groups of corporate insiders: top management, top financial officers, all corporate officers, board members, and large blockholders. We separately examine their purchases, sales and net purchases in target and control firms during the one year period prior to takeover announcement (takeover period) and the preceding one year (control) period, using a difference-in-differences approach. Using several measures of the level of insider trading, we estimate cross-sectional regressions that control for other determinants of the level of insider trading.

We find an interesting pattern in the average trading behavior of target insiders over the one year period before takeover announcement. While insiders reduce both their purchases and sales below their normal levels, the reduction in sales exceeds the reduction in purchases, resulting in an increase in their net purchases. This pattern is confined to the six-month period before takeover announcement; it holds for each insider group, and for all three measures of net purchases that we examine. We find a consistent pattern of statistically significant increases in insiders' net purchases relative to the dual control in certain sub-samples with less uncertainty about takeover completion, such as deals with a single bidder, domestic acquirer, and less regulated target. The pattern of significant increases in insiders' net purchases is also more evident in deals completed after 1995, in deals involving large targets and in targets traded on more prominent stock markets, namely NYSE and Nasdaq.

The rest of the paper is organized as follows. Section 4.2 analyzes insiders' trading decision. Section 4.3 briefly reviews prior studies on insider trading before takeovers. Section 4.4 describes our sample, data and the stock price reaction to takeover announcements. Sections 4.5 and 4.6 present our results for the full sample and for a number of sub-samples, respectively. Section 4.7 concludes.

4.2 Insiders' trading decision

How can target insiders trade profitably during the period of takeover negotiations, before a takeover is publicly announced? There are two possibilities. First, insiders can increase their purchases to profit from the stock price increase upon the announcement. We call this active insider trading. Second, insiders can increase their net stock purchases (= purchases - sales) by postponing their planned sales until after the announcement, even though their actual purchases may not increase. We call this passive insider trading. While takeover talks provide a tempting opportunity to target insiders for active insider trading, such trading is prohibited by insider trading laws. On the contrary, there is no rule against passive insider trading. We consider both possibilities by separately examining insiders' purchases, sales and net purchases. While it is generally difficult to know, even ex-post, when target insiders first learned about a takeover attempt or when takeover talks were first initiated, such talks typically precede takeover announcements by several months with a large cross-sectional variation in the length of this period (see Sanders and Zdanovicz (1992)). Therefore, we follow previous studies (see, e.g., Agrawal and Jaffe (1995)) and consider the 12-month period preceding takeover announcements as the period when insiders may have private information about an upcoming takeover of the firm.

What is the trade-off an insider faces when deciding whether to buy stock while in possession of non-public information about an upcoming takeover? An extensive literature in finance finds that takeover announcements typically result in large increases in target stock prices (for reviews of this literature, see Jensen and Ruback (1983), Jarrell, Brickley and Netter (1988), Andrade, Mitchell and Stafford (2001), and Kaplan and Holmstrom (2001)). So an insider's benefit from buying equals the potential profit to be made by selling his stockholdings after the takeover announcement. An insider's cost of buying stock before a takeover announcement consists of three components. First, he stands to lose his job or directorship with the company. Second, he risks damaging his reputation and faces a reduction in future career prospects. Third, he faces possible civil and criminal penalties under insider trading laws.

Given the costs and benefits that insiders face when trading on material, non-public information about an upcoming takeover, what do insiders typically do? While there are well-publicized episodes involving certain insiders who traded before takeover announcements, how widespread is such insider trading? This paper provides systematic, large-sample evidence on these questions. Our findings shed light on insiders' expected net benefits from buying before a takeover announcement.

We examine trades by several groups of insiders. These include top management, top financial officers, other corporate officers, directors, and blockholders. Are all of these groups likely to be equally informed about an upcoming takeover? We do not believe so. One would expect the first, second and the fourth groups to have greater knowledge of the takeover. But the other two groups also are sufficiently close to the firm that they may become aware of it. We account for the possibility of differential information of these groups by examining their trades separately.

4.3 Prior studies on insider trading before takeovers

Several papers examine the level of insider trading in takeover targets to assess the effectiveness of insider trading regulations. Arshadi and Eyssell (1991) test the effectiveness of ITSA, adopted in 1984, by examining levels of insider trading in tender offer targets pre- and post-ITSA. In a sample of 330 tender offer targets during 1975-87, they find that over the 40-week pre-announcement period, insiders change from being net buyers pre-ITSA to being net sellers post-ITSA.

Seyhun (1992) provides a broad-ranging analysis of the effectiveness of tougher rules and greater enforcement of insider trading regulations by the SEC during the 1980s. He examines the profitability and volume of insider trading in general, and the level and pattern of insider trading before earnings announcements and insider trading in target firms before takeover announcements during three regulatory eras during 1975-1989. He finds that the level of target insiders' net purchases before takeover announcements reduces post-ITSA compared to prior periods. Given its coverage of a wide range of issues, the paper has only one table (Table 10) on insider trading before takeover announcements that analyzes net purchases by insiders. Since the purpose of both these papers is to compare the level of insider trading during different regulatory regimes, they have no control sample for takeover targets. So these papers do not address the question of whether the level of profitable insider trading in targets before takeover announcements (i.e., increase in purchases or reduction in sales) was abnormal.

Agrawal and Jaffe (1995) examine the deterrent effect of the 'short-swing' trading rule (section 16b of the SEA) on trading by top managers (i.e., officer-directors) in takeover targets during 1941-1961. Their sample predates the Cady, Roberts decision in November 1961, which was the first insider trading case where the SEC enforced rule 10b-5 against stock exchange transactions.[45] They find that managers reduce their purchases significantly before takeover announcements relative to both cross-sectional and time-series benchmarks, but their sales do not decrease.

Two studies examine insider trading in specialized groups of takeover targets using time-series benchmarks. Harlow and Howe (1993) analyze a sample of 121 leveraged buyouts (LBOs) announced during 1980-1989. They find an increase in the aggregate number of net insiders buying (= number buying – number selling) over the year preceding the announcement for management-led buyouts, but not for other buyouts. Madison, Roth and Saporoschenko (2004) examine a sample of 111 target firms in bank mergers during 1991-1997. They find that insiders reduce their purchases as well as sales in the two months prior to merger announcements. None of these studies examines whether the level and pattern of profitable insider trading before

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[45] See Columbia Law Review (1962), Hines (1963) and Manne (1966). Before this case, the SEC's view was that insider trading in stock exchange transactions is a 'victimless crime'.

takeover announcements (i.e., increase in purchases or reduction in sales) is abnormal for a broad cross-section of targets of takeovers during modern times, a task that we tackle in this paper.

In addition, several papers examine insider trading in acquiring firms (see, e.g., Seyhun (1990), Boehmer and Netter (1997), Akbulut (2005), and Song (2007)). In contrast to most of the literature on insider trading that analyzes trades reported to the SEC by registered corporate insiders, Meulbroek (1992) analyzes a sample of illegal insider trades prosecuted by the SEC during 1974-1989, about 80% of which are related to takeovers. She finds that almost one-half of the pre-announcement stock price run-up in takeover targets occurs on insider trading days. Other papers indirectly examine the prevalence of illegal insider trading by examining abnormal stock returns and trading volume prior to takeover announcements (see, e.g., Keown and Pinkerton (1981), Jarrell and Poulsen (1989) and Sanders and Zdanowicz (1992)).

4.4 Sample and data

Section 4.4.1 details our sample selection procedure and describes the sample of takeover target firms. Section 4.4.2 deals with the selection of our cross-sectional control sample and compares the target and control samples. Sections 4.4.3 and 4.4.4 describe our time-series control samples and insider trading data, respectively. Section 4.4.5 describes the stock-price reactions to the full sample of takeover announcements and a number of sub-samples.

4.4.1 Sample of takeover targets

We obtain our initial sample of target firms in completed or partially completed takeovers announced during 1988-2006 from the SDC database.[46,47] We require each acquisition to have a deal value of at least $1 million, the target firm to be traded on the NYSE, AMEX, or NASDAQ

[46]Our sample begins with takeovers announced in 1988 because we need two years of insider trading data before a takeover announcement and insider trading data in TFN Insider database starts from 1986.

[47]The SDC database was accessed in November 2007.

before the acquisition, and exclude transactions that are spin-offs, recapitalizations, self-tenders, exchange offers, repurchases, minority stake purchases, acquisitions of remaining interest, or privatizations. These criteria yield an initial sample of 5,792 takeover transactions.

Table 4.1: Sample selection

The table shows sample selection out of the 5,792 target firms in takeover transactions with a deal value of $1 million or more, announced during 1988-2006. The sample is obtained from Securities Data Corporation (SDC).

Explanation	Dropped mergers	Number of mergers
Total number of merger observation obtained from SDC		5,792
Repeat acquisitions of a firm[1]	103	
		5,689
Tender offer with less than 60% shares tendered	126	
		5,563
Firms not present in Compustat during two years prior to merger	689	
		4,874
Firms with incomplete Compustat coverage	557	
		4,317
Firms not on CRSP (NYSE, AMEX, or NASDAQ) before takeover	223	
		4,085
ADRs, Units, ETFs, REITs, or Closed-end funds (Firms with share codes other than 10, 11, or 12)	165	
		3,920
Firms with incomplete CRSP coverage	152	
		3,759
Firms not present in TFN	58	
Final sample		3,701

[1]These include partial acquisitions, followed by a clean-up merger; sale to a company or management or investor group, followed by a resale, etc.

We apply several screens to obtain the final sample of target firms. Table 4.1 outlines the sample selection process. We omit 103 repeat acquisitions of a target firm after the initial acquisition. These include a clean-up merger following a partial acquisition, and a resale of a company following its initial sale to another company, management or investor group. We also drop 126 observations consisting of tender offers that sought to buy less than 60% of the target's outstanding equity. Since we need insider trading data from TFN Insider database and control variables constructed using financial and stock price data from Compustat and CRSP, we eliminate firms that are not listed, or have incomplete coverage, in these databases. A total of 689 firms are not listed, and an additional 557 firms have incomplete coverage, on Compustat

Table 4.2: Time and industry distributions

Panels A and B show, respectively, the time and industry distributions of 3,701 NYSE, AMEX, or NASDAQ-listed target firms in takeover transactions with a deal value of $1 million or more announced during 1988-2006. Industry distribution is based on a firm's 2-digit primary SIC code reported in SDC, and uses the industry classification in Song and Walkling (1993). Deal values are obtained from SDC. All dollar values are in inflation-adjusted 2000 dollars.

Panel A: Distribution by year of announcement

Year	Merger count	% of Total count	Deal value ($ mill.)	
			Mean	Median
All	3,701	100	1,448	227
1988	159	4.30	740	119
1989	114	3.08	770	162
1990	80	2.16	539	80
1991	56	1.51	504	154
1992	50	1.35	504	218
1993	66	1.78	865	143
1994	120	3.24	743	174
1995	219	5.92	858	179
1996	231	6.24	1,077	213
1997	311	8.40	1,087	357
1998	357	9.65	2,441	256
1999	402	10.86	1,935	327
2000	325	8.78	1,985	306
2001	251	6.78	1,155	151
2002	151	4.08	724	106
2003	203	5.49	857	126
2004	191	5.16	1,721	268
2005	196	5.30	2,139	339
2006	219	5.92	2,369	548

Panel B: Industry Distribution

Industry (SIC2 codes)	Merger count	% of total count	Deal value ($ mill.)	
			Mean	Median
Agriculture (01-09)	14	0.38	1,205	214
Mining (10-14)	133	3.59	2,816	398
Construction (15-19)	26	0.70	446	308
Food and Tobacco (20-21)	58	1.57	2,462	299
Textile and apparel (22-23)	33	0.89	454	182
Lumber, furniture, paper, and print (24-27)	103	2.78	1,244	313
Chemicals (28)	206	5.57	2,297	425
Petroleum, rubber, and plastic (29-30)	61	1.65	2,412	206
Leather, stone, and glass (31-32)	26	0.70	734	353
Primary and fabricated metals (33-34)	85	2.30	1,179	186
Machinery (35-36)	450	12.16	954	188
Transport equipment (37)	49	1.32	2,190	370
Instruments and miscellaneous manufacturing (38-39)	241	6.51	671	174
Transport, communications, and utilities (40-49)	284	7.67	3,715	711
Wholesale trade (50-51)	97	2.62	546	154
Retail trade (52-59)	201	5.43	923	172
Finance, insurance, and real estate (60-69)	799	21.59	1,520	209
Hotels and personal services (70-71)	46	1.24	1,794	465
Services (72-89)	788	21.29	813	192
Public administration and others (90-99)	1	0.03	174	174

during the two-year period before the takeover announcement. An additional 223 firms are not listed on CRSP. We omit 165 firms with CRSP share code other than 10, 11, or 12; these are American Depository Receipts, units, exchange-traded funds, real estate investment trusts, or closed-end funds. We exclude an additional 152 firms with incomplete coverage on CRSP. Finally, we drop 58 firms that are not listed in the TFN Insider database. This yields our final sample of 3,701 target firms.

Table 4.2 presents the distributions of the sample by the year of takeover announcement (in Panel A) and by industry (in Panel B), and shows the mean and median deal values for each group. The industry distribution is based on a firm's 2-digit primary SIC code reported in SDC, and uses the industry classification in Song and Walkling (1993). The deal values are obtained from SDC. All dollar values throughout the paper are in inflation-adjusted year 2000 dollars. Panel A shows that except during 1990-93, the sample includes over 100 takeovers in each year. After 1994, there are about 200 or more takeovers in each year except 2002. The mean (median) deal value is $1,448 million ($227 million). Panel B shows that the sample is distributed over a wide range of industries. Industries with the largest number of takeovers are finance and services, and industries with the fewest takeovers are public administration and agriculture.

4.4.2 Cross-sectional control sample

We match each target firm with a control firm from its 2-digit Compustat primary SIC industry that has the smallest percentage difference in total assets at the end of fiscal year -2, relative to the fiscal year in which the takeover announcement occurs (year 0). The pool of potential control firms excludes target firms, and is required to have CRSP share codes 10, 11 or 12 and complete Compustat and CRSP data needed for the study. A control firm matched with a given target firm in a takeover announced during fiscal year *t* is taken out of the pool of potential control firms for other target firms during fiscal years *t*-2 to *t*+2.

Table 4.3 shows descriptive statistics of our samples. Panel A reports mean and median values of financial and operating characteristics for our sample of 3,701 matched-pairs of target and control firms. The table also reports p-values of two-tailed t-tests for differences in means and two-tailed Wilcoxon tests for differences in distributions. All dollar values in the paper are in inflation-adjusted 2000 dollars. The typical target firm in the sample is relatively small, with a median market capitalization (total assets) of $136 million ($240 million), although the sample includes some very large firms, as indicated by substantially larger mean values. The median

Table 4.3: Descriptive statistics of target and control samples

Panel A shows characteristics of target and control samples. The samples consists of 3,701 target firms in takeover transactions announced during 1988-2006 with a deal value of $1 million or more, and an industry-size matched control sample. Both target and control firms are listed on the NYSE, AMEX, or NASDAQ. Each target firm is matched to a control firm in its 2-digit primary SIC code industry on Compustat that has the smallest percentage difference in total assets at the end of fiscal year -2, where fiscal year 0 is the year in which the takeover announcement occurs. Measures of firm size, financial leverage and the first two growth measures shown are for (or the end of) fiscal year -1. Sales growth is computed as $[(Sales_{t-1} / Sales_{t-5})^{(1/4)} - 1]$. OPA(t) is Operating performance to total assets for year *t*. Operating performance is operating income before depreciation. OPA equals [(OPA(-1)+OPA(-2)+OPA(-3))/3]. Firm value equals (Total assets – Book value of equity + market value of equity). All publicly traded common shares of a firm are used to compute market value of equity. PRET(t) is the market-adjusted average daily prior stock return for a firm for quarter t relative to the beginning of one year prior to the merger announcement date, where market return is the equal-weighted CRSP market index return. Stock return volatility (σ) is the standard deviation of stock returns for the period of (-250, -126) days before one year prior to the announcement date. The change in stock return volatility ($\Delta\sigma$) is computed as $[\sigma_{(-250, -126)} - \sigma_{(-125, -1)}]$. Stock returns and market value of equity are obtained from CRSP, and all other financial data are from Compustat. Panel B shows descriptive statistics of the number of insiders for matched target and control firm pairs with non-zero number of insiders, for each of five insider groups. The panel also shows the numbers of target, control, and matched pairs of firms with non-zero number of insiders. The number of insiders is obtained from TFN Insider database based on all transactions or holdings reported by insiders during the two-year period prior to the takeover announcement date. The 'top management' group consists of Chairman, Chief Executive Officer (CEO), Chief Operating Officer (COO), and President. 'Top financial officers' are Chief Financial Officer (CFO), Controller and Treasurer. 'All officers' are all corporate officers defined by the SEC under section 16a of the Securities Exchange Act of 1934. 'All directors' are all members of the board of directors. 'Blockholders' are beneficial owners of 10% or more of any class of equity securities of a firm. Panel C shows descriptive statistics of four different measures of the latest shareholdings reported by insiders of matched target and control firm pairs during the one year period prior to takeover announcement, for each of the five insider groups. Shareholding data is obtained from TFN Insider. We define *# insiders* as the number of individuals within the insider group that reported shareholdings, and *# shares* (*$ shares*) [*% equity*] as total insider shareholdings expressed in thousands of shares (in thousands of dollars) [as a percentage of shares outstanding]. The table reports p-values of two-tailed t-tests for differences in means and two-tailed Wilcoxon tests for differences in distributions. All dollar values are in inflation-adjusted 2000 dollars.

