

Incentive Effects of Stock and Option Holdings of Target and Acquirer CEOs

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ABSTRACT

Acquisitions enable target chief executive officers (CEOs) to remove liquidity restrictions on stock and option holdings and diminish the illiquidity discount. Acquisitions also enable acquirer CEOs to improve the long-term value of overvalued holdings. Examining all firms during 1993 to 2001, we show that CEOs with higher holdings (illiquidity discount) are more likely to make acquisitions (get acquired). Further, in 250 completed acquisitions, target CEOs with a higher illiquidity discount accept a lower premium, offer less resistance, and more often leave after acquisition. Similarly, acquirer CEOs with higher holdings pay a higher premium, expedite the process, and make diversifying acquisitions using stock payment.

CORPORATE ACQUISITIONS ARE IMPORTANT RESTRUCTURING EVENTS as judged by their wealth creation and redistribution effects. Andrade, Mitchell, and Stafford (2001) report that 4,256 publicly traded firms in the U.S. economy were acquired by other publicly traded firms during 1973–1998. These acquisitions resulted in average announcement-to-completion wealth gains of 23.8% to target shareholders, –3.8% to acquirer shareholders, and 1.9% to combined shareholders. A large part of the acquisition activity occurs in waves, and they document that the recent wave of 1990s was quite big. Casual observation suggests that this period was also characterized by an increase in the stock and option holdings of chief executive officers (CEOs).

This paper analyzes the incentive effects of stock and option holdings of target and acquirer CEOs in corporate acquisitions. In the case of target CEOs, our motivation comes from a growing literature that documents the adverse effect of illiquidity on personal valuation of securities. Meulbroek (2001), Hall and Murphy (2002), Cai and Vihh (2005), and many others show that the executive value of a firm's stock and option holdings can be much lower than the market

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value. The difference arises because the executive is undiversified, but unable to sell his stock or hedge his options due to several liquidity restrictions. This difference explains many empirical facts; for example, why executives often argue that the Black–Scholes option values are too high, and why they exercise their options earlier than maturity.

Acquisitions allow target CEOs to cash out of their illiquid stock and option holdings. In almost all cases the restricted stock and options become vested upon a change in control, allowing CEOs to sell their stock and to hold, exercise, or hedge (for a cost) their options.¹ This increases the value of their holdings. We therefore measure the incentive effects of target CEOs by an illiquidity discount, defined as the difference between the with-acquisition unrestricted value and the without-acquisition executive value of their holdings (we explain the calculation of these values below). This is an *ex ante* measure of their incentive effects, and it may be somewhat different from the *ex post* wealth gains if in the end some restrictions are not removed. However, we argue that in the cross-section of firms a higher illiquidity discount represents a higher potential benefit from the removal of restrictions on target CEO holdings.

We measure the incentive effects of acquirer CEOs by the market value of their stock and option holdings. Our motivation in this case comes from Shleifer and Vishny (2003), who argue that during the 1990s acquirer CEOs were driven to improve the long-term value of their currently overvalued stocks by exchanging them for relatively undervalued target stocks in stock mergers. Liquidity restrictions are a necessary part of this motivation since they prevent acquirer CEOs from immediately cashing out of their overvalued holdings. However, the illiquidity discount may not be the appropriate measure of the incentive effects of acquirer CEOs, as in most cases their liquidity restrictions remain in place after the acquisition. We argue that the incentive effects of acquirer CEOs are better captured by the size of their holdings, which determines their wealth gains from such an accretive merger (besides possible synergy effects).

This paper examines whether this meeting of personal interests between the target and acquirer CEOs—one motivated to cash out and the other motivated to improve the long-term value of his stock and option holdings—helps explain acquisition activity of recent years. Using a primary sample of 250 completed acquisitions of publicly traded firms by other publicly traded firms during 1993 to 2001, we document several results that support this proposition. Specifically:

1. We estimate a median illiquidity discount of \$5.97 million for target CEO holdings and a median market value of \$65.07 million for acquirer CEO holdings. More importantly, we document a large cross-sectional variation in both variables, which allows us to investigate several incentive effects. We further separate target CEO holdings into two parts and compute the illiquidity discount for each part. The first part includes holdings subject

¹ The stock holdings may include both restricted stock and contractually unrestricted stock. Below we argue that before an acquisition both are illiquid, although not to the same degree.

to hard liquidity restrictions (such as unvested stock and options, holdings within stock ownership requirements of the firm, or very large holdings), and the second part includes holdings subject to soft liquidity restrictions (such as vested stock and options in excess of ownership requirements). The first part dominates in value, and we find that it creates stronger incentive effects in all our tests.

2. We examine whether in the cross-section of all firms a higher market value of CEO holdings is associated with a higher probability of being an acquirer (acquisitiveness), and whether a higher illiquidity discount is associated with a higher probability of being a target (targetiveness). Using the sample of all firms available on the Center for Research in Security Prices (CRSP), Compustat, ExecuComp, and Investor Responsibility Research Center (IRRC) databases, we find significant evidence in both cases. Our results are robust to the inclusion of the governance index proposed by Gompers, Ishii, and Metrick (2003), the overconfidence measure proposed by Malmendier and Tate (2005b), and other control variables. These results set the stage for subsequent tests that examine the effect of CEO holdings on the terms and characteristics of the sample of 250 completed acquisitions.
3. We find that the acquisition premium is negatively related to the illiquidity discount for target CEOs and positively related to the market value of holdings for acquirer CEOs. An increase in the former variable from its 25th percentile value to the 75th percentile value decreases the acquisition premium by 4.33%, while a similar increase in the latter variable increases it by 4.10%. Combined with the results on acquisitiveness and targetiveness, this suggests that the target CEOs are less willing to bargain and accept a lower premium when they face a higher illiquidity discount. Conversely, the acquirer CEOs are more willing to acquire and pay a higher acquisition premium when they have a higher market value of holdings. We also find that the target CEOs with a higher illiquidity discount are more likely to relinquish control after completing the acquisition.
4. A higher illiquidity discount on target CEO holdings and a higher market value of acquirer CEO holdings both have a strong effect on speeding up the acquisition process. This result has two interpretations consistent with our story. First, a higher illiquidity discount makes target CEOs put up less resistance. This is confirmed by analyzing other measures of resistance. Second, target CEOs want to cash out sooner rather than later, while acquirer CEOs want to complete the acquisition before their stock loses some of its overvaluation.
5. Acquirer CEOs with a higher market value of holdings are more likely to seek relatively undervalued targets, make diversifying acquisitions, and use stock payment. These results are broadly consistent with the Shleifer and Vishny (2003) model.
6. We examine how much of the wealth gains represented by the illiquidity discount a target CEO can capture by simply leaving his job without

an acquisition. This quitting alternative increases the personal value of contractually unrestricted stock, which he can sell, but leads to forfeiture of unvested options and restricted stock. In addition, he is forced to exercise vested options immediately. Even ignoring the likely negative price impact and loss of reputation in the managerial job market, we estimate that in the median case the target CEO realizes a \$158,000 increase in the personal value of his holdings by quitting without acquisition. This is a small amount compared to the \$5.97 million increase resulting from the removal of liquidity restrictions with acquisition.

We verify that our results are robust to the inclusion of appropriate control variables and hedging costs, alternative measures of illiquidity discount on target CEO holdings, percent ownership as an alternative measure of the incentive effects of acquirer CEOs, and possible reverse causality in explaining stock and option awards in anticipation of an acquisition. In particular, Malmendier and Tate (2005a,b) argue that holding a vested option until maturity is an indicator of CEO overconfidence. They further argue that overconfident CEOs are more motivated to acquire and less motivated to be acquired. We find that the measures of incentive effects and CEO overconfidence are uncorrelated, and both are significant in the expected direction in our tests measuring the acquisitiveness and the targetiveness of firms.

In sum, the evidence of this paper suggests that the incentive effects arising from the illiquid stock and option holdings of target and acquirer CEOs are significant factors in explaining the acquisition activity as well as the terms and characteristics of acquisitions. We do not intend to imply that these incentive effects are the primary motivation behind all acquisitions, but rather that they matter in the cross-section. One may conjecture alternative explanations for individual parts of our evidence. However, we argue that this is the most likely explanation for the cumulative evidence. In particular, our results cannot be explained by the traditional incentive alignment hypothesis, which suggests that the interests of managers are aligned with the interests of all shareholders regardless of their investment horizons. Finally, data limitations prevent us from investigating periods before 1993. However, the incentive effects documented here are quite basic and should hold over other periods. The incentive effects for target CEOs require that they have illiquid holdings, and the incentive effects for acquirer CEOs require that the acquirer stock be overvalued and used to pay for the acquisition. The first requirement hardly needs elaboration, and the second requirement holds over different time periods, as shown in previous literature.

In the remainder of the paper, Section I motivates the incentive effects arising from stock and option holdings of target and acquirer CEOs. Section II presents the data and methods, and Section III presents the main results. Section IV discusses the robustness tests and alternative hypotheses, and Section V concludes.