Table 4.3 (cont.)

Panel A: Firm Characteristics

Measure	N	Mean Target	Mean Control	Mean p-value	Median Target	Median Control	Median p-value
Firm size							
Market value of equity ($ mill.)	3,701	912	1,079	0.015	136	145	0.000
Firm value ($ mill.)	3,546	2,833	2,888	0.487	345	361	0.000
Total assets ($ mill.)	3,563	2,245	2,148	0.039	240	243	0.098
Sales ($ mill.)	3,566	832	836	0.890	145	144	0.975
Employees (`000s)	3,156	4.110	4.672	0.005	0.824	0.846	0.538
Stock volatility and prior returns							
σ (%)	3,700	3.669	3.683	0.781	3.108	3.004	0.332
Δσ (%)	3,700	0.005	-0.032	0.558	-0.042	0.023	0.527
PRET(-1) (%)	3,701	0.019	-0.004	0.130	-0.029	-0.032	0.434
PRET(-2) (%)	3,699	-0.022	-0.007	0.098	-0.037	-0.034	0.111
PRET(-3) (%)	3,699	-0.006	-0.003	0.737	-0.023	-0.029	0.877
PRET(-4) (%)	3,610	0.000	0.009	0.403	-0.024	-0.016	0.518
Growth							
B/M	3,546	0.651	0.622	0.559	0.579	0.554	0.000
Firm value/Total assets	3,546	1.660	1.806	0.000	1.208	1.225	0.000
Sales growth rate (%)	2,066	19.552	20.004	0.753	11.164	12.849	0.010
Operating performance							
OPA(-1) (%)	3,492	5.466	6.244	0.080	8.795	8.421	0.154
OPA(-2) (%)	3,641	6.578	7.070	0.188	9.346	8.788	0.144
OPA(-3) (%)	3,516	5.806	6.740	0.079	9.380	9.588	0.027
OPA (%)	3,338	5.919	6.803	0.027	9.298	8.961	0.074
Financial leverage							
Long-term debt/Total assets	3,538	0.169	0.173	0.406	0.109	0.102	0.962
Long-term debt/Firm value	3,524	0.124	0.124	0.777	0.074	0.066	0.440

Panel B: Number of insiders

Insider group	Number of firms with non-zero number of insiders: Target	Control	Pair	Mean Target	Mean Control	Mean p-value	Median Target	Median Control	Median p-value
Top management	3,248	3,060	2,753	2.748	2.834	0.035	2.000	3.000	0.020
Top financial officers	2,242	2,118	1,584	1.712	1.744	0.349	1.000	1.000	0.342
All officers	3,415	3,204	2,970	6.448	6.557	0.284	5.000	5.000	0.225
All directors	3,537	3,324	3,184	6.760	7.192	0.000	6.000	6.000	0.000
Blockholders	1,668	1,493	739	2.892	2.578	0.072	2.000	2.000	0.022

Table 4.3 (cont.)

Panel C: Shareholdings							
	N	Mean			Median		
Measure		Target	Control	p-value	Target	Control	p-value
Top Management							
# insiders	3,701	1.469	1.516	0.116	1	1	0.077
# shares	3,701	634	959	0.243	43	55	0.000
$ shares	3,701	15,604	23,936	0.390	545	602	0.000
% equity	3,701	3.653	4.311	0.403	0.267	0.305	0.000
Top Financial Officers							
# insiders	3,701	0.615	0.610	0.758	0	0	0.974
# shares	3,701	103	187	0.586	0	0	0.197
$ shares	3,701	4,059	1,529	0.323	0	0	0.102
% equity	3,701	0.379	0.275	0.517	0	0	0.187
All Officers							
# insiders	3,701	3.324	3.431	0.136	2	2	0.138
# shares	3,701	867	787	0.729	54	65	0.000
$ shares	3,701	22,463	19,360	0.717	643	722	0.001
% equity	3,701	3.892	3.655	0.708	0.327	0.377	0.000
All Directors							
# insiders	3,701	3.828	4.148	0.000	3	3	0.000
# shares	3,701	1,066	1,388	0.407	132	152	0.000
$ shares	3,701	30,493	34,796	0.767	1,621	1,760	0.000
% equity	3,701	5.041	6.261	0.178	0.868	0.987	0.000
Blockholders							
# insiders	3,701	0.376	0.357	0.433	0	0	0.587
# shares	3,701	881	1,031	0.249	0	0	0.742
$ shares	3,701	16,089	22,262	0.120	0	0	0.428
% equity	3,701	4.327	4.087	0.526	0	0	0.958

daily stock volatility in target (control) firm is about 3.1% (3.0%). Target and control firms have similar median operating performance (measured as operating income before depreciation to total assets) over the two years before the takeover announcement, although targets under-perform the control firms somewhat in year -3. Both target and control firms have moderate financial leverage, with median ratios of long-term debt to total assets of about 11% and 10%, respectively.

4.4.3 Time-series control sample

We compare the levels of insider trading in target and control firms during the pre-takeover period to their levels during the control period. The 'pre-takeover period' is the one-year period before a takeover announcement, and 'control period' is the year before that. We focus on insider trading *before* takeover announcements because insiders clearly have an information advantage over outsiders during this period, and they can mask their trades by timing them sufficiently before the public announcement. We do not examine insider trading *after* the takeover announcement because insiders' actions are under a spotlight during that period. So while insiders may still have an information advantage over outsiders as the details of the takeover are worked out between the target and acquiring firms, insiders are unlikely to trade on the basis of this information. As discussed in section 4.2 above, we choose a one-year period before the announcement to examine possibly informed trading because takeover talks typically appear to begin about three to six months before the first public announcement of a takeover, with substantial cross-sectional variation in the length of this interval (see Sanders and Zdanovicz (1992)). While systematic, reliable data on the beginning date of takeover talks is publicly unavailable even ex-post, we find that most of the abnormal insider trading is concentrated over the six months before takeover announcement.

4.4.4 Insider trading data

We obtain data on insider trading from the Thomson Financial Insider Filing Data Files (hereafter, TFN). TFN reports ownership, insider transactions and changes in ownership that insiders report on Forms 3, 4, and 5 filed with the SEC.[48] For each target and control firm, we

[48]Most insider transactions are reported on Form 4. Form 3 is the initial statement of beneficial ownership that insiders must file. Form 5 is an annual statement of changes in beneficial ownership and contains activity from small or exempt transactions that are not reported on Form 4.

obtain data on insiders' open-market purchases and sales during the pre-takeover and control periods.[49]

Panel B of Table 4.3 shows the mean and median number of insiders in each of our five insider groups. These statistics are based on matched-pairs of target and control firms with non-zero number of insiders. Data on the number of insiders is based on all transactions or holdings reported by insiders during the two-year period prior to the takeover announcement date. The *top management* group consists of Chairman, Chief Executive Officer (CEO), Chief Operating Officer (COO), and President. *Top financial officers* are Chief Financial Officer (CFO), Controller and Treasurer. *All officers* are all corporate officers defined by the SEC under section 16a of the Securities Exchange Act of 1934.[50] *All directors* are all members of the board of directors. *Blockholders* are beneficial owners of 10% or more of any class of equity securities of a firm. The panel also shows the numbers of target, control, and matched pairs of firms with non-zero number of insiders. The median number of individuals in the top management group in target (control) firms is 2 (3); the corresponding number is 1 (1) for top financial officers, 5 (5) for all officers, 6 (6) for all directors, and 2 (2) for 10% blockholders. The small numbers of officers and directors and the large numbers of blockholders are consistent with the relatively small size of the typical firm in both samples.

Panel C shows mean and median values of four different measures of the latest shareholdings reported by insiders of matched target and control firm pairs during the one year period prior to takeover announcement, for each of the five insider groups. We define *# insiders*

[49]We review the TFN database for obvious coding and transposition errors and make corrections where appropriate. We delete filings marked as inaccurate or incomplete by TFN (labeled via cleanse indicators 'S' or 'A'). We also remove transactions that are amended by subsequent filings, and transactions involving shares indirectly owned by insiders via a partnership, corporation, trust or other entity.

[50]This group includes top management, principal financial officer, principal accounting officer, vice presidents in charge of principal business units, divisions or functions, and any other person who performs a policy-making function for the company.

as the number of individuals within the insider group that reported shareholdings, and *# shares* (*$ shares*) [*% equity*] as total insider shareholdings expressed in thousands of shares (in thousands of dollars) [as a percentage of shares outstanding]. The median shareholding by top management is $545 ($602) thousand in target (control) firms. The corresponding shareholding is $643 ($722) thousand for all officers, and $1,621 ($1,760) for all directors. Mean values of shareholdings are substantially higher (by orders of magnitude) than median values, indicating that the distribution of ownership data is highly skewed, with some insider groups having extremely large holdings.

4.4.5 Stock price reaction

We next examine the stock-price reaction to takeover announcements for our full-sample of target firms, as well as a number of sub-samples. For comparison, as well as to examine potential contagion effects, we also present corresponding reactions for the control sample of non-targets. We compute the abnormal return for stock i on day t as:

$$e_{it} = r_{it} - r_{mt}, \tag{3}$$

where r_i and r_m are the stock returns for firm i and the market, respectively. The market return is defined as the return on the equal-weighted CRSP (i.e., NYSE, AMEX and Nasdaq) stock index. We measure the cumulative abnormal return for firm i over days (t_1, t_2) as:

$$CAR^{i}_{t_1,t_2} = \sum_{t=t_1}^{t_2} e_{it} \; . \tag{4}$$

We compute t-statistics for mean CARs after adjusting for cross-sectional dependence, as in Brown and Warner (1985), and use the two-tailed Wilcoxon test for assessing the significance of median CARs.

The first two rows of Table 4.4 show the mean and median values of CARs for our full samples of target and control firms over four windows covering trading days (-40, +10), (-20, +5), (-10, +1), and (-5, +1) around the takeover announcement date (day 0). Consistent with prior research (see, e.g., Jensen and Ruback (1983) and Jarrell, Brickley and Netter (1988)), takeover announcements result in large increases in stock prices of target firms. Over the shorter (-5, +1) day window, target firms experience a mean CAR of about 24.2%; over the longer (-40, +10) day window, the mean CAR is 29.23%. The corresponding CARs for control firms are 0.4% and 1.4%, consistent with a contagion effect in the industries of takeover targets found by prior studies (e.g., Song and Walkling (2000)).

The remaining rows of Table 4.4 present CARs for sub-samples resulting from nine partitions of the target sample. These partitions are based on the method of acquisition, target management's response to the bid, number of bidders, method of payment, bidder domicile, level of regulation of the target firm, time period, target size, and target's exchange listing. Consistent with prior research (see the references cited above), target firms experience greater abnormal returns in tender-offers, hostile bids, cash deals, and cross-border acquisitions. In addition, less regulated industries, targets acquired during 1996-2001, smaller targets and targets listed

Table 4.4: Abnormal returns for target and control samples and sub-samples

The table shows mean and median values of cumulative abnormal returns (CARs) for four windows around the takeover announcement date (day 0) for target and control samples, and various sub-samples. For each firm, the abnormal return for trading day *t* is computed by subtracting the return on the equal-weighted CRSP (i.e., NYSE, Nasdaq and AMEX) index from the return on a stock on day *t*. The samples consists of 3,701 target firms in takeover transactions announced during 1988-2006 with a deal value of $1 million or more, and an industry-size matched control sample. Both target and control firms are listed on the NYSE, AMEX, or NASDAQ. The table presents nine sub-samples of takeover targets. Firms with market value of equity (as of the latest fiscal year-end before day 0) in the bottom (top) 30% of the NYSE are classified as small (large) firms, and the remaining as medium-size firms. Three different sub-samples are constructed based on takeover announcements during the periods 1988-1995, 1996-2001 and 2002-2006. The NYSE, AMEX and NASDAQ sub-samples correspond to target firms listed on each exchange. The 'Hostile' sub-sample consists of target firms whose initial reaction to the merger is hostile; the remaining targets are 'Friendly'. Tender-offers consist of takeovers where 60% or more of the target's outstanding equity is acquired via a tender-offer; LBOs are leverage buyouts; the remaining takeovers are classified as mergers. The sub-samples 'Stock deal' and 'Cash deal' consist of takeovers via 100% stock and 100% cash, respectively; the remaining takeovers are classified as 'Other deals'. Target firms in railroad, public utility, banking, finance, or insurance industries (i.e. 2-digit primary SIC codes 40, 49, 60, 61, or 63) are classified as 'More regulated'; all other firms are called 'Less regulated.' A target firm is classified into small, mid-size or large target group if it is in the bottom, middle or top tercile, respectively, of all the firms on CRSP by market capitalization at the end of its fiscal year -1. *, **, and *** denote significantly different from zero at the 10%, 5%, and 1% levels, respectively, using two-tailed Brown and Warner (1985) t-tests for means and two-tailed Wilcoxon tests for medians.

Table 4.4 (cont.)

Category	Observations		Days around announcement Means				Days around announcement Medians			
	Count	%	(-40,+10)	(-20,+5)	(-10,+1)	(-5,+1)	(-40,+10)	(-20,+5)	(-10,+1)	(-5,+1)
Target	3,701	100	29.23^{***}	27.75^{***}	25.68^{***}	24.16^{***}	25.41^{***}	23.85^{***}	21.52^{***}	20.04^{***}
Control	3,701	100	1.36^{***}	1.07^{***}	0.77^{***}	0.43^{**}	-0.61	-0.29	-0.28	-2.16
Sub-samples:										
Mergers	2,673	72.22	25.41^{***}	24.29^{***}	22.55^{***}	21.18^{***}	22.07^{***}	21.18^{***}	19.28^{***}	17.69^{***}
Tender-offers[a]	836	22.59	43.02^{***}	40.31^{***}	36.63^{***}	34.40^{***}	39.90^{***}	35.53^{***}	32.93^{***}	30.20^{***}
LBOs[a]	243	6.57	23.80^{***}	22.76^{***}	22.26^{***}	21.71^{***}	22.32^{***}	19.37^{***}	18.54^{***}	19.02^{***}
Hostile	128	3.46	34.40^{***}	31.75^{***}	28.97^{***}	27.51^{***}	29.00^{***}	27.27^{***}	24.81^{***}	23.82^{***}
Friendly	3,573	96.54	29.04^{***}	27.61^{***}	25.56^{***}	24.04^{***}	25.18^{***}	23.67^{***}	21.38^{***}	19.78^{***}
Single bidder	3,469	93.73	29.26^{***}	27.91^{***}	25.99^{***}	24.47^{***}	25.33^{***}	24.20^{***}	22.01^{***}	20.28^{***}
Multiple bidder	232	6.27	28.74^{***}	25.30^{***}	21.00^{***}	19.57^{***}	26.30^{***}	20.33^{***}	17.86^{***}	17.64^{***}
Stock deals	1,128	31.13	24.93^{***}	23.45^{***}	21.46^{***}	19.74^{***}	21.63^{***}	19.68^{***}	18.28^{***}	16.78^{***}
Cash deals	1,421	38.40	34.96^{***}	33.39^{***}	30.87^{***}	29.20^{***}	30.58^{***}	28.19^{***}	25.87^{***}	24.32^{***}
Other deals	1,152	30.48	26.37^{***}	25.00^{***}	23.41^{***}	22.27^{***}	23.09^{***}	21.67^{***}	20.18^{***}	18.84^{***}
Cross border acquirer	595	16.08	36.39^{***}	34.31^{***}	30.87^{***}	28.97^{***}	31.27^{***}	28.47^{***}	25.58^{***}	23.50^{***}
Domestic acquirer	3,106	83.92	27.88^{***}	26.49^{***}	24.69^{***}	23.24^{***}	24.41^{***}	22.92^{***}	20.84^{***}	19.27^{***}
More regulated	859	23.21	21.80^{***}	21.86^{***}	20.85^{***}	19.87^{***}	19.12^{***}	18.91^{***}	17.57^{***}	16.45^{***}
Less regulated	2,842	76.79	31.48^{***}	29.53^{***}	27.19^{***}	25.46^{***}	27.92^{***}	25.93^{***}	23.01^{***}	21.14^{***}
1988-1995	864	23.35	29.16^{***}	28.32^{***}	25.65^{***}	24.11^{***}	25.34^{***}	24.45^{***}	21.40^{***}	19.82^{***}
1996-2001	1,877	50.72	30.94^{***}	29.27^{***}	26.63^{***}	24.89^{***}	27.35^{***}	25.68^{***}	22.95^{***}	20.64^{***}
2002-2006	960	25.94	25.96^{***}	24.26^{***}	23.85^{***}	22.78^{***}	22.37^{***}	20.96^{***}	19.92^{***}	18.87^{***}
Small target	2,027	54.77	32.84^{***}	30.59^{***}	27.77^{***}	26.16^{***}	28.28^{***}	25.91^{***}	22.95^{***}	21.36^{***}
Mid-size target	780	21.08	26.48^{***}	25.91^{***}	24.74^{***}	23.29^{***}	25.11^{***}	23.39^{***}	21.67^{***}	20.10^{***}
Large target	894	24.16	23.44^{***}	22.92^{***}	21.76^{***}	20.39^{***}	20.88^{***}	19.99^{***}	18.87^{***}	17.32^{***}
NYSE target	937	25.32	25.00^{***}	23.98^{***}	22.87^{***}	21.95^{***}	23.05^{***}	21.39^{***}	19.55^{***}	18.59^{***}
AMEX target	299	8.08	30.44^{***}	27.82^{***}	25.65^{***}	24.33^{***}	27.46^{***}	23.94^{***}	21.20^{***}	18.68^{***}
NASDAQ target	2,465	66.60	30.69^{***}	29.17^{***}	26.75^{***}	24.98^{***}	26.34^{***}	25.12^{***}	22.54^{***}	20.67^{***}

[a] Note that tender offers and LBOs are not mutually exclusive. There are 51 LBOs that are also tender offers.

on Nasdaq or AMEX experience greater abnormal returns. Surprisingly, target abnormal returns are somewhat lower in takeovers with multiple bidders (cf. Bradley, Desai and Kim (1988)).