I. Incentive Effects of CEO Holdings in Corporate Acquisitions

A. Liquidity Restrictions on CEO Holdings

Kahl, Liu, and Longstaff (2003) discuss several sources of liquidity restrictions on CEO holdings. Stock options may not be exercised or sold before the end of the vesting period, and restricted stock may not be sold before the end of the restriction period. Early departure usually leads to forfeiture in both cases. After vesting, the stock options may be exercised but still may not be sold. Since CEOs are prohibited from short-selling their own firm's stock to hedge their options, they should continue to attach a lower personal value to vested options than outside investors, which in fact rationalizes the early exercise decision. Thus, vested options are still illiquid, although the restrictions on them are softer than on unvested options.²

Restricted stock is granted by about one-fourth of all firms, but stock options constitute a significant proportion of the CEO's portfolio in most cases. The other significant proportion of the CEO's portfolio consists of contractually unrestricted stock. While simpler term "unrestricted stock" is often used for such stock, it is usually a misnomer. CEOs face many implicit and explicit restrictions on the sale of their firm's stock, such as stock ownership requirements and trading restrictions established by their firms, the Securities and Exchanges Commission (SEC) regulations on insider trading, and the market reaction to insider sales. These restrictions limit the ability of CEOs to sell their contractually unrestricted stock, and as a result, they often have to maintain a substantial stock ownership of their firms.

To be more specific, we search the preannouncement proxy statements for stock ownership requirements. In a subset of 226 target and 231 acquirer firms with available proxy statements, 54 target and 44 acquirer firms have explicit ownership requirements for CEOs. The requirements usually specify the minimum amount of stock an executive should hold as a multiple of his annual salary, with mean and median multiples of 4.4 and 5.0 for CEOs. Many firms also specify penalties if an executive fails to meet the ownership requirements within a specified period of time.³ The remaining firms do not mention explicit stock ownership requirements, but in most cases, the boards do explicitly mention that they expect substantial ownership by top executives. We find another 97 target and 100 acquirer firms that fall into this category. In addition, about half of all firms with available proxy statements have stock ownership

² Malmendier and Tate (2005a,b) suggest that overconfident CEOs tend to hold vested options until expiration. While this interpretation is correct, we would like to point out that in the absence of short-sale constraints all CEOs will hold options on nondividend-paying stocks until expiration. Thus, liquidity restrictions in some form or other are a necessary condition for non-overconfident CEOs to exercise their options before maturity.

³ Core and Larcker (2002) list three types of penalties: (1) a fraction of the executive's annual salary is paid as restricted stock, (2) the executive's grants of options, restricted stock, and cash long-term incentives are reduced or eliminated, or, (3) the vesting of the executive's outstanding restricted stock and options is delayed.

or purchase plans to facilitate ownership by top executives. Stock acquired through these plans is usually subject to some selling restrictions, although it is not counted as restricted stock.

Besides stock ownership requirements, firms place restrictions on when CEOs and other insiders can trade their stock. Bettis, Coles, and Lemmon (2000) analyze a sample of 626 firms and find that 92% have trading restrictions in place. An estimated 78% of firms have blackout periods during which the insiders cannot trade their firm's stock. The most common restriction allows only a 10-day trading window every quarter starting on the third day after an earnings announcement. In addition, 74% of firms require all insider trades to be cleared by an individual or office of the firm before execution.

Even when the firm clears a trade during a permitted trading window, CEOs face additional legal restrictions from the SEC. Firm affiliates (a term broader than insiders) who want to sell large amounts of stock must go through a lengthy and expensive registration process and incur substantial underwriting fees. Alternatively, the SEC Rule 144 allows affiliates to sell unregistered stock, but places several restrictions on such sales as discussed by Osborne (1982) and Kahl, Liu, and Longstaff (2003).

Together, the firm restrictions and the SEC regulations constrain the rate at which CEOs can sell their stock, impose substantial compliance costs, and limit their ability to time their trades.⁴ These restrictions are designed to protect investors, which brings us to the last but not the least of the restrictions on CEO stock sales. Shareholders expect key executives of their firms to maintain substantial ownership of the firm's stock and react negatively to insider sales. In addition, significant liquidity concerns arise sometimes from the likely price impact of such sales. Many entrepreneurs of growth firms during the last decade owned a large part of their firm's stock. The high prices of these stocks were sometimes maintained by a small float volume. The unloading of a large number of shares held by entrepreneur-CEOs of such firms using any sale mechanism could have caused their stock prices to crash.

We now discuss the empirical evidence. Ofek and Yermack (2000) study the changes in stock ownership with a sample of 3,221 CEO-year observations during 1993 to 1995 and conclude that despite substantial new awards the annual changes in CEO stock ownership are close to zero. Their evidence can be simultaneously interpreted as suggesting that CEOs are able to sell additional annual grants of stock and options, but that they are unable to reduce their existing stock holdings. In our sample of 250 CEOs of target firms acquired during 1993 to 2001, we find that their ownership of contractually unrestricted stock had been growing by a median rate of 3.7% a year. These CEOs may

⁴ It has been suggested that sometimes firm officers are able to reduce the risk of their undiversified holdings by entering into zero-cost collars, equity swaps, and forward sales agreements. These arrangements by individuals in key positions would undermine the intent of stock and option awards, and it is unlikely that these would be properly reported to shareholders. Furthermore, Hall and Murphy (2002) state that "Existing evidence suggests that such transactions are observed but are not widespread." Bettis, Bizjak, and Lemmon (2001) report that for the firm officers involved in these transactions the effective ownership position is reduced by 25%.

have faced greater liquidity restrictions on their stock and option holdings. Finally, direct evidence on the value of liquidity restrictions is provided by Silber (1991), who analyzes a sample of 69 private placements of Rule 144 stock during 1981 to 1988 and documents an average 34% discount to the closing market price.

Given the cumulative evidence of restrictions on contractually unrestricted stock, we assume that the CEOs are required to maintain their current level of stock holding until retirement in the absence of an acquisition.

B. Hard Versus Soft Liquidity Restrictions

The liquidity restrictions vary across the different types of holdings, which may result in different levels of incentive effects. We therefore classify the holdings into two categories:

1. Holdings subject to hard restrictions, which include unvested options, restricted stock, and contractually unrestricted stock up to the following level. If a firm has an established ownership requirement, then we include stock up to that requirement.⁵ However, if there is no explicit ownership requirement but the board expects ownership or has established stock ownership or purchase plans, then we include stock up to three times the annual salary. To further account for fluctuations in stock price that may push ownership to below firm requirements, we include additional stock equal to the amount calculated above multiplied by one standard deviation of annual returns. Finally, if a CEO holds a substantial fraction of his company, it is almost impossible for him to quickly liquidate his holdings without an acquisition. We therefore assume that if a CEO holds more than 5% of the outstanding shares of his company, then all of his holdings are subject to hard restrictions.⁶
2. Holdings subject to soft restrictions, which include the rest of the contractually unrestricted stock and vested options.⁷

⁵ In a few cases, the precise formula is not disclosed. We then assume that it equals five times the annual salary.

⁶ The 5% cutoff has additional motivation based on some SEC guidelines that treat the CEO as an insider even if he leaves the firm. Below we report several robustness checks to show that our results are not specific to any assumption made for calculating the holdings subject to hard versus soft restrictions. First, we assume that contractually unrestricted stock holdings worth five times salary are subject to hard restrictions if the board explicitly expects CEO ownership. Second, we assume no additional contractually unrestricted stock beyond the ownership requirement and board expectation is subject to hard restrictions to account for the price fluctuations. Third, we assume that all holdings are subject to hard restrictions if the CEO holds more than 2.5%, 4.0%, 6.0%, or 7.5% of the outstanding shares of his company.

⁷ If a CEO's contractually unrestricted stock holding is less than the amount subject to hard restrictions, we assume that his vested options are also subject to hard restrictions. This can happen when a company has recently established a stock ownership requirement, and the CEO does not have enough stock to satisfy the requirement.

C. The Incentive Effects of Target CEOs

The liquidity restrictions on the target CEO's stock and option holdings result in what we term the *without-acquisition executive value* of holdings, which we estimate as the amount of outside wealth that gives him the same expected utility as the holdings in the absence of an acquisition. This value is usually much lower than the market value. We argue that corporate acquisitions enable the target CEOs to remove many or all of the liquidity restrictions on their holdings. We read the proxy statements and find that there is always a "change in control" clause. Typically, this clause says that all vesting restrictions on restricted stock and options will be removed after a change in control. A completed acquisition always constitutes a change in control for the target firm.

Whether and to what extent the remaining restrictions on the target CEO's stock and option holdings are lifted depends on whether he chooses to leave or to stay, the position he occupies if he stays, and the terms of the merger agreement that he negotiates with the acquirer firm. If he chooses to leave, typically all restrictions are lifted. He can then sell all of his stock, including previously restricted stock, for market value. As an outside investor, he can further hedge his options, which increases their value to the market value minus the cost of hedging, or continue to hold his options, which still increases their value due to the increased diversification of his portfolio after the stock sale. The combination of these new stock and option values is termed the *with-acquisition unrestricted value* of holdings. This definition assumes that the target CEO can hold on to his converted options on the acquirer stock after he leaves. To verify this assumption, we read the merger agreements. Out of 70 cases in which we can find the relevant discussion, in 34 cases, continued employment is not required to hold the options until their original maturity. In 13 cases, the CEO can hold the options for a period of 1–5 years after acquisition. In another 13 cases, immediate exercise is required, but there is supplemental compensation in the form of new option grants, extra cash, or linking the option payoff to the highest stock price over a period of time. In these 60 cases, the value increases approximately to the with-acquisition unrestricted value. In the remaining 10 cases, option exercise is required immediately or over a period ranging up to 1 year, so the increase may be somewhat smaller than in the first 60 cases.

In some cases, the target CEO chooses to stay with the merged firm. In these cases some but not all of the restrictions may be lifted. We find that he becomes the combined-firm CEO in only 14 cases, so in the vast majority of cases he occupies a lower position in the merged firm and faces lower ownership requirements. As a result he may be able to reduce his holdings, which eliminates the discount on the sold securities and reduces it on the held securities due to the resulting increase in diversification (i.e., an $x\%$ reduction in an illiquid portfolio reduces the total discount by more than $x\%$).

The illiquidity discount equals the difference between the with-acquisition unrestricted value and the without-acquisition executive value of holdings. It is an *ex ante* measure of the target CEO's maximum possible wealth gains from the removal of liquidity restrictions, although in some cases the *ex post*

wealth gains may be smaller than the maximum possible wealth gains. The exact removal of restrictions on the target CEO is endogenous to his decision to stay or to leave, which makes the ex post wealth gains an inappropriate measure of incentive effects, such as in tests in which we examine his decision to stay or to leave. This is one reason why we measure the incentive effects by the ex ante illiquidity discount. As another reason, whether and when the acquisition will complete and the resulting ex post wealth gains are unknown on the announcement date, which further suggests that we should measure the incentive effects by the ex ante illiquidity discount.

In addition to the illiquidity incentive effects discussed in this paper, target CEOs have other incentives in the form of side payments as discussed by Hartzell, Ofek, and Yermack (2004). These include golden parachutes, consulting payments, new equity grants, special merger bonuses, and an executive position in the combined firm. We control for these other incentives in our tests related to the terms and characteristics of completed acquisitions.

D. The Incentive Effects of Acquirer CEOs

To measure the incentive effects of acquirer CEOs, we refer to Shleifer and Vishny (2003), who posit an explanation for acquisition activity of the 1990s. The acquirer CEOs in their model have long horizons and hold overvalued but illiquid stock and options of their firms. In an effort to increase the long-term value of their holdings, they acquire relatively undervalued target firms and use the overvalued stock of their firms to pay for the acquisitions.⁸ The liquidity restrictions are important in the Shleifer and Vishny model, since without them the CEOs would immediately cash out of their overvalued holdings. However, the illiquidity discount does not capture their incentive effects as it does not represent their wealth gains from the acquisitions. We instead measure their incentive effects by the market value of their holdings, which is related to the likely benefits of merging with a relatively undervalued target firm as well as merging with a target firm for synergy reasons. As a robustness check, we verify that our results are qualitatively similar if we measure the incentive effects of acquirer CEOs by the percent holdings of their firms (which is another specification suggested by Baker and Hall (2004) in case their actions have a constant dollar effect on the acquirer firm regardless of the acquirer firm size).

E. Main Hypothesis and Development of Empirical Tests

Our tests center around the following main hypothesis: In recent years, a firm's stock and options have constituted a large part of the portfolios held by CEOs, which creates significant incentive effects in mergers and acquisitions. To test this hypothesis, we first examine whether in the aggregate sample of all firms with relevant data the acquisitiveness of firms is related to the size of

⁸ Dong et al. (2005) and Rhodes-Kropf, Robinson, and Viswanathan (2005) find empirical evidence consistent with other aspects of the Shleifer and Vishny (2003) model.

stock and option holdings of firm CEOs. In addition, we also examine whether the targetiveness of firms is related to the illiquidity discount on stock and option holdings of firm CEOs.

The next set of tests is related to the incentive effects of target CEOs in the cross-section of completed acquisitions. First, consistent with their motives to get acquired, we expect that target CEOs with a higher illiquidity discount are likely to put up less resistance and accept a lower premium.⁹ Second, they are more likely to relinquish control after the acquisition. Third, the lower resistance put up by them should speed up the acquisition process. All predictions are consistent with target CEOs increasing their own welfare. But their actions also increase the welfare of their existing shareholders who intend to sell out after receiving the acquisition premium (short-term shareholders in the Shleifer and Vishny model). However, their actions may or may not increase the welfare of shareholders who intend to hold on to the possibly overvalued acquirer stock received as payment (long-term shareholders).

The last set of tests is related to the incentive effects of acquirer CEOs in the cross-section of completed acquisitions. First, consistent with their motives to acquire, we expect that acquirer CEOs with a higher market value of stock and option holdings are less likely to bargain hard, which means that they will pay a higher premium and will speed up the acquisition process. Second, consistent with Shleifer and Vishny, they are more likely to look for relatively undervalued or less overvalued targets. Third, they are more likely to make diversifying acquisitions (since relatively undervalued firms may be found in other industries) and use stock payment. All predictions are primarily consistent with the acquirer CEOs increasing their own welfare. The payment of a higher acquisition premium may seem anomalous, but it will increase their welfare if it increases the odds of making an accretive acquisition. It is consistent with the predicted higher acquisitiveness of CEOs with larger holdings. Their actions increase the welfare of their long-term shareholders and are consistent with the incentive alignment hypothesis from the point of view of these shareholders. However, their actions are inconsistent with this hypothesis from the point of view of short-term shareholders who lose from the negative average acquirer announcement returns.

II. Data, Methods, and Preliminary Evidence

A. Samples of Acquisitions

Our primary sample of acquisitions comes from the CRSP database. We start with all potential target firms delisted from CRSP during 1993 to 2001.

⁹ The first part of this hypothesis is supported by Walkling and Long (1984) and Cotter and Zenner (1994), who find that target manager resistance is negatively related to changes in managerial wealth induced by tender offers. The second part is supported by Hartzell, Ofek, and Yermack (2004), who find that target CEOs accept a lower acquisition premium when they derive personal gains in the form of side payments, and Wulf (2004), who finds that they accept a lower acquisition premium when they negotiate shared control in the merged firm.

CRSP identifies the firms delisted because of acquisitions by a delisting code of 200, 201, 202, 203, 231, 241, or 242, and a two-digit last distribution code of 32, 37, or 38. The target firm's delisting date is our acquisition completion date. To eliminate very small or distressed firms, we exclude firms trading at less than \$3 on the acquisition completion date. This results in an initial sample of 2,605 firms. We exclude target firms that are not available on the Compustat or ExecuComp databases. This reduces the sample size to 443 firms.

We next search the *Wall Street Journal* to identify the acquisition announcement date, the acquirer firm, the payment terms, the method of payment, and the friendliness of the acquisition. The acquisition announcement date is the last trading day before the first *Wall Street Journal* publication date. We require that both the target and the acquirer firms be available from the CRSP, Compustat, and ExecuComp databases, and that the CEO stock ownership data be available in the year immediately before the announcement date. Thus, we exclude acquisitions made by foreign and private firms. Since the ExecuComp data starts in 1992, only acquisitions announced after 1992 can be included. The net result is a sample of 250 acquisitions announced and completed during 1993 to 2001.

To study whether firms with higher CEO stock and option holdings are more likely to make acquisitions and whether firms with a higher CEO illiquidity discount are more likely to get acquired, we construct an expanded sample of all firm-year observations with data available from ExecuComp, CRSP, Compustat, and IRR. We next identify the acquisitions that these firms are involved in during the period 1993 to 2001 from the Securities Data Company (SDC) database. We require that these acquisitions satisfy the following criteria: both the target and the acquirer firms are U.S. public firms, the deal value is greater than \$10 million, and the acquirer owns 100% of the target firm after the acquisition. We end up with 731 acquirer firms and 257 targets firms among 8,822 firm-year observations.

B. Sample Description

Panel A of Table I shows the summary statistics for the target and acquirer firms in our primary sample. The median market value of outstanding stock, measured on AD-21 (where AD denotes the announcement date), equals \$1.22 billion for target firms and \$7.92 billion for acquirer firms. The median size ratio equals 0.23, indicating that the size disparity between the target firm and the acquirer firm is not too severe. This suggests that there is significant potential for long-term revaluation of acquirer stock, and also that target CEOs have reasonable bargaining power in the merger negotiation process.

Panel A further shows that the median book-to-market ratio equals 0.37 for target firms and 0.30 for acquirer firms, and that the median prior-year excess return equals -7.11% and 7.93% . Both indicators are consistent with the Shleifer and Vishny (2003) proposition that in many cases relatively overvalued firms acquire relatively undervalued firms.