4.5 Results for the full sample

Section 4.5.1 presents univariate results on insider trading in our full sample of takeover targets, and section 4.5.2 presents cross-sectional regressions that control for other determinants of the level of insider trading found in prior research.

4.5.1 Univariate results

We start by comparing the level of insider trading in target firms during the one-year pre-takeover period to two sets of controls: contemporaneous trades by insiders of control firms (the cross-sectional control) and trades by target firm insiders during the preceding one-year control period (the time-series control). By examining trades by insiders of both target and control firms at the same time, the cross-sectional control provides a perfect control for the effect of the time period, but it provides an imperfect control for firm attributes that may affect the level of insider trading. The time-series control emphasizes the opposite trade-off. It provides a perfect control for firm characteristics by using the target firm as its own control, but by comparing insider trades over different periods, it does not control for possible changes in the trading behavior of insiders over time. While each control has its merits and limitations, our main interest is in the dual-control, which equals the abnormal purchases of target firm insiders (i.e., their purchases during the pre-takeover period minus their purchases during the control period) minus the abnormal purchases of control firm insiders (i.e., their purchases during the pre-takeover period minus their purchases during the control period). This difference-in-differences approach controls for both the effects of firm characteristics and the time period.

We present results for insider purchases in section 4.5.1.1 and insider sales in section 4.5.1.2. We examine purchases and sales separately because, as discussed in section 4.2 above, the incentives and penalties faced by insiders differ for the two types of transactions. Of course, what insiders really care about is the net effect of their trading, reflected in their net purchases, which we examine in section 4.5.1.3.

4.5.1.1 Insider purchases

Table 5 shows mean and median values of five parametric measures and values of two non-parametric measures of insider purchases for the target and control samples for the pre-takeover and control periods. The 'pre-takeover period' is the one year period before the takeover announcement date, and 'control period' is the one year period before that. Each panel shows measures of purchases for one of the five groups of insiders defined in section 4.4.4 above. The parametric measures of insider purchases are: number of insiders buying during a year (denoted '# insiders' in the table), number of shares bought in thousands ('# shares'), dollar value of shares bought in millions ('$ shares'), percentage of outstanding equity bought ('% equity'), and number of pure buy months, i.e., months with some insider purchases and no insider sales ('# buy months'). The dollar value of shares traded is computed by multiplying the number of shares traded by the transaction price reported on TFN. Missing transaction prices are replaced by the closing price or the bid-ask average from CRSP on the transaction date. The percentage of equity traded equals the number of shares traded divided by the number of shares outstanding on the transaction date.

The table reports p-values of the two-tailed t-test for the difference in means and Wilcoxon test for the difference in distributions (shown in rows for medians). The last two rows in each panel show the percentages of firms with at least one or at least two insiders buying shares in a year and p-values of two-tailed z-tests for differences in proportions. Signs of the test statistics are shown in parentheses after p-values. Column 5 (labeled '1 - 2') shows p-values of test statistics for the change in the level of purchases of target firm insiders between the pre-takeover and control periods (i.e., the time-series control); column 6 ('1 - 3') is for differences in the level of insider purchases during the pre-takeover period between target and control firms (i.e., the cross-sectional control); column 7 ('3 - 4') is for the change in the level of purchases of control firm insiders between the pre-takeover and control periods; and column 8 ['(1 – 2) - (3 - 4)'] is for the difference between (1) the change in the level of purchases of target firm insiders between the pre-takeover and control periods and (2) the change in the level of purchases of control firm insiders between the pre-takeover and control periods. While the tests in columns 5 and 6 are certainly pertinent, our focus is on the test in column 8, which uses the dual control or the difference-in-differences approach.

In Panel A of Table 4.5, the top management group in target firms significantly reduces their purchases during the pre-takeover period. This conclusion holds whether we use the time-series control, the cross-sectional control, or the dual control, and is based on all seven measures of insider purchases. Of the 12 p-values for the dual control shown in column 8, nine are less than .001, one is between .001 and .05, and the remaining two are between .05 and .10. The results are generally similar for the group of all financial officers (in Panel B), all officers (in Panel C), and all directors (in Panel D). While blockholders (in Panel E) also reduce their pre-takeover purchases, only two of the p-values for the dual control are below .05 and another two are below .10. These results are inconsistent with active insider trading based on private negotiations on the takeover. The fact that insiders not only avoid increasing their pre-announcement purchases above their normal levels, but actually decrease it suggests that they are concerned about being caught by either insider trading laws or company regulations against insider trading.

Table 4.5: Insider purchases at target and control firms during pre-takeover and control periods

The table shows mean and median values of five parametric measures and values of two non-parametric measures of insider purchases for target and control samples during the pre-takeover and control periods. The pre-takeover period is the one-year period before the takeover announcement date and control period is the one-year period before that. Each panel shows measures of purchases for one of the five groups of insiders defined in Table 4.3. Insider trading data is from TFN Insider database. The samples consists of 3,701 target firms in takeover transactions announced during 1988-2006 with a deal value of $1 million or more, and an industry-size matched control sample. Both target and control firms are listed on the NYSE, AMEX, or NASDAQ. The parametric measures of insider trading are: number of insiders buying during a year (# insiders), number of shares bought `000 (# shares), dollar value of shares bought in millions ($ shares), percentage of outstanding equity bought (% equity), and number of pure buy months, i.e., months with some insider purchases and no insider sales (# buy months). The table reports p-values of two-tailed t-tests for differences in means and Wilcoxon tests for differences in distributions (shown in rows for medians). The last two rows in each Panel show the percentages of firms with at least one or at least two insiders buying shares in a year and p-values of two-tailed z-tests for differences in proportions. Signs of the test statistics are shown in parentheses after p-values. All dollar values are in inflation-adjusted 2000 dollars.

Panel A: Top Management								
Statistic	Target firms		Control firm		p-values			
Insider buy measure	(1) Pre-Takeover Period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# insiders	0.269	0.354	0.335	0.329	0.000 (-)	0.000 (-)	0.683 (+)	0.000 (-)
# shares	6.639	9.533	13.231	8.846	0.212 (-)	0.024 (-)	0.082 (+)	0.034 (-)
$ shares	0.050	0.107	0.101	0.096	0.020 (-)	0.022 (-)	0.838 (+)	0.072 (-)
% equity	0.057	0.084	0.131	0.092	0.220 (-)	0.021 (-)	0.220 (+)	0.089(-)
# buy months	0.303	0.412	0.405	0.409	0.000 (-)	0.000 (-)	0.801 (-)	0.000 (-)
Median								
# insiders	0	0	0	0	0.000 (-)	0.000 (-)	0.679 (+)	0.000 (-)
# shares	0	0	0	0	0.000 (-)	0.000 (-)	0.165 (+)	0.000 (-)
$ shares	0	0	0	0	0.000 (-)	0.000 (-)	0.686 (-)	0.000 (-)
% equity	0	0	0	0	0.000 (-)	0.000 (-)	0.198 (+)	0.000 (-)
# buy months	0	0	0	0	0.000 (-)	0.000 (-)	0.797 (-)	0.000 (-)
% of firms with								
≥1 insiders buying	20.08	24.97	23.99	24.10	0.000 (-)	0.000 (-)	0.913 (-)	0.001 (-)
≥2 insiders buying	9.38	13.37	12.97	12.16	0.000 (-)	0.000 (-)	0.293 (+)	0.000 (-)

Table 4.5 (cont.)

Panel B: Top Financial Officers

Statistic Insider buy measure	Target (1) Pre-Takeover period	Target (2) Control period	Control (3) Pre-Takeover period	Control (4) Control period	p-values 1 - 2	p-values 1 - 3	p-values 3 - 4	p-values (1-2) - (3-4)
Mean								
# insiders	0.098	0.126	0.110	0.113	0.000 (-)	0.117 (-)	0.675 (-)	0.013 (-)
# shares	0.471	1.341	1.216	1.298	0.182 (-)	0.189 (-)	0.919 (-)	0.448 (-)
$ shares	0.004	0.018	0.011	0.009	0.162 (-)	0.106 (-)	0.645 (+)	0.147 (-)
% equity	0.004	0.010	0.008	0.013	0.074 (-)	0.226 (-)	0.465 (-)	0.978 (-)
# buy months	0.119	0.154	0.141	0.135	0.000 (-)	0.054 (-)	0.484 (+)	0.001 (-)
Median								
# insiders	0	0	0	0	0.000 (-)	0.117 (-)	0.760 (-)	0.007 (-)
# shares	0	0	0	0	0.000 (-)	0.087 (-)	0.679 (+)	0.010 (-)
$ shares	0	0	0	0	0.000 (-)	0.302 (-)	0.482 (-)	0.040(-)
% equity	0	0	0	0	0.001 (-)	0.163 (-)	0.729 (+)	0.018 (-)
# buy months	0	0	0	0	0.000 (-)	0.042 (-)	0.451 (+)	0.001 (-)
% of firms with								
≥1 insiders buying	9.05	11.45	10.11	10.13	0.001 (-)	0.123 (-)	0.969 (+)	0.017 (-)
≥2 insiders buying	2.51	3.35	3.22	3.13	0.033 (-)	0.070 (-)	0.842 (+)	0.104 (-)

Panel C: All Officers

Statistic Insider buy measure	Target (1) Pre-Takeover period	Target (2) Control period	Control (3) Pre-Takeover period	Control (4) Control period	p-values 1 - 2	p-values 1 - 3	p-values 3 - 4	p-values (1-2) - (3-4)
Mean								
# insiders	0.426	0.509	0.531	0.477	0.000 (-)	0.000 (-)	0.008 (+)	0.000 (-)
# shares	5.882	8.670	13.151	7.391	0.170 (-)	0.008 (-)	0.023 (+)	0.009 (-)
$ shares	0.049	0.100	0.135	0.082	0.040 (-)	0.036 (-)	0.209 (+)	0.035 (-)
% equity	0.054	0.067	0.104	0.061	0.512 (-)	0.036 (-)	0.014 (+)	0.032 (-)
# buy months	0.341	0.427	0.469	0.422	0.000 (-)	0.000 (-)	0.005 (+)	0.000 (-)
Median								
# insiders	0	0	0	0	0.000 (-)	0.000 (-)	0.002 (+)	0.000 (-)
# shares	0	0	0	0	0.000 (-)	0.000 (-)	0.001 (+)	0.000 (-)
$ shares	0	0	0	0	0.000 (-)	0.000 (-)	0.020 (+)	0.000 (-)
% equity	0	0	0	0	0.000 (-)	0.000 (-)	0.001 (+)	0.000 (-)
# buy months	0	0	0	0	0.000 (-)	0.000 (-)	0.006 (+)	0.000 (-)
% of firms with								
≥1 insiders buying	23.21	28.07	27.99	26.18	0.000 (-)	0.000 (-)	0.080 (+)	0.000 (-)
≥2 insiders buying	11.21	14.10	16.59	13.94	0.000 (-)	0.000 (-)	0.002 (+)	0.000 (-)

Table 4.5 (cont.)

Panel D: All Directors								
Statistic	Target		Control		p-values			
Insider buy measure	(1) Pre-Takeover period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# insiders	0.672	0.907	0.939	0.952	0.000 (-)	0.000 (-)	0.608 (-)	0.000 (-)
# shares	11.348	22.970	25.499	17.002	0.001 (-)	0.014 (-)	0.156 (+)	0.004 (-)
$ shares	0.127	0.258	0.238	0.188	0.001 (-)	0.031 (-)	0.307 (+)	0.004 (-)
% equity	0.104	0.171	0.164	0.147	0.019 (-)	0.022 (-)	0.515 (+)	0.030 (-)
# buy months	0.608	0.828	0.869	0.851	0.000 (-)	0.000 (-)	0.441 (+)	0.000 (-)
Median								
# insiders	0	0	0	0	0.000 (-)	0.000 (-)	0.938 (-)	0.000 (-)
# shares	0	0	0	0	0.000 (-)	0.000 (-)	0.159 (+)	0.000 (-)
$ shares	0	0	0	0	0.000 (-)	0.000 (-)	0.542 (-)	0.000 (-)
% equity	0	0	0	0	0.000 (-)	0.000 (-)	0.368 (+)	0.000 (-)
# buy months	0	0	0	0	0.000 (-)	0.000 (-)	0.411 (+)	0.000 (-)
% of firms with								
≥1 insiders buying	35.86	44.07	44.31	43.83	0.000 (-)	0.000 (-)	0.673 (+)	0.000 (-)
≥2 insiders buying	19.35	26.88	28.12	27.45	0.000 (-)	0.000 (-)	0.517 (+)	0.000 (-)

Panel E: Blockholders								
Statistic	Target		Control		p-values			
Insider buy measure	(1) Pre-Takeover period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# insiders	0.076	0.106	0.088	0.098	0.001 (-)	0.140 (-)	0.206 (-)	0.071 (-)
# shares	82.230	42.027	62.103	51.246	0.421 (+)	0.702 (+)	0.392 (+)	0.569 (+)
$ shares	0.917	0.528	0.705	0.505	0.352 (+)	0.632 (+)	0.267 (+)	0.678 (+)
% equity	0.243	0.243	0.287	0.191	0.998 (+)	0.620 (-)	0.115 (+)	0.333 (-)
# buy months	0.105	0.119	0.121	0.129	0.162 (-)	0.215 (-)	0.461 (-)	0.700 (-)
Median								
# insiders	0	0	0	0	0.001 (-)	0.140 (-)	0.325 (-)	0.125 (-)
# shares	0	0	0	0	0.001 (-)	0.644 (-)	0.792 (+)	0.018 (-)
$ shares	0	0	0	0	0.009 (-)	0.541 (-)	0.725 (-)	0.053 (-)
% equity	0	0	0	0	0.010 (-)	0.837 (-)	0.563 (+)	0.034 (-)
# buy months	0	0	0	0	0.044 (-)	0.255 (-)	0.610 (-)	0.329 (-)
% of firms with								
≥1 insiders buying	6.19	7.19	7.05	7.00	0.085 (-)	0.135 (-)	0.928 (+)	0.205 (-)
≥2 insiders buying	3.05	4.08	3.35	3.86	0.019 (-)	0.468 (-)	0.216 (-)	0.401 (-)

Table 4.6: Insider sales at target and control firms during pre-takeover and control periods

The table shows mean and median values of five parametric measures and values of two non-parametric measures of insider sales for target and control samples during the pre-takeover and control periods. The pre-takeover period is the one-year period before the takeover announcement date and control period is the one-year period before that. Each panel shows measures of sales for one of the five groups of insiders defined in Table 4.3. Insider trading data is from TFN Insider database. The samples consists of 3,701 target firms in takeover transactions announced during 1988-2006 with a deal value of $1 million or more, and an industry-size matched control sample. Both target and control firms are listed on the NYSE, AMEX, or NASDAQ. The parametric measures of insider trading are: number of insiders selling during a year (# insiders), number of shares sold `000 (# shares), dollar value of shares sold in millions ($ shares), percentage of outstanding equity sold (% equity), and number of pure selling months, i.e., months with some insider sales and no insider purchases (# sell months). The table reports p-values of two-tailed t-tests for differences in means and Wilcoxon tests for differences in distributions (shown in rows for medians). The last two rows in each Panel show the percentages of firms with at least one or at least two insiders selling shares in a year and p-values of two-tailed z-tests for differences in proportions. Signs of the test statistics are shown in parentheses after p-values. All dollar values are in inflation-adjusted 2000 dollars.

Panel A: Top Management

Statistic	Target		Control		p-values			
Insider sales measure	(1) Pre-Takeover period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# insiders	0.419	0.507	0.516	0.497	0.000 (-)	0.000 (-)	0.177 (+)	0.000 (-)
# shares	41.517	48.812	55.169	49.228	0.238 (-)	0.045 (-)	0.175 (+)	0.078 (-)
$ shares	1.172	1.256	1.746	1.347	0.615 (-)	0.012 (-)	0.030 (+)	0.049 (-)
% equity	0.163	0.212	0.224	0.221	0.020 (-)	0.014 (-)	0.874 (+)	0.090 (-)
# sale months	0.521	0.627	0.701	0.640	0.000 (-)	0.000 (-)	0.006 (+)	0.000 (-)
Median								
# insiders	0	0	0	0	0.000 (-)	0.000 (-)	0.099 (+)	0.000 (-)
# shares	0	0	0	0	0.000 (-)	0.000 (-)	0.019 (+)	0.000 (-)
$ shares	0	0	0	0	0.000 (-)	0.000 (-)	0.009 (+)	0.000 (-)
% equity	0	0	0	0	0.000 (-)	0.000 (-)	0.042 (+)	0.000 (-)
# sale months	0	0	0	0	0.000 (-)	0.000 (-)	0.029 (+)	0.000 (-)
% of firms with								
≥1 insiders selling	26.72	31.53	31.69	29.94	0.000 (-)	0.000 (-)	0.102 (+)	0.000 (-)
≥2 insiders selling	15.86	19.05	19.56	19.13	0.000 (-)	0.000 (-)	0.638 (+)	0.004 (-)

(-) and (+) show the sign of the test statistic.