Table I
Summary Statistics of Target and Acquirer Firms and the Announcement Period Excess Returns

To identify the sample of acquisitions, we start with all potential target firms delisted from the CRSP files with a delisting code of 200, 201, 202, 203, 231, 241, or 242 and a two-digit last distribution code of 32, 37, or 38. The final sample of 250 acquisitions meets the following additional requirements: (1) The target stock price exceeds \$3 on the delisting date; (2) one or more *Wall Street Journal* reports can be found to establish the identity of the acquirer firm, the acquisition announcement date, and the acquisition characteristics; (3) the acquisition is announced and completed during 1993–2001; (4) the target and acquirer firms are included in the Compustat and CRSP files; and (5) the stock ownership data for the CEOs of both firms are available from ExecuComp for the last fiscal year before the acquisition announcement year. The acquisition announcement date (AD) is the last trading day before the first *Wall Street Journal* publication date. The book values and the SIC codes are obtained from Compustat as of the last fiscal year ending before AD. The stock prices and market values are obtained from CRSP as of AD-21. The stock volatility is estimated over the 60-month period prior to the acquisition announcement month. The prior-year excess returns are calculated by subtracting the cumulative market returns from stock returns over the period AD-272 to AD-21, and the market returns are measured by the CRSP value-weighted returns including dividends (VWRETD). Firms are classified into various industry groups as follows: energy firms with two-digit SIC code of 13 or 29; financial firms with two-digit SIC code between 60 and 69; manufacturing firms with two-digit SIC code between 20 and 28, 30 and 34, and 38 and 39; technology firms with two-digit SIC code of 35, 36, 48, or 73; transportation firms with two-digit SIC code of 37 or between 40 and 47; and utility firms with two-digit SIC code of 49. The others group includes firms with the remaining SIC codes. The acquisition announcement period excess returns is calculated as the difference between the cumulative target, acquirer, or combined stock returns and the cumulative market returns (VWRETD) over various windows bracketing AD. The combined returns are the value-weighted averages of the target and acquirer stock returns. The acquisition premium is calculated as the acquisition price divided by the target stock price on AD-21, minus one. The acquisition price is the acquirer stock price on AD+1 multiplied by the exchange ratio in case of stock payment, and the cash amount in case of cash payment. In Panel C the *t*-statistics are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Panel A: Firm Characteristics					
Variables	N	Target Firms		Acquirer Firms	
		Mean	Median	Mean	Median
Market value (\$billion)	250	4.30	1.22	25.98	7.92
Target to acquirer size ratio	250	0.35	0.23		
Book-to-market ratio	250	0.43	0.37	0.35	0.30
Prior year excess return (%)	250	4.86	-7.11	21.59	7.93
Stock volatility	250	0.39	0.36	0.32	0.28

(continued)

Table I—Continued

Panel B: Sample Distribution										
Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	
Number of acquisitions announced	1	9	29	24	40	50	48	34	15	
Industry	Energy	Financial	Manufacturing	Technology	Transportation	Utility	Others			
Number of targets	14	59	40	66	13	19	39			
Number of acquirers	12	60	40	60	13	21	44			
Panel C: Announcement Period Mean Excess Returns (%)										
Period	Target Stocks			Acquirer Stocks			Combined			
[AD-20, AD+1]	23.79 (15.24)***			−0.39 (−0.51)			3.39 (4.75)***			
[AD-1, AD+1]	17.94 (14.36)***			−3.00 (−6.33)***			0.39 (0.94)			
Acquisition premium	31.84 (17.96)***									

Panel B of Table I shows that our sample is well dispersed over time and across industries. Although not reported in the table, consistent with previous studies such as Holmstrom and Kaplan (2001), most acquisitions during our study period are friendly (239 cases) and paid entirely with the acquirer stock (216 cases). Further, in 185 cases, the target and the acquirer firms are from the same broad industry as defined by the two-digit SIC code.

We measure the market reaction to acquisition announcement using market-adjusted excess returns computed over two windows surrounding the announcement date (AD). The exact computation procedure is described in Table I. The short window spans AD-1 to AD+1, and the long window spans AD-20 to AD+1. The long window is necessary, as there is some leakage of news before an announcement. Panel C of Table I shows that the target excess returns average a highly significant 17.94% over the short window and 23.79% over the long window, and that the acquisition premium averages 31.84%. The acquirer excess returns average a significant -3.00% and an insignificant -0.39% over the short and the long windows, and the combined excess returns average an insignificant 0.39% and a significant 3.39%.

Consistent with the theoretical model by Shleifer and Vishny (2003) and the empirical evidence by Loughran and Vijh (1997), we also find that acquirer stocks earn significantly negative post-acquisition long-term excess returns. On average, the three-year buy-and-hold returns are significantly lower than those earned by the size, industry, and book-to-market matching firms. Equal-weighted and value-weighted portfolios of acquirer stocks also earn negative alphas in the Fama-French three-factor and four-factor regressions.¹⁰

C. Estimating Market Value and Illiquidity Discount of CEO Holdings

We measure the incentive effects of stock and option holdings by the ex ante illiquidity discount for target CEOs and the market value for acquirer CEOs, both calculated on AD-21. These incentive effects are empirically estimated as follows.

First, we infer the contractual details of target and acquirer CEOs' stock and option holdings from the ExecuComp database. This is necessary for calculating the market value and the illiquidity discount. Unfortunately, ExecuComp does not directly provide these details. We therefore adopt and extend the procedure of Hall and Knox (2002) to infer these details. This procedure is described in Appendix A.

Second, we use the Cai and Vijh (2005) model to estimate the without-acquisition executive value of stock and option holdings as the amount of outside wealth that gives the target CEO the same expected utility as the holdings in the absence of an acquisition. This model allows the CEO to optimally invest his outside wealth in the market portfolio and the risk-free asset as suggested by the portfolio theory, and it provides several improvements over the one state-variable models that only allow the CEO to invest his outside wealth in the

¹⁰ Detailed results are available from the authors upon request.

risk-free asset. In addition, the Cai and Vijh model excludes short-selling of the market portfolio or the risk-free asset (i.e., borrowing), which is permitted by some other models but may not be typical of CEO portfolios. Appendix B summarizes the model and the estimation details.

Third, we calculate the with-acquisition unrestricted value of the target CEO's stock and option holdings. As we explain before, as an outside investor after acquisition the former target CEO can sell his stock and hedge his options. Hence, the with-acquisition unrestricted value of stock equals the market value. However, hedging options can be costly, so his valuation of options is lower than their market value. We estimate the hedging costs using the Leland (1985) model assuming monthly rebalancing and a round-trip transaction cost of 4% for stock. The with-acquisition unrestricted value of options is then calculated as the higher of the following two values: (1) The risk-neutral market value net of hedging cost; and (2) the executive value assuming no hedging but full vesting of options and selling of stock. For 81% of options the former value exceeds the latter value, and for 19% the converse is true.

Fourth, we calculate the illiquidity discount of the target CEO's stock and option holdings as the difference between the with-acquisition unrestricted value and the without-acquisition executive value of holdings. Clearly, this incentive effect should be measured in dollar terms.

Fifth, we calculate the market value of stock and option holdings for the acquirer CEO. The final question is whether this incentive effect should be measured in dollar terms or in percent terms (i.e., as a proportion of acquirer firm value). Following Baker and Hall (2004), if the acquirer firm's gain from an acquisition is proportional to the firm size, then the CEO's incentive should be measured in dollar terms. However, if the acquirer firm's gain is a fixed dollar amount regardless of firm size, then the incentive should be measured in percent terms. The reality is expected to lie somewhere between these two extreme cases, so this becomes an empirical matter. We test our hypotheses with both specifications and find that the dollar value better captures the incentive effects in our sample. If our story is correct, then, based on the empirical results with the sample of acquisitions during 1993 to 2001, the dollar holdings of acquirer CEOs may be the better specification of their incentive effects. This may be because there is a large range in the target and acquirer firm values, and because the acquirer size is highly correlated with the target size (correlation between log firm values equals 0.54). We therefore report the results in the main text with the dollar specification. We verify that our results are reasonably robust to the percent specification, although the statistical significance of the key variables in some regressions is lowered.

Panel A of Table II shows that target CEOs hold substantial amounts of stock and options, with a median illiquidity discount of \$5.97 million. Options and contractually unrestricted stock are the two main sources of the illiquidity discount. Between the two types of options, the unvested options have a lower market value but a higher illiquidity discount than the vested options, since the restrictions on unvested options are more severe. Panel A further shows that acquirer CEOs hold substantial amounts of stock and options, with a median

market value of \$65.07 million. Similar to the illiquidity discount for target CEOs, the market value of acquirer CEO holdings is also mainly made up of options and contractually unrestricted stock. Vested and unvested options have similar weights in this case.

Both the illiquidity discounts of target CEO holdings and the market value of acquirer CEO holdings have substantial cross-sectional variation. Both are also highly skewed. Therefore, in all subsequent regression analyses, we log-transform the illiquidity discount and the market value.¹¹

D. Are the Market Value and Illiquidity Discount of Holdings Proxies for CEO Overconfidence?

CEOs may hold their stock and options, especially those with soft restrictions, for reasons other than liquidity restrictions. Malmendier and Tate (2005a,b) argue that overconfident CEOs do not exercise their in-the-money vested options. They also show that overconfident CEOs are more likely to make acquisitions. To make sure that the illiquidity discount and market value of holdings are not proxies for overconfidence, we follow Malmendier and Tate (2005a,b) and Hall and Liebman (1998) to construct the “long-holder” indicator of overconfidence for the target and acquirer CEOs in our sample (described further in Table II). Panel B of Table II shows that the correlation between the overconfidence indicator and the target CEO illiquidity discount equals 0.029 and the correlation between the overconfidence indicator and the market value of acquirer CEO holdings equals -0.050 , both statistically insignificant. We therefore conclude that neither the illiquidity discount nor the market value of holdings is a proxy for CEO overconfidence, or vice versa.

We do find evidence consistent with the CEO overconfidence story in our sample. First, we find that overconfident CEOs are more acquisitive. Panel B of Table II shows that there are 62 overconfident acquirer CEOs and only 13 overconfident target CEOs in our sample of 250 acquisitions. The difference is significant at the 1% level. Second, the acquirer CEOs are significantly more likely to be overconfident than the CEOs of their industry, size, and book-to-market matching firms, while the target CEOs are significantly less likely to be overconfident than their matching firm CEOs. Below, we show that the evidence in support of the CEO overconfidence story continues to hold when we analyze multivariate models of acquisitiveness and targetiveness with the expanded sample of all firms. However, following the model and empirical tests of Malmendier and Tate (2005b), there is no clear prediction of CEO

¹¹ A log specification can also be derived within the Baker and Hall (2004) framework. On page 772, they assume that the CEO's cost of effort has the following functional form: $C(a_{it}) = a_{it}^2/2$, where a_{it} is the effort of the CEO of firm i in period t . Suppose we instead choose the functional form $C(a_{it}) = \exp(a_{it})$. With this alternative functional form, it can be shown that the acquirer CEO's incentive effects should be measured by the log dollar holding if acquisitions change the acquirer firm value by a constant percent amount regardless of firm value, and by the log percent holding if acquisitions change the acquirer firm value by a constant dollar amount regardless of firm value.

Table II

Stock and Option Holdings of Target and Acquirer CEOs

The sample of 250 acquisitions announced and completed during 1993 to 2001 is described in Section II. In Panel A, the market value, unrestricted value, and illiquidity discount of stock and option holdings are computed on AD-21. The with-acquisition unrestricted value of stock holdings equals their market value. The with-acquisition unrestricted value of option holdings equals the higher of the following two values: (1) The risk-neutral market value net of hedging cost; and (2) the executive value assuming no hedging but full vesting of options and selling of stock. The hedging cost in the former case is estimated using the Leland (1985) model assuming monthly rebalancing and a round-trip transaction cost of 4% for stock. The illiquidity discount equals the difference between the with-acquisition unrestricted value and the without-acquisition executive value of holdings, all based on the stock price as of AD-21. The executive value of stock or option holdings equals the amount of outside wealth that gives the CEO the same expected utility as the holdings. The classification of holdings with hard and soft restrictions is described in Section I, and the calculation of executive value is described in Section II and Appendix B. In Panel B, for each target and acquirer firm, we choose a matching firm from the CRSP and ExecuComp databases as follows. We first identify the subset of nonsample firms with the same two-digit SIC code as the sample firm, and with the market value between 70% and 130% of the sample firm market value. Within this subset we choose the matching firm with the closest book-to-market value to the sample firm. If this procedure does not give a matching firm, then we match only by the industry code and the closest market value. The combined procedure gives a matching firm for 245 target and 242 acquiring firms. The overconfidence dummy is defined to be similar to the Malmendier and Tate (2005b) longholder measure. A CEO is overconfident if, following the Hall and Liebman (1998) option classification procedure, he owns options at the beginning of the last year of their life that are at least 40% in the money. The p -value of difference between frequencies of overconfident CEOs is calculated using a chi-square test.

Panel A: Market Value and Illiquidity Discount of Stock and Option Holdings for Target and Acquirer CEOs									
Variables		Contractually Unrestricted Stock	Restricted Stock ^a	Unvested Options	Vested Options	All Holdings			
						With Hard Restrictions	With Soft Restrictions	All Restrictions	
Target CEO Holdings in \$million, $N = 250$									
Unrestricted value	Mean	33.77	1.02	7.48	11.34	34.31	19.30	53.61	
	Median	4.85	0.00	1.85	2.63	6.87	2.20	16.67	
Illiquidity discount	Mean	18.87	0.20	4.11	1.73	17.51	7.40	24.91	
	Median	1.75	0.00	0.89	0.69	2.90	0.39	5.97	
Acquirer CEO Holdings in \$million, $N = 250$									
Market value	Mean	713.46	7.20	56.56	70.31			847.53	
	Median	18.18	0.00	9.82	10.71			65.07	

(continued)

Table II—Continued

Panel B: CEO Overconfidence and Its Correlation with Illiquidity Discount and Market Value of Holdings			
Number of Overconfident CEOs		Sample Firm CEOs	Matching Firm CEOs
Target CEOs		13	34
Acquirer CEOs		62	44
p-value of difference		0.000	0.195
Correlation between overconfidence dummy and illiquidity discount for target CEOs and market value of holdings for acquirer CEOs		Target CEOs	Acquirer CEOs
p-value of correlation		0.029	–0.050
		0.756	0.431

^aIt may appear at first glance that restricted stock has a smaller percent illiquidity discount than contractually unrestricted stock. This occurs because, following Ofek and Yermack (2000), we assume that CEOs maintain a stable level of stock holding over the years. Thus, restricted stock is assumed to be sold upon vesting. Notice that, upon vesting, formerly restricted stock is no different from contractually unrestricted stock, and in this sense one may think of the illiquidity discount on restricted stock as being in addition to the illiquidity discount on contractually unrestricted stock.

overconfidence for many tests in our paper that are specifically designed to study the incentive effects of illiquid stock and option holdings. Therefore, we do not include the overconfidence indicator as an independent variable in these tests, even though our results are robust to its inclusion.

*E. The Wealth Effects of Target CEO Leaving before
Versus after the Acquisition*

An acquisition enables the target CEO to potentially remove the entire illiquidity discount. One may argue that the CEO can also remove part of the illiquidity discount by simply leaving his job without an acquisition. We therefore examine the wealth effects of pursuing this quitting alternative on AD-21. When a CEO leaves without an acquisition, all his restricted stock and unvested options are forfeited, and his valuation of these holdings decreases from the executive value to zero. Table III shows that the median forfeiture amount equals $-\$1.075$ million for restricted stock, and $-\$0.748$ million for unvested options. With an acquisition, the target CEO can claim a change in control, and all restrictions on restricted stock and unvested options are removed (as argued in Section I.C). If he leaves after the acquisition, he can further sell the previously restricted stock and exercise or hedge the previously unvested options. Therefore, the value of the restricted stock and unvested options reverts to their unrestricted value, which results in a median gain of $\$0.257$ million for the restricted stock and $\$1.290$ million for the unvested options.

In addition, without an acquisition, all vested options that are in the money are forced to be exercised immediately when the CEO leaves the firm, and his valuation of these options decreases from the executive value to the immediate exercise value. (The vested options that are out of the money are forfeited.) Note that the executive value of vested options is always greater than the exercise value since otherwise he would have already exercised the options. Table III shows that the median loss on account of immediate exercise of vested options equals $\$16,000$. However, following the evidence on post-acquisition treatment discussed in Section I.C., if the target CEO leaves as a result of the acquisition, he can usually hold on to his vested options, and he values the options at the unrestricted value since he is no longer an executive of the company. This represents a median gain of $\$0.759$ million. Finally, the contractually unrestricted stock is the only part of holdings that gains in valuation when a CEO leaves his job without an acquisition. Its valuation increases from the executive value to the market value, by a median of $\$1.749$ million. Leaving after an acquisition results in the same wealth change in this case.

Combining all four parts of holdings, we estimate that the personal valuation of the aggregate holdings of target CEOs increases by a median of $\$158,000$ if he leaves his job without an acquisition. Since quitting may lead to an additional negative price impact and the loss of reputation in the managerial job market, leaving without an acquisition does not seem to be an attractive alternative available to target CEOs to remove their liquidity restrictions. In contrast, the value of his stock and option holdings increases by $\$5.967$ million if he leaves

Table III
Changes in Stock and Option Values to Target CEOs as a Result of Leaving Before or After the Acquisition

The sample of 250 acquisitions announced and completed during 1993 to 2001 is described in Section II. Following typical contract terms, the CEO forfeits his restricted stock and unvested options if he leaves his job before acquisition (i.e., without a change in control). The change in value of these holdings thus equals zero minus the executive value that is based on continued employment. Vested options, without a change in control, are forced to be exercised immediately if in-the-money, and forfeited if out-of-the-money. The change in value of these holdings is also bounded from above by zero, since the exercise value is a natural lower bound on the executive value of vested options. Finally, the change in value of contractually unrestricted stock is calculated as the difference between the market value and the executive value of the stock, and it is zero or positive in all cases. After an acquisition, the CEO can claim a change in control, and all vesting restrictions on stock and options are removed. If he leaves after the acquisition, he can sell his stock and he can exercise, hedge (for a cost), or simply hold his options. Therefore, the value of his stock and option holdings reverts to the with-acquisition unrestricted value. The change in value in this case is calculated as the difference between the with-acquisition unrestricted value and the without-acquisition executive value. The calculation of these values is described in Section II. The price impact of leaving without an acquisition and the possible loss of reputation in the managerial labor market are ignored.