Table 4.6 (cont.)

Panel B: Top Financial Officers

Statistic	Target		Control		p-values			
Insider sales measure	(1) Pre-Takeover period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# insiders	0.178	0.206	0.215	0.208	0.001 (-)	0.001 (-)	0.427 (+)	0.004 (-)
# shares	4.649	8.971	7.261	6.826	0.178 (-)	0.002 (-)	0.726 (+)	0.167 (-)
$ shares	0.145	0.454	0.239	0.192	0.264 (-)	0.002 (-)	0.155 (+)	0.202 (-)
% equity	0.017	0.027	0.033	0.024	0.001 (-)	0.049 (-)	0.268 (+)	0.030 (-)
# sale months	0.243	0.283	0.313	0.281	0.005 (-)	0.000 (-)	0.024 (+)	0.000 (-)
Median								
# insiders	0	0	0	0	0.001 (-)	0.001 (-)	0.352 (+)	0.002 (-)
# shares	0	0	0	0	0.001 (-)	0.001 (-)	0.028 (+)	0.000 (-)
$ shares	0	0	0	0	0.001 (-)	0.001 (-)	0.009 (+)	0.000 (-)
% equity	0	0	0	0	0.000 (-)	0.000 (-)	0.019 (+)	0.000 (-)
# sale months	0	0	0	0	0.000 (-)	0.000 (-)	0.066 (+)	0.001 (-)
% of firms with								
≥1 insiders selling	14.97	17.66	17.86	17.21	0.002 (-)	0.001 (-)	0.463 (+)	0.007 (-)
≥2 insiders selling	6.40	8.05	8.35	7.65	0.006 (-)	0.001 (-)	0.265 (+)	0.007(-)

Panel C: All Officers

Statistic	Target		Control		p-values			
Insider sales measure	(1) Pre-Takeover period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# insiders	1.056	1.206	1.262	1.148	0.000 (-)	0.000 (-)	0.000 (+)	0.000 (-)
# shares	59.630	98.471	70.950	65.708	0.226 (-)	0.178 (-)	0.328 (+)	0.175 (-)
$ shares	1.702	2.100	3.212	4.734	0.274 (-)	0.133 (-)	0.602 (-)	0.702(+)
% equity	0.295	0.618	0.256	0.251	0.408 (-)	0.678 (+)	0.847 (+)	0.403 (-)
# sale months	0.912	1.009	1.110	1.007	0.000 (-)	0.000 (-)	0.000 (+)	0.000 (-)
Median								
# insiders	0	0	0	0	0.000 (-)	0.000 (-)	0.000 (+)	0.000 (-)
# shares	0	0	0	0	0.000 (-)	0.000 (-)	0.001 (+)	0.000 (-)
$ shares	0	0	0	0	0.000 (-)	0.000 (-)	0.000 (+)	0.000 (-)
% equity	0	0	0	0	0.000 (-)	0.000 (-)	0.001 (+)	0.000 (-)
# sale months	0	0	0	0	0.000 (-)	0.000 (-)	0.001 (+)	0.000 (-)
% of firms with								
≥1 insiders selling	38.31	42.77	42.61	40.45	0.000 (-)	0.000 (-)	0.059 (+)	0.000 (-)
≥2 insiders selling	26.34	30.05	29.56	27.86	0.000 (-)	0.002 (-)	0.105 (+)	0.000 (-)

Table 4.6 (cont.)

Panel D: All Directors								
Statistic	Target		Control		p-values			
Insider sales measure	(1) Pre-Takeover Period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# insiders	0.752	0.889	0.942	0.910	0.000 (-)	0.000 (-)	0.151 (+)	0.000 (-)
# shares	78.666	84.010	77.758	76.632	0.661 (-)	0.933 (+)	0.884 (+)	0.654 (-)
$ shares	2.037	2.019	2.449	2.276	0.951 (+)	0.304 (-)	0.624 (+)	0.740 (-)
% equity	0.346	0.366	0.341	0.357	0.642 (-)	0.905 (+)	0.655 (-)	0.954 (-)
# sale months	0.812	0.921	1.007	0.959	0.000 (-)	0.000 (-)	0.072 (+)	0.000 (-)
Median								
# insiders	0	0	0	0	0.000 (-)	0.000 (-)	0.092 (+)	0.000 (-)
# shares	0	0	0	0	0.000 (-)	0.000 (-)	0.295 (+)	0.000 (-)
$ shares	0	0	0	0	0.000 (-)	0.000 (-)	0.201 (+)	0.000 (-)
% equity	0	0	0	0	0.000 (-)	0.000 (-)	0.631 (+)	0.000 (-)
# sale months	0	0	0	0	0.000 (-)	0.000 (-)	0.096 (+)	0.000 (-)
% of firms with								
≥1 insiders selling	39.58	44.64	44.31	43.31	0.000 (-)	0.000 (-)	0.386 (+)	0.000 (-)
≥2 insiders selling	24.56	29.02	29.91	28.83	0.000 (-)	0.000 (-)	0.307 (+)	0.000 (-)

Panel E: Blockholders								
Statistic	Target		Control		p-values			
Insider sales measure	(1) Pre-Takeover Period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# insiders	0.124	0.187	0.132	0.152	0.000 (-)	0.529 (-)	0.171 (-)	0.033 (-)
# shares	102.739	136.806	129.591	88.094	0.277 (-)	0.647 (-)	0.484 (+)	0.272 (-)
$ shares	2.405	3.413	1.663	2.084	0.333 (-)	0.307 (+)	0.605 (-)	0.663 (-)
% equity	0.477	0.484	0.486	0.366	0.940 (-)	0.955(-)	0.392 (+)	0.448 (-)
# sale months	0.132	0.184	0.155	0.163	0.000 (-)	0.115 (-)	0.497 (-)	0.011 (-)
Median								
# insiders	0	0	0	0	0.000 (-)	0.471 (-)	0.296 (-)	0.001 (-)
# shares	0	0	0	0	0.000 (-)	0.249 (-)	0.788 (+)	0.000 (-)
$ shares	0	0	0	0	0.000 (-)	0.183 (-)	0.973 (-)	0.000 (-)
% equity	0	0	0	0	0.000 (-)	0.263 (-)	0.819 (+)	0.000 (-)
# sale months	0	0	0	0	0.000 (-)	0.068 (-)	0.399 (-)	0.003 (-)
% of firms with								
≥1 insiders selling	7.75	10.75	8.97	9.21	0.000 (-)	0.058 (-)	0.716 (-)	0.004 (-)
≥2 insiders selling	4.35	5.92	4.62	4.89	0.002 (-)	0.574 (-)	0.585 (-)	0.069 (-)

Table 4.7: Insiders' net purchases at target and control firms during pre-takeover and control periods

This Table presents means and medians of three different measures of insiders' net purchases for target and control samples during the pre-takeover and control periods. The pre-takeover period is the one-year period before the takeover announcement date and control period is the one-year period before that. Each panel shows net purchase measures for one of the five groups of insiders defined in Table 4.3. Insider trading data is from TFN Insider database. The samples consists of 3,701 target firms in takeover transactions announced during 1988-2006 with a deal value of $1 million or more, and an industry-size matched control sample. Both target and control firms are listed on the NYSE, AMEX, or NASDAQ. The measures of insiders' net purchases are: net number of shares bought during a year in `000 (# shares), net dollar value of shares bought during a year in millions ($ shares), and net percentage of outstanding equity bought during a year (% equity). The table reports p-values of two-tailed t-tests for differences in means and Wilcoxon tests for differences in distributions (shown in rows for medians). Signs of the test statistics are shown in parentheses after p-values. All dollar values are in inflation-adjusted 2000 dollars.

Panel A: Top Management

Statistic	Target		Control		p-values			
Insider net buy measure	(1) Pre-Takeover period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# shares	-34.878	-39.280	-41.938	-40.381	0.506 (+)	0.319 (+)	0.735 (-)	0.457 (+)
$ shares	-1.123	-1.150	-1.615	-1.250	0.873 (+)	0.030 (+)	0.034 (-)	0.089 (+)
% equity	-0.106	-0.128	-0.093	-0.129	0.497 (+)	0.727 (-)	0.342 (+)	0.769 (-)
Median								
# shares	0	0	0	0	0.009 (+)	0.119 (+)	0.127 (-)	0.008 (+)
$ shares	0	0	0	0	0.003 (+)	0.006 (+)	0.003 (-)	0.000 (+)
% equity	0	0	0	0	0.016 (+)	0.354 (+)	0.229 (-)	0.034 (+)

Panel B: Top Financial Officers

Statistic	Target		Control		p-values			
Insider net buy measure	(1) Pre-Takeover period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# shares	-4.178	-7.630	-6.045	-5.528	0292 (+)	0.063 (+)	0.727 (-)	0.270 (+)
$ shares	-0.141	-0.437	-0.228	-0.183	0.287 (+)	0.005 (+)	0.183 (-)	0.223 (+)
% equity	-0.013	-0.017	-0.025	-0.011	0.405 (+)	0.171 (+)	0.192 (-)	0.130 (+)
Median								
# shares	0	0	0	0	0.108 (+)	0.023 (+)	0.057 (-)	0.005 (+)
$ shares	0	0	0	0	0.075 (+)	0.003 (+)	0.008 (-)	0.000 (+)
% equity	0	0	0	0	0.111 (+)	0.009 (+)	0.040 (-)	0.005 (+)

Table 4.7 (cont.)

Panel C: All Officers								
Statistic	Target		Control		p-values			
Insider net buy measure	(1) Pre-Takeover period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# shares	-53.478	-89.801	-57.799	-58.317	0.262 (+)	0.635 (+)	0.925 (+)	0.276 (+)
$ shares	-1.653	-2.001	-3.077	-4.653	0.343 (+)	0.157 (+)	0.589 (+)	0.676 (-)
% equity	-0.241	-0.551	-0.152	-0.190	0.428 (+)	0.357 (-)	0.159 (+)	0.488 (+)
Median								
# shares	0	0	0	0	0.001 (+)	0.157 (+)	0.112 (-)	0.006 (+)
$ shares	0	0	0	0	0.000 (+)	0.015 (+)	0.008 (+)	0.000 (+)
% equity	0	0	0	0	0.003 (+)	0.395 (+)	0.242 (-)	0.019 (+)

Panel D: All Directors								
Statistic	Target		Control		p-values			
Insider net buy measure	(1) Pre-Takeover period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# shares	-67.318	-61.040	-52.259	-59.630	0.620 (-)	0.210 (-)	0.446 (+)	0.392 (-)
$ shares	-1.910	-1.761	-2.211	-2.088	0.621 (-)	0.455 (+)	0.731 (-)	0.955 (-)
% equity	-0.243	-0.195	-0.176	-0.210	0.343 (-)	0.216(-)	0.432 (+)	0.217 (-)
Median								
# shares	0	0	0	0	0.032 (+)	0.561 (+)	0.707 (-)	0.211 (+)
$ shares	0	0	0	0	0.006 (+)	0.081 (+)	0.088 (-)	0.011 (+)
% equity	0	0	0	0	0.138 (+)	0.857 (-)	0.960 (-)	0.279 (+)

Panel E: Blockholders								
Statistic	Target		Control		p-values			
Insider net buy measure	(1) Pre-Takeover period	(2) Control period	(3) Pre-Takeover period	(4) Control period	1 - 2	1 - 3	3 - 4	(1-2) - (3-4)
Mean								
# shares	-20.510	-94.780	-67.488	-36.848	0.202 (+)	0.542 (+)	0.614 (-)	0.220 (+)
$ shares	-1.487	-2.885	-0.958	-1.579	0.204 (+)	0.504 (-)	0.438 (+)	0.576 (+)
% equity	-0.234	-0.241	-0.199	-0.175	0.952 (+)	0.834 (-)	0.873 (-)	0.869 (+)
Median								
# shares	0	0	0	0	0.008 (+)	0.440 (+)	0.696 (+)	0.100 (+)
$ shares	0	0	0	0	0.002 (+)	0.375 (+)	0.652 (+)	0.046 (+)
% equity	0	0	0	0	0.004 (+)	0.353 (+)	0.579 (+)	0.058 (+)

4.5.1.2 Insider sales

Table 4.6 examines insider sales in a format similar to Table 4.5. Column 8 shows that target insiders reduce their pre-takeover sales significantly compared to their normal levels. This conclusion holds for all five insider groups in Panels A through E, and for all seven measures of the level of insider sales. These results are consistent with passive insider trading. While securities laws and company rules against insider trading can deter insiders from purchasing shares based on inside information about the upcoming takeover, they cannot prevent them from postponing their planned sales.

4.5.1.3 Net purchases

Table 4.7 examines the net effect of insiders' purchases and sales. Four of the measures of insider trading (namely # insiders, # buy or sell months, and % of firms with at least one or at least two insiders buying or selling) that we examine in Tables 4.5 and 4.6 are no longer well-defined for measuring the level of net purchases. So we examine the remaining three measures (# shares, $ shares, and % equity). Table 4.7 provides some evidence that insiders increase their net purchases before the takeover announcement. This conclusion holds for top management, top financial officers and all officers (Panels A through C), and is based on the Wilcoxon test for the dual control in column 8. For the group of all directors and blockholders in Panels D and E, while the signs of the dual control in column 8 are positive for the Wilcoxon test, only one of the three p-values is low (.011) for directors and two of the p-values are low (.046 and .058) for blockholders. While these results provide both a time-series and a cross-sectional control for the level of insider trading, they do not control for other determinants of the level of insider trading, a task that we turn to next.

4.5.2 Cross-sectional regressions

We next estimate cross-sectional regressions that control for other determinants of the level of insider trading. Section 4.5.2.1 discusses our regression specification. We present the results for insiders' purchases, sales and net purchases in sections 4.5.2.2 through 4.5.2.4.

4.5.2.1 Regression specification

We next estimate cross-sectional regressions of the level of insider trading. Each regression includes four observations corresponding to each target firm: two observations for the target firm (for the pre-takeover and control periods) and two for the control firm. The main explanatory variables are Pre-takeover, Target and Pre-takeover*Target. Pre-takeover is a dummy variable equal to 1 (0) if the insider trading activity occurs during the pre-takeover (control) period. Target is a dummy variable equal to 1 (0) for a target (control) firm. The marginal effects of the first two variables measure the abnormal level of insider trading relative to our time-series and cross-sectional controls, respectively. The marginal effect of the interaction term measures abnormal insider trading relative to our dual control, i.e., it represents the difference-in- differences (DiD) estimate.

The regressions control for other determinants of the level of insider trading found by prior studies, including firm size, the level and change in stock volatility, prior stock returns, stock liquidity, firm valuation, innovation, and insider holdings. Seyhun (1986) finds that insiders at small (large) firms tend to be net buyers (sellers) of their firms' stock. We measure firm size as the natural logarithm of market capitalization, denoted Ln (Market cap), defined as the market value of equity as of the second last fiscal year ending prior to a takeover announcement. Meulbroek (2000) finds that managers in more risky companies tend to sell equity more aggressively. We measure risk, σ, as the standard deviation of stock returns over trading days (-250, -126) relative to the beginning of the pre-takeover or control period.[51]

Demsetz and Lehn (1985), Aggarwal and Samwick (1999, 2003), and Jin (2002) show theoretically and empirically that managers' equity holdings are determined by optimal contracting considerations. Their findings imply that changes in equity risk should induce changes in managers' holdings via stock purchases or sales. We measure the change in equity risk, $\Delta\sigma$, as the standard deviation of a firm's daily stock returns computed over trading days (-125, -1) relative to the takeover or control period minus σ. Lakonishok and Lee (2001) find that insiders are contrarian investors who buy (sell) stock with poor (good) past performance. We control for prior stock returns using $PRET_t$ for quarter t, t = -4 to -1. $PRET_t$ is the market-adjusted average daily prior stock return for a firm for quarter t (of either the pre-takeover or the control period), where the market return is the equal-weighted CRSP market index return.

Ofek and Yermack (2000) find that executives with large shareholdings sell stock after receiving new equity incentives to diversify their portfolios. We control for the direct shareholdings last reported by insiders during the relevant period. Jenter (2005) finds that insiders tend to be contrarian investors who buy a stock when it is selling at a low valuation, and sell it when it has a high valuation. Book-to-market (B/M) decile is our measure of a firm's valuation ratio relative to other firms. B/M deciles equal 1 through 10 depending on a firm's B/M ratio. NYSE B/M decile breakpoints during the year are used to ascertain a firm's B/M decile in a given year.[52]

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[51] We require that at least two thirds of the daily stock returns over this period be available on CRSP. We impose the same requirement when calculating the average daily stock returns for a period.

[52] The NYSE decile breakpoints were obtained from Professor Kenneth French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french.