Type of Holdings	<i>N</i>	Leave before Acquisition		Leave after Acquisition	
		Description	Median (\$million)	Description	Median (\$million)
Restricted stock	77	Forfeited	-1.075	Restrictions removed	0.257
Unvested options	214	Forfeited	-0.748	Restrictions removed	1.290
Vested options	233	Immediately exercised	-0.016	Restrictions removed	0.759
Contractually unrestricted stock	250	Restrictions removed	1.749	Restrictions removed	1.749
Total change in value	250		0.158		5.967

after an acquisition. There is no likely negative impact on the stock price or the CEO reputation. Therefore, the acquisition alternative is far more attractive than the quitting alternative.

Finally, we account for the difference between these two alternatives by separating holdings into parts subject to hard versus soft liquidity restrictions. The holdings with hard restrictions usually can only be cashed out with a change-in-control event, such as an acquisition, while the holdings with soft restrictions can often be cashed out even if the CEO leaves without an acquisition. Our results show that the holdings with hard restrictions provide stronger incentive to the target CEO to get acquired.

III. Main Results

We report two sets of tests. First, using the expanded sample of all 8,822 firm-years of data during 1993 to 2001, we investigate the effect of stock and option holdings of CEOs on their acquisition decisions. Second, using the primary

sample of 250 completed acquisitions during the same period, we investigate the effect of CEO holdings on the terms and characteristics of acquisitions.

A. Are CEOs with Higher Stock and Option Holdings More Likely to Make Acquisitions?

If a CEO believes that an acquisition improves the long-term value of his company, then a greater personal incentive in the form of a higher market value of his stock and option holdings should motivate him to make the acquisition. Regressions (1) to (6) in Table IV test this prediction with three different measures: the acquisition ratio, the acquisition count, and the acquisition dummy. The independent variables include the market value of CEO holdings, the CEO overconfidence indicator, the governance index, total assets, the Tobin's q ratio, and cash flow divided by assets. All dependent and independent variables are defined in the table legend.

For each dependent variable, we report a pooled regression with calendar-year dummies and average coefficients from yearly regressions (following the methodology used by Gompers, Ishii, and Metrick (2003)). We use the Tobit model when the dependent variable is the acquisition ratio (continuous but censored at zero), the Poisson model when the dependent variable is the acquisition count (multiple discrete values), and the Logit model when the dependent variable is the acquisition dummy (binary discrete values). In all six regressions the market value of CEO holdings is positively related to the probability of making an acquisition. The associated coefficients are statistically significant at the 1% or 5% level. This evidence supports our main hypothesis. In addition, consistent with Malmendier and Tate (2005b), we find that overconfident CEOs are more acquisitive, and consistent with Gompers, Ishii, and Metrick we find that firms with a weaker governance structure are more acquisitive. As expected, larger firms are also more acquisitive. Interestingly, the q ratio has a significantly positive coefficient and cash flow has an insignificant coefficient. This is consistent with the conjecture that acquirer firms during our study period of 1993 to 2001 were likely to be growth firms with average cash flow. This is unlike the evidence during 1980 to 1994, when acquirer firms were likely to be value firms with higher than average cash flow as documented by Malmendier and Tate (2005a,b).

B. Are Firms with a Higher CEO Illiquidity Discount More Likely to Be Acquisition Targets?

CEOs with a greater cash-out incentive in the form of a higher illiquidity discount are likely to be more receptive to acquisition bids initiated by others. They may also initiate such bids themselves. In either case, the net effect would be lower resistance and a higher probability of getting acquired, which we refer to as targetiveness.

Regressions (7) and (8) in Table V test this prediction. The dependent variable is the target dummy, which equals one if a firm is acquired during a given year,

Table IV
Are CEOs with Higher Stock and Option Holdings
More Likely to Make Acquisitions?

The sample includes all firm-year observations with data available from the ExecuComp, Compustat, and IRRC databases as described in Section II. Three different specifications of acquisitiveness are used as follows: the acquisition ratio, the acquisition count, and the acquisition dummy. The acquisition ratio equals the total target firm equity value of all acquisitions a firm completes in a fiscal year divided by the firm's own equity value averaged over the beginning and the end of the year. This is a continuous variable censored at zero, so we estimate the regressions using the Tobit model. The acquisition count equals the total number of acquisitions a firm completes in a fiscal year. This is a discrete variable censored at zero, so we estimate the regressions using the Poisson model. The acquisition dummy equals one if a firm completes an acquisition during a fiscal year, and zero otherwise. This is a binary variable, and we estimate the regressions using the Logit model. For each dependent variable, we estimate two models. First, we estimate a pooled regression with calendar year dummies. Second, we estimate yearly regressions and calculate the average coefficients and the *t*-statistics across years. The significance levels of these *t*-statistics are calculated using eight degrees of freedom. All independent variables are calculated at the end of the last fiscal year. The market value of CEO holdings equals the market value of all his stock and option holdings. This variable and the total assets are highly skewed, and therefore are log transformed. Following Malmendier and Tate (2005b), the overconfidence indicator equals one if at any time during our sample period a CEO holds a series of options until the last year before expiration, provided that the options are at least 40% in the money entering into the last year. The governance index is constructed following Gompers, Ishii, and Metrick (2003) using the IRRC data. The Tobin's *q* ratio is calculated by dividing the market value of common stock plus the book value of total assets minus the book value of common stock by the book value of total assets. Cash flow equals earnings before extraordinary items plus depreciation. The *t*-statistics are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Independent Variables and Statistics	Dependent Variable					
	Acquisition Ratio		Acquisition Count		Acquisition Dummy	
	Pooled Tobit (1)	Avg. Coeff. from Yearly Tobit (2)	Poisson Pooled (3)	Avg. Coeff. from Yearly Poisson (4)	Pooled Logit (5)	Avg. coeff. from Yearly Logit (6)
Intercept	-2.19 (-17.74)***	-1.90 (-7.97)***	-6.99 (-24.16)***	-6.30 (-16.76)***	-7.25 (-22.24)***	-6.64 (-11.95)***
Market value of CEO holdings	0.031 (3.86)***	0.025 (3.22)**	0.104 (4.84)***	0.071 (2.51)**	0.102 (3.94)***	0.074 (2.42)**
Overconfidence indicator	0.06 (2.15)**	0.06 (3.17)**	0.23 (2.92)***	0.21 (3.31)**	0.29 (3.02)***	0.28 (4.83)***
Governance index	0.01 (2.69)***	0.01 (2.11)*	0.04 (2.89)***	0.02 (1.45)	0.05 (3.29)***	0.03 (1.39)
Total Assets	0.10 (11.43)***	0.08 (6.58)***	0.35 (16.31)***	0.33 (12.29)***	0.36 (13.85)***	0.34 (10.98)***
Tobin's <i>q</i> ratio	0.02 (2.91)***	0.03 (2.48)**	0.09 (5.54)***	0.18 (3.24)**	0.11 (4.46)***	0.19 (3.10)**
Cash flow/Assets	0.23 (1.33)	0.03 (0.16)	0.09 (0.20)	-1.17 (-1.51)	0.76 (1.30)	-0.46 (-0.53)
Calendar year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of acquirer firm-years	731	731	731	731	731	731
<i>N</i>	8,882	8,882	8,882	8,882	8,882	8,882

Table V
Are Firms with a Higher CEO Illiquidity Discount
More Likely to Be Acquisition Targets?

The sample includes all firm-year observations with data available from the ExecuComp, Compustat, and IRRCD databases as described in Section II. The dependent variable is the target dummy, which equals one if a firm is acquired during a fiscal year and zero otherwise. This is a binary variable, and we estimate the regressions using the Logit model. We estimate two regressions. First, we estimate a pooled regression with calendar year dummies. Second, we estimate yearly regressions and calculate the average coefficients and the *t*-statistics across years. The significance levels of these *t*-statistics are calculated using seven degrees of freedom. All independent variables are calculated at the end of the last fiscal year. The illiquidity discount of CEO holdings equals the difference between the with-acquisition unrestricted value and the without-acquisition executive value of his stock and option holdings. The calculation of these values is described in Section II. The illiquidity discount and the market value of equity are highly skewed, so they are log transformed. Following Malmendier and Tate (2005b), the overconfidence indicator equals one if at any time during our sample period a CEO holds a series of options until the last year before expiration, provided that the options are at least 40% in the money entering into the last year. The governance index is constructed following Gompers, Ishii, and Metrick (2003) using the IRRCD data. The Tobin's *q* ratio is calculated by dividing the market value of common stock plus the book value of total assets minus the book value of common stock by the book value of total assets. Cash flow equals earnings before extraordinary items plus depreciation. Leverage equals the book value of debt divided by the sum of book value of debt and market value of equity. Return on assets equals the operating income before depreciation divided by total assets. The industry acquisition activity equals the number of firms with the same two-digit SIC code as the target firm that are acquired during the previous fiscal year. The *t*-statistics are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Independent Variables and Statistics	Dependent Variable = Target Dummy	
	Pooled Logit (7)	Avg. Coeff. from Yearly Logit (8)
Intercept	-5.01 (-0.20)	-3.60 (-5.97)***
Illiquidity discount of CEO holdings	0.061 (1.63) ^a	0.086 (1.96)*
Overconfidence indicator	-0.80 (-3.36)***	-6.25 (-2.85)***
Governance index	0.04 (1.73)*	0.04 (2.17)*
Market value of equity	-0.06 (-1.32)	-0.11 (-1.81)
Tobin's <i>q</i> ratio	-0.17 (-2.28)**	-0.14 (-1.57)
Cash flow/Assets	1.12 (0.85)	-0.42 (-0.26)
Leverage	-0.25 (-0.61)	-0.10 (-0.24)
Return on assets	-1.85 (-1.42)	-1.10 (-0.88)
Industry acquisition activity	0.08 (2.80)***	0.04 (0.50)
Calendar year dummy	Yes	N/A
Number of target firm-years	257	257
<i>N</i>	8,704	8,704