Aboody and Lev (2000) argue that research and development (R&D) activities increase the information asymmetry between insiders and outsiders, thereby allowing insiders to reap greater profits on their trades. Their finding implies that insiders will trade more in firms with greater R&D expenses. We divide R&D expense by sales revenue for the fiscal year. R&D/Sales equals zero for firms whose R&D expenses are not reported by Compustat. Data for B/M and R&D/Sales are for (or at the end of) the fiscal year *t*-2, where the takeover announcement occurs during fiscal year *t*.

The market microstructure models of Grossman and Stiglitz (1980), Kyle (1985) and Holmstrom and Tirole (1993) imply that informed traders are more likely to trade when stock liquidity is higher due to more trading by uninformed traders. Our regressions control for stock liquidity, measured as daily average over the prior year of the ratio of share trading volume to shares outstanding.

Finally, an insider's incentive to trade before the announcement increases with the potential effect of a takeover announcement on the target's stock price. We measure this stock price effect as the cumulative abnormal stock return over days -40 to +10 around the takeover announcement (denoted $CAR_{-40,+10}$), as defined in equation (4) in section 4.4.5 above. The beginning date of the window for measuring the stock price effect of the takeover announcement follows the findings of a stock price run-up before a takeover announcement, possibly due to published rumors and leakage of information about the upcoming bid (see, e.g., Jarrell and Poulsen (1989). The ending date allows for more bid- related information that typically follows the initial announcement.

We construct the explanatory variables using stock-price data from CRSP and financial statement data from Compustat. Financial statement data are for the last fiscal year ending prior to the relevant misstated or pre-misstated period. To be included in the regressions, we require that two observations (one for the pre-takeover period, the other for the control period) be available for all explanatory variables for both the target firm and the control firm. Accordingly, the regression includes observations pooled from these four matched samples. We estimate the following equation:

$$IT_i = \beta_o + \beta_1 \text{ Ln(Market cap)}_i + \beta_2 \sigma_{si} + \beta_3 \Delta\sigma_{si} + \beta_4 \text{ PRET}_{-1i} + \beta_5 \text{ PRET}_{-2i} + \beta_6 \text{ PRET}_{-3i}$$
$$+ \beta_7 \text{ PRET}_{-4i} + \beta_8 \text{ Holdings}_i + \beta_9 \text{ B/M decile}_i + \beta_{10} \text{ R\&D/Sales}_i + \beta_{11} \text{ Liquidity}$$
$$+ \beta_{12} \text{ CAR}_{-40,+10,i} + \beta_{13} \text{ Pre-Takeover}_i + \beta_{14} \text{ Target}_i + \beta_{15} \text{ Pre-Takeover}_i{*} \text{ Target}_i$$
$$+ \varepsilon_i,\ i = 1, 2, \ldots, \qquad (5)$$

where IT is one of the five measures of insider trading (#Insiders, #Shares, $Shares, %Equity, or #Buy months) as defined in section 4.5.1.1 above. The error term is denoted by ε. All other variables are defined above.

The first and fifth dependent variables used in the regressions are the number of insiders (#Insiders) buying or selling shares during the period of interest and the number of pure buy months (#Buy months). Both variables take integer values from 0 to 5 in most cases. For example, the last two rows in Panel A of Table 4.5 show that the number of top managers of target firms who sell during the pre-takeover period is zero for about 80% of the sample, one for 10.8% of the sample, and two or more for the remaining 9.4% of the sample. Given that the observations of these two dependent variable represent count data, we estimate equation (5) using the Poisson or Negative Binomial regression here. We use the Poisson model if the equi-dispersion restriction holds; otherwise we use the Negative Binomial model.

The remaining three dependent variables (#Shares, $Shares, and %Equity) are censored from below at zero. We use the single-censored Tobit model to estimate these regressions (see

Greene (2003) for an exposition of these models). Since these variables contain some influential outliers, we winsorize the top and bottom 1% of the dependent-variable observations in each regression. Finally, we calculate test statistics using robust standard errors where appropriate.

4.5.2.2 Insider purchases

Table 4.8 shows estimates of the regressions of insider purchases. From here on, the sample consists of 2,763 target firms and 2,763 control firms for which data for all the variables in the regressions is not missing. Each regression contains two observations for each firm: one for the one-year period immediately before a takeover announcement (pre-takeover period), and the other for the year before that (control period). Panel A of Table 4.8 shows the coefficient estimates and p-values of the regressions for top management purchases for the full year. Panel B shows the coefficient estimates of Pre-takeover*Target in similar regressions, where the pre-takeover and control periods are partitioned into two half-year periods; these regressions are estimated separately for each half-year pre-takeover sub-periods, using the first half-year control period (i.e. half-year -3 relative to the takeover announcement date) as the control in both cases. Half-year -1 consists of months -1 to -6 relative to the takeover announcement date.

Panel C presents the marginal effect (ME) of Pre-takeover*Target and the %ME from regressions for each of the five insider groups for the full year and the two half-year periods. The marginal effect of Pre-takeover*Target is computed as [{E(IT| Pre-takeover=1,Target=1, Pre-takeover*Target=1, X) - E(IT| Pre-takeover=0,Target=1, Pre-takeover*Target=0, X)} – {E(IT| Pre-takeover=1, Target=0, Pre-takeover*Target=0, X) - E(IT| Pre-takeover=0, Target=0, Pre-takeover*Target=0, X)}], where X represents all other covariates at their mean values. The % marginal effect (%ME) of Target*Pre-takeover is computed as 100*(Marginal Effect / Mean value of the dependent variable), if the mean of the dependent variable>0, and as -100*(Marginal Effect / Mean of the dependent variable), if the mean of the dependent variable<0.

In Panel A, top management purchases are positively related to stock volatility, change in stock volatility, insider holdings, firm valuation and (for the last two measures of insider purchases) stock liquidity; they are negatively related to firm size and stock returns over the three previous quarters. While their purchases are not abnormal using either the time-series or the cross-sectional benchmark, they are significantly lower using the dual (i.e., DiD) control, as indicated by the coefficient of the interaction term, Pre-takeover*Target. That is, during the one-year pre-takeover announcement period, top managers of target firms reduce their purchases relative to their normal levels significantly more than do top managers of control firms. Panel B shows that this reduction is confined to the six month period before takeover announcement.

To give an idea of the magnitudes of these effects, Panel C of Table 4.8 shows the marginal effect of the interaction term for each of the five insider groups for each of the five measures of insider trading, for the full year before takeover announcement and for its two equal sub-periods. Each set of three values (ME, p-value, %ME) in Panel C shows the result of one regression. The first five rows in the panel show that for the full year before takeover announcement, each of the first four insider groups (i.e., all except blockholders) significantly reduce their purchases. The magnitude of this reduction is quite substantial regardless of the measure of insider purchase we use. For example, the number of top managers purchasing goes down by 0.158. Relative to the usual number of top managers buying, this represents a 52% reduction. The dollar value of their purchases drops by about 124% and the number of pure buy months drops by 44%. The magnitudes of the effects are particularly striking for top financial officers, who reduce the dollar value of their purchases by about 247%. Even for the group of all directors, the drop is almost 60% in dollar terms. The remaining of Panel C shows that these effects are confined to, and much stronger for, the six month period immediately preceding the takeover announcement. This finding is consistent with our expectation that most takeovers talks begin within six months before the public announcement of a deal.

Table 4.8: Regressions of insider purchases

Panel A of the table shows coefficient estimates from regressions of measures of stock purchases by top management (Chairman, CEO, COO, and President) on several explanatory variables. The sample consists of 2,763 target firms in takeover transactions announced during 1988-2006 with a deal value of $1 million or more, and an industry-size matched control sample, with non-missing data for all the variables in the regressions. Both target and control firms are listed on the NYSE, AMEX, or NASDAQ. There are two observations for each firm: one measures insider purchases during the one-year period immediately before a takeover announcement (pre-takeover period), and the other measures it during the year before that (control period). '# insiders' is the number of insiders buying during a year, '# shares' is the number of shares (in `000) bought during the year, '$ shares' is the dollar value of shares (in millions) bought, '% equity' is the percentage of outstanding equity bought, and '# buy months' is the number of pure buy months, i.e., months with some insider purchases and no insider sales. All dollar values are in inflation-adjusted 2000 dollars. The top and bottom 1% of the observations of three of the dependent variables ('# shares', '$ shares' and '% equity') in each regression are winsorized. Market cap equals the market value of equity as of the second last fiscal year ending prior to a takeover announcement. The standard deviation of daily stock returns (σ) is computed over trading days (-250, -126) relative to the beginning of the pre-takeover or control period. The change in standard deviation (Δσ) equals the standard deviation of the firm's daily stock returns computed over trading days (-125, -1) relative to the pre-takeover or control period minus σ. PRET(t) is the market-adjusted average daily stock return for a firm for quarter t prior to either the pre-takeover or the control period, where the market return is the equal-weighted CRSP market index return. Book-to-market (B/M) deciles equal 1 through 10 depending on a firm's B/M ratio. NYSE B/M decile breakpoints during the year are used to assign B/M deciles. R&D/Sales is R&D expense to sales revenue. Data for B/M and R&D/Sales are for (or at the end of) the fiscal year *t*-2 and *t*-3 for pre-takeover and control period, respectively, where the takeover announcement occurs during fiscal year *t*. Liquidity equals the average daily trading volume scaled by shares outstanding during the pre-takeover (control) period, provided that data is available for at least 160 trading days. $CAR_{-40,+10}$ is the cumulative abnormal return on the stock from 40 days before to 10 days after the takeover announcement date. Pre-takeover is a dummy variable equal to 1 (0) if the insider trading activity occurs during the pre-takeover (control) period. Using TFN Insider data, insider holdings are measured as the number of insiders (when dependent variable is # insiders or # buy months), log of 1 plus total shares held (when dependent variable is # shares), log of 1 plus total shareholdings in dollar value (when dependent variable is $ shares), and total number of shares held as a percentage of shares outstanding (when dependent variable is % equity), based on the latest holdings reported by insider during either the pre-takeover or the control period. Target is a dummy variable equal to 1 (0) for a target (control) firm. Regressions of '# insiders' and '# buy months' use the Poisson model if the equi-dispersion restriction holds; otherwise they use the Negative Binomial model. Regressions of '# shares', '$ shares', and '% equity' use the single-censored Tobit model. Test statistics are calculated using robust standard errors where appropriate. Panel A shows coefficient estimates for the full sample period. Panel B shows the coefficient estimates of Pre-takeover*Target in similar regressions, where the pre-takeover and control periods are partitioned into two half-year periods; these regressions are estimated separately for each half-year pre-takeover sub-periods, using the first half-year control period (i.e. half-year -3 relative to the takeover announcement date) as the control in both cases. Half-year -1 consists of months -1 to -6 relative to the takeover announcement date. Panel C presents the marginal effect (ME) of Pre-takeover*Target and the %ME from regressions for each of the five insider groups for the full year and the two half-year periods. The marginal effect of Pre-takeover*Target is computed as [(E(IT| Pre-takeover=1,Target=1, Pre-takeover*Target=1, X) - (E(IT| Pre-takeover=0,Target=1, Pre-takeover*Target=0, X)) – ((E(IT| Pre-takeover=1, Target=0, Pre-takeover*Target=0, X) - (E(IT| Pre-takeover=0, Target=0, Pre-takeover*Target=0, X))], where X represents all other covariates at their mean values. The % marginal effect (%ME) of Target*Pre-takeover is computed as 100*(Marginal Effect / Mean of the dependent variable), if the mean of the dependent variable>0, and as -100*(Marginal Effect / Mean of the dependent variable), if the mean of the dependent variable<0.

Table 4.8 (cont.)

Panel A: Top Management Purchases (Full Year)										
Dependent variables	# insiders[a]		# shares		$ shares		% equity		# buy months[b]	
Independent variables	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Ln (market cap)	-0.241	0.000	-5.536	0.000	-0.044	0.000	-0.041	0.000	-0.253	0.000
σ	1.592	0.124	221.332	0.000	1.334	0.000	1.367	0.000	1.285	0.325
Δσ	0.235	0.841	134.827	0.004	0.666	0.062	0.978	0.018	-0.073	0.963
PRET1	-21.660	0.000	-969.070	0.000	-6.316	0.000	-7.601	0.000	-19.278	0.000
PRET 2	-16.535	0.001	-505.850	0.005	-3.800	0.007	-4.125	0.010	-21.050	0.000
PRET 3	-8.322	0.097	-544.734	0.004	-4.499	0.006	-4.085	0.009	-14.654	0.011
PRET 4	-4.353	0.322	-299.694	0.051	-1.999	0.114	-1.034	0.447	-1.989	0.683
Insider holdings	0.391	0.000	5.809	0.000	0.043	0.000	0.001	0.033	0.565	0.000
B/M decile	0.019	0.016	1.288	0.000	0.010	0.000	0.011	0.000	0.029	0.001
R&D/Sales	-0.005	0.544	-0.384	0.169	-0.003	0.271	-0.003	0.198	-0.009	0.356
Liquidity	0.004	0.271	0.167	0.284	0.000	0.670	0.002	0.032	-0.015	0.002
$CAR_{-40,+10}$	0.023	0.669	-1.833	0.369	0.000	0.986	0.007	0.670	-0.023	0.708
Pre-takeover	-0.031	0.597	-0.235	0.896	-0.011	0.481	-0.001	0.930	-0.079	0.213
Target	0.069	0.223	1.276	0.491	0.009	0.610	0.022	0.194	0.063	0.324
Pre-takeover * Target	-0.278	0.001	-7.695	0.002	-0.069	0.002	-0.094	0.000	-0.257	0.005
Constant	-0.882	0.000	-82.461	0.000	-0.737	0.000	-0.277	0.000	-0.893	0.000
N	11,052		11,052		11,052		11,052		11,052	
Chi-square p-value	0.000		0.000		0.000		0.000		0.000	
Pseudo R-squared	0.1095		0.058		0.166		0.044			
Mean of dependent variable	0.303		4.548		0.039		0.040		0.371	
Panel B: Top Management Purchases (Half- Year Periods)										
First half (months -1 to -6)	-0.638[a]	0.000	-11.782	0.000	-0.099	0.000	-0.104	0.000	-0.612[a]	0.000
Second half (months -7 to -12)	0.012[a]	0.910	-1.290	0.513	-0.012	0.458	-0.021	0.210	-0.045[a]	0.681

[a]Poisson regression, [b]Negative binomial regression

Table 4.8 (cont.)

Panel C: Marginal effect of Pre-takeover * Target

Dependent variables / Insider Category	# insiders			# shares			$ shares			% equity			# buy months		
	ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME
Full Year (months -1 to -12)															
Top management	-0.158[a]	0.005	-52.193	-7.695	0.002	-169.201	-0.047	0.003	-123.511	-0.082	0.000	-208.199	-0.164[b]	0.024	-44.299
Top financial officers	-0.505[a]	0.015	-481.502	-1.080	0.024	-307.799	-0.09	0.040	-246.683	-0.016	0.002	-518.970	-0.488[a]	0.024	-372.091
All officers	-0.163[b]	0.013	-34.071	-6.497	0.001	-155.946	-0.041	0.002	-110.222	-0.057	0.000	-172.916	-0.149[b]	0.009	-35.981
All directors	-0.181[b]	0.003	-20.328	-10.192	0.000	-102.263	-0.064	0.002	-59.446	-0.093	0.000	-107.537	-0.191[b]	0.001	-23.613
Blockholders	0.026[a]	0.665	30.824	-51.620	0.162	-389.553	-0.349	0.178	-284.981	-0.296	0.293	-293.678	-0.021[a]	0.639	-17.560
First half year (months -1 to -6)															
Top management	-0.260[a]	0.001	-153.050	-11.782	0.000	-643.768	-0.079	0.000	-523.366	0.098	0.000	-650.112	-0.240[a]	0.002	-133.663
Top financial officers	-0.768[a]	0.012	-1,360.471	-1.124	0.033	-815.281	-0.013	0.002	-988.071	-0.017	0.000	-1,608.248	-0.602[a]	0.022	-945.877
All officers	-0.376[a]	0.001	-141.608	-10.083	0.000	-593.239	-0.074	0.000	-481.397	-0.087	0.000	-635.382	-0.314[a]	0.000	-154.408
All directors	-0338[b]	0.000	-66.318	-12.751	0.000	-296.059	-0.091	0.000	-200.367	-0.111	0.000	-299.713	-0.279[b]	0.000	-70.766
Blockholders	-0.014[a]	0.801	-28.614	-21.959	0.311	-545.810	-0.209	0.160	-655.252	-0.328	0.139	-826.077	-0.022[a]	0.622	-36.899
Second half year (months -7 to -12)															
Top management	0.004[a]	0.951	1.981	-1.290	0.513	-61.135	-0.008	0.461	-50.912	-0.018	0.214	-103.786	-0.026[a]	0.668	-13.472
Top financial officers	-0.087[a]	0.612	-141.117	0.063	0.905	36.698	0.002	0.583	112.937	-0.001	0.719	-107.809	-0.156[a]	0.384	-227.061
All officers	-0.029[a]	0.701	-10.123	-1.210	0.441	-60.828	-0.011	0.287	-63.842	-0.016	0.154	-104.274	-0.034[a]	0.540	-15.927
All directors	0.048[b]	0.441	8.927	-1.510	0.435	-32.021	-0.005	0.749	-10.244	-0.020	0.207	-50.186	0.010[b]	0.863	2.263
Blockholders	0.023[a]	0.759	44.666	-9.459	0.665	-215.162	-0.091	0.518	-267.363	-0.107	0.565	-278.952	0.007[a]	0.924	11.207

[a]Poisson regression, [b]Negative binomial regression.