^a*p*-value 0.104.

and zero otherwise. We report a pooled Logit regression with calendar-year dummies and average coefficients from yearly regressions. The independent variables include the illiquidity discount of CEO stock and option holdings, the CEO overconfidence indicator, the governance index, the firm's market value of equity, the Tobin's q ratio, cash flow divided by assets, leverage, ROA, and industry acquisition activity. Unlike in all subsequent tests that focus on the sample of 250 completed acquisitions, it is computationally infeasible with the expanded sample of this table to further divide the CEO holdings into parts subject to hard versus soft restrictions (a task that requires reading proxy statements).

We find that the CEO illiquidity discount has a positive coefficient in both regressions, significant at the 10% level in regression (8). This supports our main hypothesis that the illiquidity discount associated with CEO holdings plays an important role in determining a firm's likelihood of getting acquired. The overconfidence indicator has significantly negative coefficients, suggesting that overconfident CEOs are less likely to get acquired. This is consistent with the Malmendier and Tate (2005b) story, but is not empirically tested in their paper. The governance index has significantly positive coefficients, suggesting that firms with weaker governance are also more likely to be acquisition targets.

C. Do Target CEOs with a Higher Illiquidity Discount Accept a Lower Acquisition Premium? Do Acquirer CEOs with Higher Stock and Option Holdings Pay a Higher Acquisition Premium?

The ex ante illiquidity discount of the target CEO proxies for his incentive in getting acquired. A target CEO facing a large illiquidity discount may not bargain hard for a higher acquisition premium as it may decrease his chances of making a deal. The market value of an acquirer CEO's stock and option holdings is a measure of his long-term interest in his firm. If the acquirer CEO believes that the acquisition will improve his long-term stock value, a large holding may motivate him to offer a higher premium as it increases his chances of making a deal. To some extent both CEOs may understand their own as well as each other's situation. Under such circumstances the acquisition premium should decrease with the target CEO's illiquidity discount and increase with the acquirer CEO's market value of holdings.

Regressions (9)–(14) in Table VI test these predictions. The dependent variable is either the target announcement excess return over a long window (AD-20 to AD+1) or a short window (AD-1 to AD+1), or the acquisition premium. The key independent variable for acquirer CEOs is the market value of stock and option holdings in all six regressions. The key independent variables for target CEOs are either the total illiquidity discount or the illiquidity discounts with hard and soft restrictions. In addition, we include the target CEO's side payment variable and other control variables known to affect the acquisition

Table VI
Do Target CEOs with a Higher Illiquidity Discount Accept a Lower Acquisition Premium? Do Acquirer CEOs with Higher Stock and Option Holdings Pay a Higher Acquisition Premium?

The sample of 250 acquisitions announced and completed during 1993 to 2001 is described in Section II. The acquisition announcement date (AD) is the last trading day before the first *Wall Street Journal* publication date. The dependent variables in (9) to (12) are the market-adjusted excess returns for the target stocks, which are calculated by subtracting the cumulative market returns from the cumulative stock returns over the relevant window. The dependent variable in (13) to (14) is the acquisition premium, which is calculated as the acquisition price divided by the target stock price on AD-21 minus one. The acquisition price is the acquirer stock price on AD+1 multiplied by the exchange ratio in case of stock payment, and the cash amount in case of cash payment. The illiquidity discounts for the target CEOs are calculated as the difference between the with-acquisition unrestricted value and the without-acquisition executive value of their stock and option holdings on AD-21. The calculation of these values is described in Section II. The illiquidity discount is further divided into the illiquidity discount with hard restrictions or soft restrictions as described in Section I. The market value of acquirer CEO holdings is calculated on AD-21. Both market value and illiquidity discount are highly skewed, so they are log transformed. The relative size is calculated as the ratio of target to acquirer market value on AD-21. The target and acquirer book-to-market ratios equal the book value of equity at the last fiscal year-end divided by the market value on AD-21. The cash payment dummy equals one if there is some cash payment, and zero otherwise. The relatedness dummy equals one if the target and acquirer have the same two-digit SIC code, and zero otherwise. Target CEO's side payment equals the sum of five dummy variables that indicate whether the target CEO receives a golden parachute payment, consulting agreement payment, new equity grants, special merger bonus, or an executive position in the combined firm. The *t*-statistics are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Independent Variables and Statistics	Dependent Variables					
	Market-Adjusted Excess Return for the Target Stocks (%)			Acquisition Premium (%)		
	AD-20 to AD+1	(10)	(11)	AD-1 to AD+1	AD-20 to Acquisition Price	(14)
Intercept	29.60 (2.36)**	24.10 (1.99)**	23.80 (2.32)**	19.26 (1.94)*	49.36 (3.42)***	43.77 (3.14)***
Illiquidity discount for target CEO	-2.27 (-2.43)**		-1.81 (-2.36)**		-2.24 (-2.08)**	
Illiquidity discount with hard restrictions for target CEO	-1.91 (-2.46)**			-1.33 (-2.08)**		-1.71 (-1.90)*

(continued)

Table VI—Continued

	Dependent Variables					
	Market-Adjusted Excess Return for the Target Stocks (%)			Acquisition Premium (%)		
	AD-20 to AD+1		AD-1 to AD+1	AD-20 to Acquisition Price		
	(9)	(10)	(11)	(12)	(13)	(14)
Independent Variables and Statistics						
Illiquidity discount with soft restrictions for target CEO		−0.00 (−0.01)		−0.12 (−0.45)		−0.10 (−0.25)
Market value of acquirer CEO holdings	2.25 (2.32)**	2.26 (2.30)**	1.77 (2.23)**	1.70 (2.11)**	1.47 (1.32)	1.40 (1.24)
Relative size	−20.33 (−4.34)***	−20.86 (−4.43)***	−19.90 (−5.19)***	−20.20 (−5.22)***	−22.80 (−4.23)***	−23.25 (−4.28)***
Cash payment dummy	7.72 (1.82)*	7.79 (1.83)*	6.51 (1.87)*	6.61 (1.89)*	10.62 (2.17)**	10.72 (2.19)**
Target book-to-market ratio	12.48 (2.17)**	13.48 (2.36)**	−1.90 (−0.40)	−1.03 (−0.23)	11.82 (1.79)*	12.90 (1.96)**
Acquirer book-to-market ratio	−0.92 (−0.14)	0.09 (0.01)	5.83 (1.05)	6.16 (1.10)	−3.71 (−0.48)	−3.12 (−0.40)
Relatedness dummy	−9.79 (−2.97)***	−9.10 (−2.77)***	−5.07 (−1.88)*	−4.51 (−1.67)*	−12.01 (−3.17)***	−11.32 (−2.99)***
Target CEO's side payment	−2.81 (−1.69)*	−2.98 (−1.78)*	−1.29 (−0.95)	−1.35 (−0.98)	−2.78 (−1.45)	−2.88 (−1.49)
<i>N</i>	250	250	250	250	250	250
Adjusted- <i>R</i> ²	0.215	0.213	0.178	0.171	0.196	0.190

premium.¹² Regressions (9), (11), and (13) use the total illiquidity discount as the measure of the target CEO's incentive. This measure has a negative coefficient in all three regressions, significant at the 5% level. Since the target CEO's illiquidity discount (log transformed) has first and third quartile values of 7.63 and 9.68, an interquartile increase makes them accept a $2.11 \times (9.68 - 7.63) = 4.33\%$ lower return (where 2.11 is the average regression coefficient). While these actions are motivated by the CEO's own interest, it does not follow that they are against the interest of their shareholders, who can all benefit from the increased likelihood of making a deal. On the other hand, the market value of stock and option holdings for the acquirer CEO has a positive coefficient in all three regressions and is significant at the 5% level in two cases. Since the market value of holdings (log transformed) for acquirer CEOs has first and third quartile values of 10.02 and 12.26, an interquartile increase makes them pay a $1.83 \times (12.26 - 10.02) = 4.10\%$ higher return (where 1.83 is the average regression coefficient). This evidence on higher payment by acquirer CEOs with higher stock and options holdings ties in with the evidence on higher acquisitiveness on their part. Their stronger personal incentives motivate them to be more aggressive in making acquisitions, and paying a higher premium increases the probability of making the deals.