4.5.2.3 Insider sales

Table 4.9 shows estimates of the regressions of insider sales in a format similar to Table 4.8. In Panel A, the significant determinants of top management's sales for the full year before takeover announcement are largely the same as the determinants of their purchases found in Table 4.8, except that their sales are also negatively related to their firms' R&D intensity. Top management's sales increase with their holdings; as one would expect, the signs of the other determinants of their sales are the opposite of the signs for purchases. Once again, relative to either time-series or cross-sectional benchmarks, the levels of their sales show no evidence of being abnormal. But importantly, relative to the dual benchmark, their sales are significantly lower for each of the five sales measures. Panel B shows that, as in Table 4.8, the decrease in top managers' sales is also confined to the six month period immediately preceding the takeover announcement.

Table 4.9: Regressions of insider sales

Panel A of the table shows coefficient estimates from regressions of measures of stock sales by top management (Chairman, CEO, COO, and President) on several explanatory variables. The sample consists of 2,763 target firms in takeover transactions announced during 1988-2006 with a deal value of $1 million or more, and an industry-size matched control sample, with non-missing data for all the variables in the regressions. Both target and control firms are listed on the NYSE, AMEX, or NASDAQ. There are two observations for each firm: one measures insider sales during the one-year period immediately before a takeover announcement (pre-takeover period), and the other measures it during the year before that (control period). '# insiders' is the number of insiders selling during a year, '# shares' is the number of shares (in `000) sold during the year, '$ shares' is the dollar value of shares (in millions) sold, '% equity' is the percentage of outstanding equity sold, and '# sales months' is the number of pure sales months, i.e., months with some insider sales and no insider purchases. All dollar values are in inflation-adjusted 2000 dollars. The top and bottom 1% of the observations of three of the dependent variables ('# shares', '$ shares' and '% equity') in each regression are winsorized. The independent variables, the regression models used, and computations of test statistics and marginal effect are as described in Table 4.8. Panel A shows coefficient estimates for the full sample period. Panel B shows the coefficient estimates of Pre-takeover*Target in similar regressions, where the pre-takeover and control periods are partitioned into two half-year periods; these regressions are estimated separately for each half-year pre-takeover sub-periods, using the first half-year control period (i.e. half-year -3 relative to the takeover announcement date) as the control in both cases. Half-year -1 consists of months -1 to -6 relative to the takeover announcement date. Panel C presents the marginal effect (ME) of Pre-takeover*Target and the %ME (computed as described in Table 4.8) from regressions for each of the five insider groups for the full year and the two half-year periods.

Table 4.9 (cont.)

Panel A: Top Management Sales (Full Year)										
Dependent variables	# insiders[a]		# shares		$ shares		% equity		# sales months[b]	
Independent variables	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Ln (market cap)	0.102	0.000	27.438	0.000	0.937	0.000	0.059	0.000	0.074	0.000
σ	-3.498	0.002	-243.296	0.181	-5.625	0.252	-3.870	0.000	-5.946	0.000
Δσ	-4.635	0.000	-358.150	0.102	-9.679	0.100	-2.555	0.015	-6.544	0.000
PRET1	25.153	0.000	4,147.908	0.000	121.583	0.000	17.934	0.000	18.345	0.000
PRET 2	13.027	0.001	2,547.720	0.002	81.827	0.000	11.246	0.001	10.735	0.028
PRET 3	9.781	0.018	2,528.858	0.001	80.319	0.000	16.616	0.000	19.915	0.000
PRET 4	-0.388	0.914	312.176	0.665	1.257	0.948	5.276	0.094	0.686	0.886
Insider holdings	0.281	0.000	26.262	0.000	0.642	0.000	0.002	0.025	0.438	0.000
B/M decile	-0.088	0.000	-12.172	0.000	-0.353	0.000	-0.053	0.000	-0.103	0.000
R&D/Sales	-0.016	0.198	-3.699	0.014	-0.102	0.014	-0.014	0.047	-0.004	0.641
Liquidity	0.024	0.000	6.443	0.000	0.192	0.000	0.031	0.000	0.046	0.000
$CAR_{-40,+10}$	-0.021	0.692	-12.143	0.226	-0.175	0.550	0.007	0.863	-0.043	0.516
Pre-takeover	0.020	0.676	11.896	0.125	0.433	0.055	0.052	0.126	0.035	0.529
Target	0.013	0.783	4.917	0.559	0.071	0.768	0.036	0.323	-0.048	0.411
Pre-takeover * Target	-0.208	0.002	-42.444	0.000	-1.303	0.000	-0.220	0.000	-0.254	0.001
Constant	-1.438	0.000	-499.890	0.000	-15.766	0.000	-0.662	0.000	-1.293	0.000
N	11,052		11,052		11,052		11,052		11,052	
Chi-square p-value	0.000		0.000		0.000		0.000		0.000	
Pseudo R-squared	0.191		0.067		0.131		0.069			
Mean of dependent variable	0.481		35.800		0.981		0.146		0.622	
Panel B: Top Management Sales (Half Year Periods)										
First half (months -1 to -6)	-0.490[a]	0.000	-58.879	0.000	-1.647	0.000	-0.293	0.000	-0.507[a]	0.000
Second half (months -7 to -12)	-0.097[a]	0.246	-13.667	0.120	-0.381	0.116	-0.092	0.020	-0.075[a]	0.408

[a]Poisson regression, [b]Negative binomial regression

Table 4.9 (cont.)

Panel C: Marginal effect of Pre-takeover * Target

Insider Category \ Dependent variables	# insiders			# shares			$ shares			% equity			# sell months		
	ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME
Full Year (months -1 to -12)															
Top management	-0.300[a]	0.006	-62.391	-42.444	0.000	-118.559	-1.303	0.000	-132.861	-0.248	0.000	-169.691	-0.357[b]	0.008	-57.334
Top financial officers	-0.413[a]	0.048	-199.045	-7.361	0.009	-158.718	-0.225	0.004	-163.735	-0.046	0.002	-266.118	-0.406[a]	0.048	-143.940
All officers	-0.459[b]	0.005	-37.732	-41.131	0.001	-72.334	-1.339	0.000	-90.649	-0.192	0.000	-109.241	-0.308[b]	0.011	-29.256
All directors	-0.315[b]	0.000	-35.729	-35.191	0.002	-58.625	-1.352	0.000	-90.452	-0.202	0.000	-83.937	-0.223[b]	0.021	-23.644
Blockholders	-0.035[a]	0.718	-28.463	-199.228	0.009	-590.774	-2.987*	0.007*		-1.306	0.042	-598.871	-0.027[a]	0.669	-20.009
First half year (months -1 to -6)															
Top management	-0.658[a]	0.000	-230.987	-58.879	0.000	-371.883	-1.647*	0.000*		-0.343	0.000	-523.117	-0.594[a]	0.000	-194.966
Top financial officers	-0.846[a]	0.015	-705.912	-8.400	0.001	-406.255	-0.260	0.000	-416.393	-0.051	0.000	-657.834	-0.721[a]	0.022	-520.855
All officers	-1.090[b]	0.000	-152.008	-51.680	0.000	-216.188	-1.524	0.000	-226.672	-0.240	0.000	-295.751	-0.642[b]	0.000	-123.380
All directors	-0.672[b]	0.000	-131.665	-56.782	0.000	-225.792	-1.693	0.000	-255.985	-0.294	0.000	-275.689	-0.524[b]	0.000	-112.863
Blockholders	-0.022[a]	0.861	-31.224	-118.972	0.011	-1,143.917	-1.529	0.019	-1,083.358	-0.789	0.014	-1,169.673	-0.080[a]	0.347	-121.059
Second half year (months -7 to -12)															
Top management	-0.124[a]	0.263	-40.849	-13.667	0.120	-79.982	-0.381	0.116	-83.363	-0.105	0.020	-147.700	-0.078[a]	0.424	-23.909
Top financial officers	-0.166[a]	0.471	-130.895	-0.041	0.987	-1.826	-0.006	0.935	-8.853	-0.009	0.516	-104.593	-0.196[a]	0.380	-134.133
All officers	-0.024[b]	0.877	-3.181	-3.888	0.624	-15.421	-0.113	0.627	-16.057	-0.033	0.318	-38.390	0.005[b]	0.966	0.897
All directors	0.000[b]	1.000	-0.007	-3.602	0.670	-13.367	-0.077	0.743	-10.996	-0.036	0.404	-31.428	0.029[b]	0.735	5.817
Blockholders	0.057[a]	0.520	76.886	-26.850	0.507	-273.434	-0.349	0.454	-232.434	-0.221	0.476	-337.144	0.050[a]	0.428	74.315

[a]Poisson regression, [b]Negative binomial regression, *Reports the regression coefficient and its p-value instead of ME and its p-value, as the ME estimation is non-convergent.

In Panel C of Table 4.9, the reduction in sales is seen for all five sales measures for the first four insider groups, and for the second through fourth measures, also by blockholders. The magnitudes of the reduction are quite substantial. For example, top managers reduce the dollar value of their sales by about 133% relative to the DiD benchmark. The magnitude of the reduction in sales is particularly striking for blockholders and top financial officers. As with purchases, the reduction in insider sales is confined to the six month pre-bid period.

4.5.2.4 Net insider purchases

We next examine the net effect of the reduction in insiders' purchases and sales. Since the definition of net purchases is not clear for our first and fifth measures of insider trading (number of insiders and percentage of pure buy months), Table 4.10 shows the results for the remaining three measures of net purchases in the same format as Tables 4.8 and 4.9. Panel A shows that for the full pre-bid year, top managers significantly increase their net purchases. This conclusion holds for each of the three net purchase measures. Panel B shows that the effect is largely confined to the six month pre-bid period.

Panel C shows that the increase in net purchases for the full year before takeover announcement is not confined to top managers. It is also displayed by each of the other four insider groups. The magnitude of the effect on dollar value of net purchases is about 33% for each of the first four insider groups; at 74%, it is substantially larger for blockholders. For the first four insider groups, the effect is confined to the six month pre-bid period; the magnitude of the increase in the dollar value of their net purchases is quite substantial, about 50%. For blockholders, while the signs of the effects are positive for each the two 6-month periods before the bid, they are statistically insignificant in both sub-periods.

Table 4.10: Regressions of insiders' net purchases

Panel A of the table shows coefficient estimates from OLS regressions of measures of net purchases of top management (Chairman, CEO, COO, and President) on several explanatory variables. The sample consists of 2,763 target firms in takeover transactions announced during 1988-2006 with a deal value of $1 million or more, and an industry-size matched control sample, with non-missing data for all the variables in the regressions. There are two observations for each firm: one measures insiders' net purchases during the one-year period immediately before a takeover announcement (pre-takeover period), and the other measures it during the year before that (control period). '# shares' is the net number of shares (in `000) bought by insiders during a year, '$ shares' is the net dollar value of shares (in millions) bought during the year, and '% equity' is the net percentage of outstanding equity bought. All dollar values are in inflation-adjusted 2000 dollars. The top and bottom 1% of the observations of dependent variables in each regression have been winsorized. The independent variables are as in Table 4.8. Panel A shows coefficient estimates for the full sample period. Panel B shows coefficient estimates of Pre-takeover*Target in similar regressions, where the pre-takeover and control periods are partitioned into two half-year periods; these regressions are estimated separately for each half-year pre-takeover sub-periods, using the first half-year control period (i.e. half-year -3 relative to the takeover announcement date) as the control in both cases. Half-year -1 consists of months -1 to -6 relative to the takeover announcement date. Panel C presents the marginal effect (ME) of Pre-takeover*Target and the %ME (computed as described in Table 4.8) from regressions for each of the five insider groups for the full year and the two half-year periods.

Panel A: Top Management's Net Purchase (Full Year)

Independent variables	Dependent variables					
	# shares		$ shares		% equity	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Ln (market cap)	-11.291	0.000	-0.460	0.000	0.003	0.276
σ	-96.560	0.100	-2.396	0.100	1.872	0.000
Δσ	4.266	0.953	-0.182	0.916	1.229	0.002
PRET1	-1,522.833	0.000	-41.525	0.000	-8.534	0.000
PRET 2	-1,057.997	0.002	-36.527	0.000	-5.473	0.000
PRET 3	-890.727	0.002	-26.075	0.001	-7.170	0.000
PRET 4	-24.625	0.935	2.635	0.726	-2.165	0.094
Insider holdings	-2.983	0.000	-0.068	0.000	-0.001	0.068
B/M deciles	3.125	0.000	0.076	0.000	0.016	0.000
R&D/Sales	0.760	0.001	0.022	0.003	0.002	0.003
Liquidity	-2.758	0.000	-0.086	0.000	-0.013	0.000
$CAR_{-40,+10}$	5.428	0.073	0.068	0.419	0.002	0.889
Pre-takeover	-1.478	0.637	-0.111	0.234	-0.008	0.532
Target	0.704	0.829	0.058	0.532	0.002	0.881
Pre-takeover * Target	8.754	0.037	0.304	0.014	0.036	0.044
Constant	48.685	0.000	2.160	0.000	-0.228	0.000
N	11,052		11,052		11,052	
F-statistic p-value	0.000		0.000		0.000	
R-squared	0.138		0.169		0.062	
Mean value of dependent variable	-31.314		-0.942		-0.107	

Panel B: Half Year Periods

First half	6.634	0.002	0.200	0.001	0.033	0.000
Second Half	2.999	0.193	0.084	0.196	0.017	0.098

Table 4.10 (cont.)

Panel C: Marginal effect of Pre-takeover * Target

Dependent variables / Insider Category	# shares			$ shares			% equity		
	ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME
Full Year									
Top management	8.754	0.037	27.96	0.304	0.014	32.27	0.036	0.044	33.78
Top financial officers	1.178	0.060	27.52	0.045	0.021	33.84	0.007	0.008	46.52
All officers	15.194	0.004	32.62	0.465	0.008	32.50	0.054	0.003	38.22
All directors	10.744	0.086	23.02	0.484	0.006	35.14	0.024	0.386	15.82
Blockholders	14.760	0.056	77.32	0.251	0.026	74.19	0.091	0.074	83.26
First half (months -1 to -6)									
Top management	6.634	0.002	47.62	0.200	0.001	48.14	0.033	0.000	66.02
Top financial officers	0.796	0.017	41.54	0.031	0.004	50.79	0.004	0.008	53.86
All officers	10.384	0.000	46.95	0.316	0.000	48.18	0.083	0.000	56.66
All directors	8.789	0.006	42.38	0.331	0.000	53.92	0.030	0.036	43.02
Blockholders	4.126	0.118	71.76	0.046	0.187	49.06	0.022	0.224	91.52
Second half (months -7 to -12)									
Top management	2.999	0.193	20.01	0.084	0.196	19.18	0.017	0.098	31.23
Top financial officers	0.071	0.842	3.46	0.003	0.757	5.41	0.002	0.275	22.17
All officers	2.947	0.333	12.76	0.084	0.358	12.31	0.009	0.378	13.26
All directors	0.484	0.884	2.18	0.015	0.871	2.33	-0.002	0.903	2.54
Blockholders	1.584	0.538	28.79	0.023	0.566	20.66	0.009	0.619	32.47

4.6 Sub-sample results

In section 4.5, we find an interesting and subtle pattern of insider trading in takeover targets. While insiders reduce both their purchases and sales before takeover announcement, they reduce their sales much more than their purchases, thus effectively increasing their (net) purchases. We next examine whether this pattern of insider trading is more pronounced in certain sub-samples of takeovers. In particular, one might expect insiders to increase their effective (i.e., net) stock purchases in sub-samples where there is less uncertainty about the completion of the takeover, such as mergers, friendly bids, single bidder deals, cash deals, bids with a domestic acquirer, and deals with smaller or less regulated targets.

Table 4.11 shows the marginal effects of the interaction term, Pre-takeover*Target, from regressions of trades by top management for a number of sub-samples. Panels A and B of the table show the results for purchases and sales, respectively. The sample is partitioned by the type of acquisition, target management reaction to the bid, number of bidders, method of payment, acquirer nationality, the degree of target regulation, the year of acquisition, target size or target exchange listing. The rows in the table are for the various sub-samples; the columns are the same as in Panel C of Table 8, with an additional column for sample size.

In general, the results in Table 4.11 are consistent with those seen in Panel A of Tables 4.8 and 4.9. For most of the sub-samples, the levels of both purchases and sales by top management are lower relative to the dual control, after controlling for other determinants of the levels of insider trades. Statistical significance of the marginal effect of the interaction term reduces in many sub-samples, particularly those with lower sample sizes.

Table 4.11: Regressions for sub-samples of top management purchases and sales

The table shows marginal effects (ME), p-values and percentage marginal effects (%ME) of Pre-takeover*Target from regressions similar to those shown in Tables 4.8 and 4.9 for nine partitions of the target sample. Regressions are estimated for each of five measures of purchases (in Panel A) or sales (in Panel B) of the top management group. The sample consists of 2,763 target firms in takeover transactions announced during 1988-2006 with a deal value of $1 million or more, and an industry-size matched control sample, with non-missing data for all the variables in the regressions. Both target and control firms are listed on the NYSE, AMEX, or NASDAQ. There are two observations for each firm: one measures insider trading activity during the one-year period immediately before takeover announcements (pre-takeover period), and the other measures it during the year before that (control period). Pre-takeover is a dummy variable that equals 1 (0) for the pre-takeover (control) period. Target is a dummy variable that equals 1 (0) for the target (control) firm. The dependent and independent variables, the regression models and methodology used, and computations of test statistics and marginal effects are as described in Tables 4.8 (for insider purchases) and 4.9 (for sales). The sample partitions are as described in Table 4.4.

Table 4.11 (cont.)

Panel A: Top Management Purchases

Dependent variable / Sub-samples	N	# insiders			# shares			$ shares			% equity			# buy months		
		ME	p-value	% ME	ME	p-value	% ME	ME	p-value	% ME	ME	p-value	% ME	ME	p-value	% ME
Merger	8,180	-0.180[a]	0.014	-54.49	-8.042	0.006	-180.72	-0.056	0.003	-149.42	-0.082	0.000	-219.49	-0.214[b]	0.034	-56.51
Tender offer	2,248	-0.117[a]	0.192	-38.29	-5.072	0.336	-109.77	-0.021	0.523	-49.96	-0.069	0.099	-158.30	-0.110[a]	0.245	-29.08
LBO	784	-0.128[a]	0.364	-48.86	-13.323	0.249	-252.70	-0.030	0.454	-85.32	-0.095	0.280	-184.76	-0.033[b]	0.525	-9.29
Hostile	432	0.013[a]	0.491	5.84	-3.291	0.805	-79.58	-0.037	0.778	-77.39	-0.018	0.886	-48.19	0.003[a]	0.336	1.13
Friendly	10,620	-0.178[a]	0.004	-58.00	-7.657*	0.003*		-0.047	0.003	-123.42	-0.082	0.000	-206.71	-0.191[b]	0.020	-50.85
Single bidder	10,324	-0.161[a]	0.006	-52.27	-7.750	0.003	-166.20	-0.046	0.005	-117.97	-0.080	0.000	-198.82	-0.171[b]	0.024	-45.25
Multiple bidder	728	-0.064[a]	0.579	-27.42	8.556	0.918	293.00	-0.080	0.187	-229.85	-0.096	0.182	-320.67	-0.110[a]	0.940	-3.91
Stock deals	3,344	-0.148[a]	0.161	-45.57	-6.901	0.090	-173.81	-0.039	0.136	-107.92	-0.084	0.018	-212.87	-0.155[b]	0.237	-39.06
Cash deals	4,112	-0.216[a]	0.043	-79.06	-11.866	0.010	-239.44	-0.057	0.026	-155.03	-0.100	0.008	-225.84	-0.151[a]	0.105	-45.28
Other deals	3,596	-0.100[a]	0.200	-31.89	-3.799	0.389	-82.26	-0.041	0.173	-94.29	-0.055	0.064	-159.56	-0.135[b]	0.255	-34.62
Cross border acquirer	1,748	-0.132[a]	0.162	-45.59	-11.100	0.077	-250.31	-0.078	0.089	-192.39	-0.096	0.055	-272.66	-0.138[a]	0.204	-40.76
Domestic acquirer	9,304	-0.154[a]	0.016	-50.40	-6.987	0.011	-152.91	-0.042	0.012	-110.85	-0.080	0.000	-198.67	-0.152[b]	0.059	-40.39
More regulated	2,840	-0.151[b]	0.342	-40.40	-3.391	0.293	-107.64	-0.026	0.301	-63.87	-0.029	0.188	-92.99	-0.078[b]	0.448	-15.52
Less regulated	8,212	-0.152[a]	0.010	-54.62	-9.595	0.004	-190.71	-0.054	0.004	-143.85	-0.097	0.000	-227.00	-0.168[a]	0.012	-51.29
1988-1995	2,592	-0.561[a]	0.243	-291.40	-10.408	0.099	-311.72	-0.081	0.038	-261.54	-0.100	0.073	-267.84	-0.120[a]	0.449	-80.25
1996-2001	5,260	-0.088[b]	0.075	-23.00	-5.011	0.119	-95.40	-0.032	0.145	-64.81	-0.048	0.055	-102.97	-0.128[b]	0.155	-27.21
2002-2006	3,200	-0.124[a]	0.068	-45.51	-13.734	0.010	-314.34	-0.065	0.021	-248.44	-0.103	0.003	-348.63	-0.070[a]	0.173	-23.77
Small target	5,784	-0.080[a]	0.286	-24.20	-8.076	0.019	-151.19	-0.034	0.041	-107.60	-0.102	0.002	-174.19	-0.081[b]	0.466	-19.40
Mid-size target	2,300	-0.222[a]	0.241	-78.66	-12.439	0.023	-311.38	-0.084	0.023	-199.60	-0.081	0.021	-313.46	-0.405[b]	0.152	-119.78
Large target	2,968	-0.087[a]	0.188	-33.32	-2.623	0.599	-76.49	-0.033	0.407	-67.75	-0.022	0.300	-159.30	-0.084	0.176	-27.40
NYSE target	3,164	-0.063[a]	0.330	-24.47	-3462	0.452	-103.25	-0.029	0.458	-64.91	-0.034	0.177	-192.31	-0.041[b]	0.389	-12.70
AMEX target	924	-0.952[a]	0.207	-322.19	-17.255	0.079	-338.44	-0.152	0.024	-414.73	-0.207	0.027	-350.91	-2.248[b]	0.230	-585.04
NASDAQ target	6,964	-0.168[a]	0.036	-51.86	-8.264	0.008	-164.70	-0.042	0.015	-116.68	-0.091	0.001	-193.36	-0.144[b]	0.097	-36.82

[a]Poisson regression, [b]Negative binomial regression, *Reports the regression coefficient and its p-value instead of ME and its p-value, as the ME estimation is non-convergent.

Table 4.11 (cont.)

Panel B: Top Management Sales

Sub-samples / Dependent variable	N	# insiders			# shares			$ shares			% equity			# sales months		
		ME	p-value	% ME	ME	p-value	% ME	ME	p-value	% ME	ME	p-value	% ME	ME	p-value	% ME
Merger	8,180	-0.202[a]	0.076	-40.80	-31.826	0.011	-88.44	-0.943	0.010	-94.58	-0.216	0.000	-149.66	-0.230[b]	0.093	-36.26
Tender offer	2,248	-0.514[a]	0.118	-122.44	-49.922	0.038	-168.09	-1.758	0.008	-219.57	-0.183	0.113	-124.88	-0.553[b]	0.147	-102.10
LBO	784	-1.682[a]	0.077	-324.84	-149.775	0.009	-279.57	-4.235	0.008	-302.11	-0.591	0.002	-342.16	-2.451[b]	0.119	-346.21
Hostile	432	-0.445[a]	0.255	-77.20	-199.94	0.006	-318.71	-5.947	0.005	-327.08	-0.495	0.009	-294.06	-1.695[b]	0.255	-218.62
Friendly	10,620	-0.298[a]	0.008	-62.39	-36.861	0.001	-106.22	-1.131*	0.000*		-0.234	0.000	-161.43	-0.336[b]	0.013	-54.55
Single bidder	10,324	-0.273[a]	0.012	-55.85	-42.139	0.000	-116.89	-1.287	0.000	-131.13	-0.243	0.000	-162.41	-0.330[b]	0.013	-52.30
Multiple bidder	728	-1.160[a]	0.210	-301.71	-46.433	0.347	-143.98	-1.463	0.348	-151.34	-0.257	0.109	-270.14	-1.547[b]	0.358	-306.11
Stock deals	3,344	-0.186[a]	0.243	-36.19	-36.561	0.054	-103.43	-1.264	0.030	-118.95	-0.257	0.009	-169.29	-0.188[b]	0.371	-30.07
Cash deals	4,112	-0.685[a]	0.028	-152.52	-41.949	0.023	-117.70	-1.185	0.017	-138.07	-0.231	0.005	-149.49	-1.019[b]	0.033	-160.40
Other deals	3,596	-0.292[a]	0.059	-59.62	-52.093	0.009	-143.10	-1.571	0.008	-150.52	-0.238	0.008	-181.82	-0.203[b]	0.191	-33.58
Cross border acquirer	1,748	-0.236[a]	0.291	-47.49	-37.935	0.162	-108.84	-1.110	0.136	-119.34	-0.272	0.044	-173.19	-0.281[b]	0.122	-42.25
Domestic acquirer	9,304	-0.329[a]	0.007	68.69	-43.629	0.000	-121.26	-1.356	0.000	-136.98	-0.246	0.000	-170.72	-0.354[b]	0.029	-57.73
More regulated	2,840	-0.334[a]	0.491	-82.53	-18.644	0.194	-122.03	-0.666	0.183	-126.91	-0.103	0.113	-152.34	-0.589[b]	0.529	-127.74
Less regulated	8,212	-0.353[a]	0.012	-69.46	-50.187	0.000	-116.99	-1.516	0.000	-133.19	-0.272	0.000	-157.04	-0.481[b]	0.013	-71.02
1988-1995	2,592	-0.345[a]	0.369	-130.92	-6.929	0.738	-44.95	-0.280	0.642	-71.33	0.000	0.999	0.09	-0.191[a]	0.543	-54.03
1996-2001	5,260	-0.313[a]	0.029	-61.75	-46.519	0.003	-137.86	-1.622	0.001	-158.39	-0.294	0.000	-198.90	-0.335[b]	0.038	-58.93
2002-2006	3,200	-0.270[a]	0.077	-43.76	-56.424	0.007	-101.32	-1.476	0.011	-106.47	-0.254	0.001	-152.46	-0.373[b]	0.095	-40.23
Small target	5,784	-0.651[a]	0.071	-198.39	-29.477	0.027	-150.45	-0.677*	0.022*		-0.269	0.002	-186.44	-1.147[b]	0.149	-259.04
Mid-size target	2,300	-0.876[a]	0.111	-159.12	-33.938	0.131	-79.05	-0.747	0.196	-72.70	-0.151	0.136	-82.71	-1.161[b]	0.215	-158.77
Large target	2,968	0.046[b]	0.719	5.79	-62.812	0.006	-101.54	-2.274	0.002	-103.87	-0.214	0.002	-175.21	-0.370[b]	0.094	-41.79
NYSE target	3,164	-0.247[a]	0.200	-41.18	-60.456	0.007	-126.00	-1.900	0.008	-118.13	-0.209	0.003	-196.32	-0.624[b]	0.029	-83.30
AMEX target	924	-0.115[a]	0.886	-44.09	7.386	0.860	43.77	-0.036	0.963	-12.86	-0.123	0.618	-92.12	1.098[a]	0.536	318.94
NASDAQ target	6,964	-0.459[a]	0.007	-100.48	-39.120	0.003	-119.36	-1.145	0.001	-145.14	-0.276	0.000	-166.78	-0.375[b]	0.063	-62.38

[a]Poisson regression, [b]Negative binomial regression, *Reports the regression coefficient and its p-value instead of ME and its p-value, as the ME estimation is non-convergent.

Table 4.12: Regressions for sub-samples of insider net purchases

The table shows marginal effects (ME), p-values and percentage marginal effects (%ME) of Pre-takeover*Target from regressions similar to those shown in Panels A and C of Table 4.10 for nine partitions of the target sample. Regressions are estimated for each of three measures of net purchases. Panels A through E show the results for each of the five insider groups. The sample consists of 2,763 target firms in takeover transactions announced during 1988-2006 with a deal value of $1 million or more, and an industry-size matched control sample, with non-missing data for all the variables in the regressions. Both target and control firms are listed on the NYSE, AMEX, or NASDAQ. There are two observations for each firm: one measures insider trading activity during the one-year period immediately before takeover announcements (pre-takeover period), and the other measures it during the year before that (control period). Pre-takeover is a dummy variable that equals 1 (0) for the pre-takeover (control) period. Target is a dummy variable that equals 1 (0) for the target (control) firm. The dependent and independent variables, the regression models and methodology used, and computations of test statistics and marginal effects are as described in Table 4.10. The sample partitions are as described in Table 4.4.

Panel A: Top Management Net Purchases

Dependent variable / Sub-samples	N	# shares			$ shares			% equity		
		ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME
Merger	8,180	6.122	0.203	19.37	0.188	0.193	19.61	0.035	0.085	32.60
Tender offer	2,248	10.566	0.212	42.12	0.491	0.038	64.67	-0.001	0.987	0.67
LBO	784	27.792	0.181	57.40	0.884	0.134	64.66	0.108	0.157	88.30
Hostile	432	68.109	0.023	63.59	2.059	0.021	116.58	0.164	0.092	124.24
Friendly	10,620	6.655	0.111	22.03	0.240	0.051	26.38	0.032	0.078	30.27
Single bidder	10,324	8.431	0.052	26.81	0.294	0.021	31.20	0.035	0.066	31.47
Multiple bidder	728	14.106	0.403	48.08	0.434	0.408	46.58	0.051	0.369	77.98
Stock deals	3,344	4.526	0.544	14.37	0.209	0.371	20.34	0.048	0.155	41.89
Cash deals	4,112	8.978	0.192	29.12	0.315	0.089	38.30	0.044	0.142	39.64
Other deals	3,596	13.024	0.081	41.08	0.392	0.084	39.33	0.015	0.597	15.93
Cross border acquirer	1,748	4.990	0.640	16.38	0.188	0.526	21.20	0.043	0.379	34.94
Domestic acquirer	9,304	9.443	0.038	30.01	0.326	0.016	30.20	0.036	0.064	34.18
More regulated	2,840	3.607	0.468	29.41	0.130	0.454	26.75	0.029	0.194	76.88
Less regulated	8,212	10.442	0.050	27.55	0.362	0.019	32.88	0.035	0.119	27.04
1988-1995	2,592	-1.077	0.844	-8.88	0.031	0.844	8.57	-0.057	0.105	-70.83
1996-2001	5,260	5.293	0.379	18.51	0.291	0.116	29.94	0.045	0.095	44.91
2002-2006	3,200	23.346	0.014	45.50	0.585	0.028	43.04	0.077	0.011	56.29
Small target	5,784	1.141	0.782	7.94	0.061	0.502	19.69	0.023	0.380	26.37
Mid-size target	2,300	7.134	0.461	18.28	0.106	0.674	10.70	0.004	0.930	2.35
Large target	2,968	26.988	0.013	46.24	1.032	0.004	48.36	0.073	0.009	67.58
NYSE target	3,164	19.040	0.042	42.70	0.604	0.048	38.76	0.054	0.042	60.35
AMEX target	924	-12.268	0.257	-101.72	-0.171	0.378	-70.10	-0.046	0.512	-58.72
NASDAQ target	6,964	7.692	0.117	27.64	0.265	0.048	35.19	0.039	0.109	32.40

Table 4.12 (cont.)

Panel B: Top Financial Officers' Net Purchases										
Dependent variable / Sub-samples	N	# shares			$ shares			% equity		
		ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME
Merger	8,180	0.914	0.218	20.51	0.033	0.164	23.27	0.006	0.027	43.99
Tender offer	2,248	0.678	0.569	21.79	0.052	0.127	57.24	0.002	0.687	18.43
LBO	784	4.892	0.076	82.17	0.113	0.177	64.42	0.015	0.067	106.88
Hostile	432	3.869	0.311	55.17	0.134	0.314	57.08	0.009	0.367	59.17
Friendly	10,620	1.31	0.073	27.13	0.043	0.028	33.25	0.007	0.010	46.53
Single bidder	10,324	1.356	0.037	31.48	0.051	0.012	37.95	0.007	0.006	49.51
Multiple bidder	728	-1.445	0.541	-37.26	-0.042	0.604	-32.22	-0.003	0.648	-36.39
Stock deals	3,344	0.716	0.520	17.38	0.021	0.574	14.59	0.008	0.066	61.78
Cash deals	4,112	1.500	0.140	34.78	0.041	0.163	34.93	0.007	0.087	45.00
Other deals	3,596	1.104	0.326	25.14	0.071	0.051	48.83	0.004	0.381	28.09
Cross border acquirer	1,748	1.833	0.221	44.90	0.052	0.257	42.60	0.003	0.669	18.64
Domestic acquirer	9,304	1.056	0.124	24.47	0.044	0.042	32.39	0.007	0.007	51.31
More regulated	2,840	-0.046	0.958	-2.07	0.021	0.490	25.84	0.005	0.211	52.62
Less regulated	8,212	1.610	0.039	32.29	0.054	0.027	35.14	0.007	0.024	43.47
1988-1995	2,592	0.639	0.254	75.69	0.018	0.279	74.74	0.002	0.410	49.59
1996-2001	5,260	0.787	0.339	21.61	0.044	0.135	32.02	0.005	0.133	42.43
2002-2006	3,200	2.366	0.137	29.17	0.075	0.098	34.25	0.011	0.045	46.10
Small target	5,784	0.742	0.211	39.97	0.017	0.227	41.34	0.006	0.122	47.59
Mid-size target	2,300	0.754	0.575	16.38	0.025	0.516	19.79	0.003	0.595	15.77
Large target	2,968	2.829	0.095	32.33	0.139	0.017	43.43	0.010	0.009	68.15
NYSE target	3,164	1.994	0.178	29.11	0.089	0.073	37.59	0.009	0.017	68.88
AMEX target	924	-0.352	0.751	-34.63	-0.009	0.745	-34.12	0.004	0.610	45.93
NASDAQ target	6,964	1.170	0.099	33.00	0.038	0.069	37.41	0.006	0.075	39.03

Table 4.12 (cont.)

Panel C: All Officers' Net Purchases										
Dependent variable / Sub-samples	N	# shares			$ shares			% equity		
		ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME
Merger	8,180	9.471	0.128	19.65	0.247	0.232	16.51	0.044	0.033	30.94
Tender offer	2,248	22.588	0.019	69.46	0.884	0.004	87.29	0.049	0.206	39.06
LBO	784	60.433	0.016	88.12	1.632	0.036	84.80	0.132	0.090	71.84
Hostile	432	84.808	0.019	111.61	2.169	0.088	84.54	0.156	0.108	91.84
Friendly	10,620	12.669	0.017	27.91	0.405	0.019	29.24	0.050	0.006	36.18
Single bidder	10,324	14.129	0.010	30.17	0.441	0.014	30.84	0.051	0.007	35.22
Multiple bidder	728	30.033	0.161	69.72	0.736	0.336	49.97	0.085	0.131	88.59
Stock deals	3,344	5.867	0.520	13.76	0.155	0.629	10.60	0.053	0.085	42.01
Cash deals	4,112	16.323	0.065	33.65	0.516	0.049	40.15	0.072	0.029	41.99
Other deals	3,596	22.709	0.018	47.26	0.712	0.030	45.25	0.028	0.301	23.76
Cross border acquirer	1,748	25.623	0.068	52.23	0.785	0.077	51.81	0.088	0.079	54.77
Domestic acquirer	9,304	13.130	0.022	28.47	0.402	0.034	28.39	0.045	0.017	33.20
More regulated	2,840	5.866	0.389	27.12	0.170	0.518	19.77	0.027	0.220	43.13
Less regulated	8,212	18.305	0.006	33.15	0.563	0.009	34.57	0.060	0.008	35.74
1988-1995	2,592	-0.147	0.967	-2.02	0.070	0.601	27.21	-0.012	0.542	-26.81
1996-2001	5,260	12.228	0.084	32.24	0.478	0.057	34.84	0.059	0.026	47.97
2002-2006	3,200	33.679	0.010	36.37	0.832	0.040	33.57	0.089	0.021	36.24
Small target	5,784	7.080	0.148	34.08	0.197	0.106	45.40	0.044	0.084	37.23
Mid-size target	2,300	14.635	0.216	28.02	0.345	0.294	26.12	0.057	0.173	29.69
Large target	2,968	36.368	0.010	39.32	1.290	0.012	37.28	0.057	0.047	39.27
NYSE target	3,164	23.318	0.059	32.86	0.722	0.102	28.15	0.055	0.045	44.29
AMEX target	924	-7.876	0.449	-62.26	-0.154	0.405	-62.33	-0.021	0.701	-31.91
NASDAQ target	6,964	16.209	0.008	40.06	0.486	0.008	45.23	0.062	0.010	39.70

Table 4.12 (cont.)

Panel D: All Directors' Net Purchases

Sub-samples \ Dependent variable	N	# shares			$ shares			% equity		
		ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME
Merger	8,180	5.604	0.444	11.77	0.387	0.065	27.41	0.014	0.652	9.50
Tender offer	2,248	19.111	0.110	52.69	0.553	0.099	50.85	0.029	0.633	19.06
LBO	784	46.033	0.103	70.52	1.427	0.071	77.66	0.070	0.531	46.28
Hostile	432	67.163	0.082	93.93	1.824	0.128	80.53	0.266	0.084	149.66
Friendly	10,620	8.584	0.173	18.80	0.432	0.015	32.23	0.016	0.577	10.44
Single bidder	10,324	9.544	0.143	20.23	0.753	0.014	32.71	0.018	0.529	11.69
Multiple bidder	728	25.757	0.205	70.35	0.863	0.197	68.66	0.096	0.327	97.43
Stock deals	3,344	2.672	0.811	5.89	0.568	0.102	37.14	-0.008	0.877	-5.49
Cash deals	4,112	12.401	0.211	27.40	0.420	0.104	35.93	0.048	0.311	28.79
Other deals	3,596	17.401	0.132	35.12	0.513	0.116	34.79	0.026	0.564	18.06
Cross border acquirer	1,748	18.275	0.269	36.41	0.476	0.305	32.94	0.024	0.759	11.87
Domestic acquirer	9,304	9.190	0.173	19.97	0.482	0.012	35.32	0.021	0.472	14.77
More regulated	2,840	7.490	0.389	33.12	0.458	0.110	52.81	0.021	0.595	36.20
Less regulated	8,212	11.787	0.132	21.43	0.494	0.023	31.77	0.019	0.578	10.34
1988-1995	2,592	-2.130	0.792	-13.19	0.152	0.516	29.65	-0.067	0.187	-71.39
1996-2001	5,260	13.868	0.125	31.66	0.648	0.017	44.26	0.067	0.121	44.20
2002-2006	3,200	16.444	0.238	21.60	0.509	0.162	26.25	0.019	0.696	9.51
Small target	5,784	0.670	0.909	3.34	0.161	0.157	40.26	0.019	0.633	16.35
Mid-size target	2,300	16.901	0.218	31.51	0.448	0.181	33.40	0.031	0.609	14.54
Large target	2,968	30.059	0.074	32.29	1.332	0.014	40.20	0.019	0.674	11.15
NYSE target	3,164	26.546	0.052	41.00	1.022	0.020	44.78	0.031	0.464	23.38
AMEX target	924	-9.673	0.529	-55.72	0.022	0.939	6.11	-0.005	0.962	-5.37
NASDAQ target	6,964	8.344	0.261	19.70	0.364	0.060	33.09	0.030	0.427	17.44

Table 4.12 (cont.)

Panel E: Blockholders' Net Purchases										
Dependent variable / Sub-samples	N	# shares			$ shares			% equity		
		ME	p-value	%ME	ME	p-value	%ME	ME	p-value	%ME
Merger	8,180	16.188	0.071	81.49	0.267	0.040	77.69	0.093	0.112	81.08
Tender offer	2,248	24.228	0.135	175.94	0.404	0.088	150.98	0.173	0.116	223.13
LBO	784	-38.047	0.250	-159.14	-0.510	0.308	-109.88	-0.155	0.516	-117.05
Hostile	432	-6.987	0.811	-93.68	-0.010	0.980	-5.05	-0.100	0.663	-172.40
Friendly	10,620	15.386	0.053	78.65	0.258	0.025	75.13	0.099	0.059	88.76
Single bidder	10,324	15.875	0.049	80.64	0.267	0.023	77.01	0.106	0.048	91.77
Multiple bidder	728	-4.800	0.843	-45.12	-0.029	0.932	-13.03	-0.162	0.311	-587.41
Stock deals	3,344	12.999	0.353	62.73	0.281	0.170	77.34	0.083	0.366	70.40
Cash deals	4,112	8.699	0.473	56.89	0.121	0.474	42.46	0.042	0.620	40.21
Other deals	3,596	23.268	0.100	106.17	0.365	0.084	97.24	0.152	0.087	141.36
Cross border acquirer	1,748	16.685	0.407	98.02	0.420	0.143	127.18	0.133	0.320	130.64
Domestic acquirer	9,304	14.564	0.082	74.77	0.221	0.071	65.01	0.083	0.132	75.22
More regulated	2,840	19.936	0.035	522.89	0.242	0.079	260.16	0.069	0.276	227.10
Less regulated	8,212	12.612	0.201	51.75	0.248	0.083	58.68	0.099	0.130	72.08
1988-1995	2,592	9.533	0.447	118.16	0.063	0.728	38.79	0.066	0.511	104.88
1996-2001	5,260	17.171	0.132	89.01	0.382	0.027	102.59	0.123	0.111	104.94
2002-2006	3,200	17.674	0.262	63.84	0.222	0.306	52.23	0.077	0.393	57.59
Small target	5,784	0.445	0.962	3.06	-0.002	0.985	-1.12	0.059	0.419	53.91
Mid-size target	2,300	28.687	0.099	134.08	0.464	0.079	113.18	0.123	0.278	95.02
Large target	2,968	31.415	0.081	119.90	0.567	0.058	96.89	0.123	0.175	132.00
NYSE target	3,164	22.372	0.155	104.47	0.315	0.207	71.71	0.123	0.156	133.45
AMEX target	924	28.081	0.269	173.77	0.460	0.222	155.67	0.126	0.513	128.49
NASDAQ target	6,964	9.847	0.294	53.45	0.201	0.118	67.30	0.074	0.264	62.13

Table 4.12 shows the marginal effects of the interaction term for the three measures of net purchases for each of the sub-samples. Panels A through E of this table show the results for each of the five insider groups. Consistent with the results for the full sample in Table 4.10, insiders increase their net purchases in most of the sub-samples. As in Table 4.11, statistical significance of the marginal effect of the interaction term reduces in many sub-samples, partly reflecting lower sample

sizes. The table shows a consistent pattern of statistically significant increases in insiders' net purchases relative to the dual control in certain sub-samples with less uncertainty about takeover completion, such as deals with a single bidder, domestic acquirer, and less regulated target.

The pattern of significant increases in insiders' net purchases is also more evident in deals completed after 1995, in deals involving large targets and in targets traded on more prominent stock markets, namely NYSE and Nasdaq. Table 4.11 shows that the increase in top managers' net purchases in large and NYSE-listed targets is driven by a significant reduction in their pre-bid sales, but not in their purchases. Given the large trading volume in these stocks and the large amount of media coverage of these firms, their insiders may find it easier to hide this subtle, unregulated pattern of their trading.

4.7 Summary and conclusions

This paper provides systematic evidence on the level, pattern and prevalence of insider trading before takeovers during modern times. We examine the level and pattern of insider trading in about 3,700 targets of takeovers announced during 1988-2006 and in two control samples: a cross-sectional control sample and a time-series control sample. We analyze open-market stock transactions of five groups of corporate insiders: top management, top financial officers, all corporate officers, board members, and large blockholders. We separately examine their purchases, sales and net purchases in target and control firms during the one year period prior to takeover announcement (takeover period) and the preceding one year (control) period, using a difference-in-differences approach. Using several measures of the level of insider trading, we estimate cross-sectional regressions that control for other determinants of the level of insider trading.

Our conclusions are tempered by three caveats that apply to most studies of insider trading.[53] First, we only examine trades of registered corporate insiders; we do not observe the activities of other potentially informed insiders who are not required to report their trades to the SEC. Second, registered insiders may trade via friends or extended family members (outside their immediate family), who are not required to report their trades. However, an insider who trades illegally may think twice about involving others, because expanding the circle of participants increases the likelihood that the crime will be revealed. Third, our tests assume that registered insiders report their trades to the SEC as required by law.

We find an interesting and subtle pattern in the average trading behavior of target insiders over the one year period before takeover announcement. While insiders reduce both their purchases and sales below their normal levels, the reduction in sales exceeds the reduction in purchases, resulting in an increase in their net purchases. This pattern of passive insider trading is confined to the six-month period before takeover announcement when insiders are more likely to be informed about an upcoming takeover; it holds for each insider group, and for all three measures of net purchases that we examine. We find a consistent pattern of statistically significant increases in insiders' net purchases relative to the dual control in certain sub-samples with less uncertainty about takeover completion, such as deals with a single bidder, domestic acquirer, and less regulated target. The pattern of significant increases in insiders' net purchases is also more evident in deals completed after 1995, in deals involving large targets and in targets traded on more prominent stock markets, namely NYSE and Nasdaq. Our findings suggest that while insiders are careful about trading before major corporate events, they try to get around the restrictions on their trading activities.

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[53] An exception is Meulbroek (1992), who examines illegal insider trading uncovered by, rather than reported to, the SEC.

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5. CONCLUSION

This dissertation contains three distinct essays in the broad area of empirical corporate finance. The first two essays examine the role of an independent director who is also a blockholder (IDB), a potent governance mechanism, on executive compensation, and corporate financial and investment policies, respectively. The last essay examines insider trading in takeover targets.

While numerous studies examine the relation between board independence or outside blockholdings on CEO compensation, turnover or firm valuation, no prior study has examined these issues in the presence of an independent director who is a blockholder (i.e., an IDB). An IDB has strong incentives and the ability to monitor the CEO. But whether the IDB uses his position to pursue the interests of all shareholders or to extract private benefits from the firm is an empirical question. Moreover, the presence of an IDB is likely endogenous, as blockholders decide which firm to invest in and whether to try to obtain a board seat. Therefore, to answer questions like whether the presence of an IDB influence CEO compensation, turnover, or firm performance requires analytical frameworks that account for endogeneity of an IDB's presence in a firm. In the first essay, we address these questions using a variety of methods that account for different sources of endogeneity.

We find that IDBs are more prevalent in smaller firms and firms that have higher growth rates, worse prior performance, less powerful CEOs, bigger and more independent boards, more shareholder rights, and lower institutional ownership. These findings indicate that an IDB's presence in a firm is not a random occurrence. After controlling for CEO characteristics, other governance mechanisms and relevant firm attributes, we find that CEOs of firms with IDBs have: (1) lower levels of cash and total compensation, and (2) lower proportions of pay via stock and options. These results are robust across several methodologies that account for the potential endogeneity of IDB presence. While CEO turnover-performance sensitivity is unrelated to the presence of an IDB in OLS and probit regressions, this relation is significantly positive after accounting for endogeneity. Finally, firms with an IDB have higher valuation, as measured by Tobin's q. The magnitudes of these effects are substantial, and are generally stronger when an IDB serves on the board's compensation committee. Our results on the level and structure of CEO pay and on firm valuation are robust to several alternative definitions of IDB presence in a firm, changes in disclosure rules on executive pay, the adoption of Sarbanes-Oxley Act, and an alternate method of computing industry-adjusted Tobin's q. Our results are also generally robust to controlling for the presence of an outside blockholder or a majority independent board. Finally, an analysis of firms that switched to or from having IDB presence further lends credence to these results. Our findings suggest that the presence of an independent blockholder on the board promotes better incentives and monitoring of the CEO, and consequently leads to higher firm valuation.

Any mechanism that can mitigate agency problems between managers and shareholders is valuable to a firm. The presence of an IDB can act as a powerful control mechanism because an IDB has both a strong incentive as well as the ability to effectively monitor managers. But an IDB's risk preferences can differ from those of other shareholders and the IDB can use his power to extract private benefits from the firm at the expense of other shareholders. One way to examine these agency implications is to empirically examine whether and how IDB presence influences firms' financial and investment policies and risk-taking. In the second essay, we examine how the presence of an IDB affects: 1) four key financial and investment policy choices of a firm: the levels of cash holdings, dividends, investments and financial leverage, and 2) firm risk. We also examine how the market values IDB presence and changes in various policy choices associated with IDB presence in a firm.

After controlling for other variables and accounting for the potential endogeneity of IDB presence, we find that firms with IDBs have significantly lower levels of cash holdings, dividend yields, repurchases, and total payout, and higher levels of capital expenditures. IDB presence has no significant impact on the levels of a firm's financial leverage and R&D expenditures. We also find that firms with IDBs have lower total, systematic and unsystematic risk. While IDB presence enhances overall firm valuation and the market appears to value a decrease in dividend yields associated with IDB presence, changes in other corporate policy choices associated with IDB presence do not appear to affect firm valuation.

These results have three implications. First, IDBs appears to take a 'hands-off' approach for firms' financial leverage and R&D activities but take an active role in reducing cash holdings and increasing investment spending. Second, lower dividends in firms with IDB and their higher market valuation suggest that IDB presence 'substitutes' costly signals for a firm's governance quality. Third, while IDB presence reduces firm risk, the market values IDB presence positively. This suggests that IDBs play a valuable role in reallocation of corporate resources and expunging dead-weight costs. As a whole, IDB presence appears to reduce agency costs.

The third essay provides systematic evidence on the level, pattern and prevalence of insider trading before takeovers during modern times. We examine the level and pattern of insider trading in about 3,700 targets of takeovers announced during 1988-2006 and in two control samples: a cross-sectional control sample and a time-series control sample. We analyze open-market stock transactions of five groups of corporate insiders: top management, top financial officers, all corporate officers, board members, and large blockholders. We separately examine their purchases, sales and net purchases in target and control firms during the one year period prior to takeover announcement (takeover period) and the preceding one year (control) period, using a difference-in-differences approach. Using several measures of the level of insider trading, we estimate cross-sectional regressions that control for other determinants of the level of insider trading.

We find an interesting and subtle pattern in the average trading behavior of target insiders over the one year period before takeover announcement. While insiders reduce both their purchases and sales below their normal levels, the reduction in sales exceeds the reduction in purchases, resulting in an increase in their net purchases. This pattern of passive insider trading is confined to the six-month period before takeover announcement when insiders are more likely to be informed about an upcoming takeover; it holds for each insider group, and for all three measures of net purchases that we examine. We find a consistent pattern of statistically significant increases in insiders' net purchases relative to the dual control in certain sub-samples with less uncertainty about takeover completion, such as deals with a single bidder, domestic acquirer, and less regulated target. The pattern of significant increases in insiders' net purchases is also more evident in deals completed after 1995, in deals involving large targets and in targets traded on more prominent stock markets, namely NYSE and Nasdaq. Our findings suggest that while insiders are careful about trading before major corporate events, they try to get around the restrictions on their trading activities.