Next, to allow for different severity of liquidity restrictions on different types of holdings, we break up the target CEO's illiquidity discount into hard and soft components in regressions (10), (12), and (14). As expected, the illiquidity discount with hard restrictions has more significant coefficients. It therefore provides stronger incentives to target CEOs.

The combined evidence in Table VI supports our main story related to the incentive effects of (illiquid) stock and option holdings of target and acquirer CEOs. The evidence on target CEO incentives is consistent with Hartzell, Ofek, and Yermack (2004), who document a similar relation between the acquisition premium and the target CEO's personal benefits in the form of side payments. Notice that the target CEO's side payment variable is also negative and marginally significant in our sample. Finally, at first glance, our evidence on acquirer CEO incentives seems to contradict the result of Datta, Iskandar-Datta, and Raman (2001), who find a negative relation between equity-based compensation (EBC) to the top five executives of the acquirer firm and the acquisition premium. However, unlike our measure, which captures the incentive

¹² In addition to the removal of liquidity restrictions, target CEOs may benefit in two additional ways. First, a target CEO may receive other side payments as part of the merger agreement, such as a golden parachute, consulting bonus, equity grant, merger bonus, and an executive position in the combined firm. We control for these additional incentive effects by including the variable target CEO's side payments in all relevant regressions. Second, the acquisition premium increases the market value of stock and option holdings. This incentive effect is traditionally measured by using either the market value of holdings or the market value of holdings times the premium as an independent variable. The former is correlated with the illiquidity discount, which introduces multicollinearity, and the latter is additionally correlated with the premium that is the dependent variable.

effects of acquirer CEO's aggregate stock and option holdings, their EBC measure is defined as the Black–Scholes value of new options granted to the executives during the last year divided by their total compensation. This ignores the incentive effects of any options granted more than 1 year before the acquisition and *all* stock received at any time as part of compensation or otherwise owned or inherited by the executives. Thus, the economic meaning of the two measures is quite different, and the correlation between them is quite low.

D. Are Target CEOs with a Higher Illiquidity Discount More Likely to Relinquish Control after an Acquisition?

If the target CEO remains a top executive of the combined firm after the acquisition is completed, he may not be able to sell all of his stock holdings, and he may not be able to hedge his option holdings. To capture more of the illiquidity discount, the target CEO has to step down from being a top executive. We examine whether in the cross-section target CEOs with a higher illiquidity discount are more likely to relinquish control after the acquisition is completed. For this purpose, we construct the relinquish dummy that equals one if the target CEO is not among the top executives listed in ExecuComp at the first fiscal year-end after the acquisition is completed, and zero otherwise. We find that 195 of the 250 target CEOs relinquish control after acquisition.¹³

Table VII shows the results of Logit regressions in which the dependent variable is the relinquish dummy. The key independent variables are either the total illiquidity discount or the illiquidity discounts with hard and soft restrictions for target CEOs. We also include relative size and relatedness dummy as control variables, since target CEOs from relatively large firms and similar industry backgrounds may be more likely to remain as top executives of the combined firm. We include age as a control variable since older CEOs may be more willing to retire. Target CEO's side payment is included since some of the payments may be related to his retirement. Regressions (15) and (16) include all 250 acquisitions and show that the total illiquidity discount for target CEO is significant at the 5% level and the illiquidity discount with hard restrictions is significant at the 10% level. This suggests that target CEOs with a higher illiquidity discount are more likely to relinquish control. However, the added significance of relative size suggests that the CEOs of small target firms are less likely to remain as top executives of the combined firm. To ensure that our results are not driven by acquisitions with large size disparity, we exclude cases in which relative size is less than 0.10 in regressions (17) and (18). Despite the smaller sample, we find that the total illiquidity discount and the illiquidity discount with hard restrictions have positive coefficients of similar magnitude.

¹³ Martin and McConnell (1991), Agrawal and Walkling (1994), and Hartzell, Ofek, and Yermack (2004) also find that there is a large turnover of target CEOs after acquisitions.

Table VII
Are Target CEOs with a Higher Illiquidity Discount
More Likely to Relinquish Control after an Acquisition?

The sample of 250 acquisitions announced and completed during 1993 to 2001 is described in Section II. The dependent variable is the relinquish dummy in all regressions of this table. The relinquish dummy equals one if the target CEO is not listed among the top executives of the combined firm at the first fiscal year-end after the acquisition is completed, and zero otherwise. Given the binary nature of the dependent variable, this table shows the results of Logit regressions. The independent variables include the illiquidity discount for the target CEO, the relative size, the relatedness dummy, the target CEO age, and the target CEO's side payment. The illiquidity discount is calculated as the difference between the with-acquisition unrestricted value and the without-acquisition executive value of a CEO's stock and option holdings on AD-21. The calculation of these values is described in Section II. The illiquidity discount is further divided into the illiquidity discount with hard restrictions or soft restrictions as described in Section I. These variables are highly skewed, so they are log transformed. The relative size is calculated as the ratio of target to acquirer market value on AD-21. The relatedness dummy equals one if the target and acquirer have the same two-digit SIC code, and zero otherwise. We obtain the target CEO age from the ExecuComp and proxy statements. Target CEO's side payment equals the sum of four dummy variables that indicate whether the target CEO receives golden parachute payment, consulting agreement payment, new equity grants, or special merger bonus from combined firm. The *t*-statistics are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Independent Variables and Statistics	Dependent Variable = Relinquish Dummy			
	All Acquisitions		Acquisitions with Relative Size >0.10 ^a	
	(15)	(16)	(17)	(18)
Intercept	-0.31 (-0.16)	0.27 (0.15)	-1.55 (-0.78)	-1.05 (-0.54)
Illiquidity discount for target CEO	0.18 (1.98)**		0.15 (1.62)	
Illiquidity discount with hard restrictions for target CEO		0.14 (1.70)*		0.11 (1.37)
Illiquidity discount with soft restrictions for target CEO		-0.05 (-1.15)		-0.04 (-1.03)
Relative size	-2.35 (-4.92)***	-2.30 (-4.80)***	-1.43 (-2.75)***	-1.38 (-2.66)***
Relatedness dummy	-0.68 (-1.43)	-0.80 (-1.67)*	-0.41 (-0.83)	-0.52 (-1.06)
Target CEO age	0.03 (0.94)	0.03 (1.05)	0.04 (1.22)	0.04 (1.31)
Target CEO's side payment	0.01 (0.04)	0.03 (0.15)	0.08 (0.35)	0.12 (0.51)
<i>N</i>	250	250	179	179

^aAll target CEOs of firms with relative size lower than 0.10 relinquish control. This may be because they actually leave, but possibly also because they stay and are not significant enough to be included in the top executives of the combined firm as reported in the proxy statements and ExecuComp. However, we do find that two target CEOs with relative size of 0.12 (and several with relative size greater than 0.12) stay and are included in the top five executives of the combined firm. This motivates the cutoff value of 0.10 for the relative size measure in (17) and (18). In addition, we include the relative size as a control variable in all multivariate regressions.

E. Do Target CEOs with a Higher Illiquidity Discount and Acquirer CEOs with Higher Stock and Option Holdings Speed Up the Acquisition Completion?

The liquidity constraints on the stock and option holdings of the target CEO are not removed until the acquisition is completed. If removing constraints is an important motivation for a target CEO, he may want to complete the acquisition as soon as possible. Similarly, until the target firm becomes a part of the acquirer firm, the long-term value of the acquirer firm remains unchanged. The acquirer firm may even have to pay out more stock if the acquirer stock price falls substantially before the acquisition is completed.¹⁴ If improving the long-term firm value is an important motivation for the acquirer CEO, he may also want to complete the acquisition as soon as possible. We therefore predict that in the cross-section it will take less time for target CEOs with a higher illiquidity discount and acquirer CEOs with a higher market value of holdings to complete the acquisition. Besides impatience of target and acquirer CEOs, the speed of acquisition completion is an indicator of resistance, which should also decrease with increasing personal incentive effects of CEOs.

Table VIII shows evidence consistent with this prediction. The dependent variable is the number of trading days between announcement and completion. The key independent variable for acquirer CEOs is the market value of their stock and option holdings. The key independent variables for target CEOs are either the total illiquidity discount or the illiquidity discounts with hard and soft restrictions. Control variables include the target firm's market value, since larger acquisitions may take a longer time to complete, the relatedness dummy, since acquisitions in the same industry are more likely to be subject to antitrust scrutiny, and the target CEO's side payment, since the side payment may similarly motivate the target CEOs to quickly close the deal. Regressions (19) and (20) show that all the key independent variables are highly significant. In regression (19), the coefficient of the illiquidity discount for target CEO equals -11.91 and the coefficient of the market value of acquirer CEO stock and option holdings equals -9.56 , both significant at the 1% level. Thus, an interquartile increase in the log illiquidity discount leads to an acquisition completing $11.91 \times (9.68 - 7.63) = 24.4$ trading days earlier in the first case and $9.56 \times (12.26 - 10.02) = 21.4$ trading days earlier in the second case. Regression (20) further shows that the target CEO's illiquidity discount with hard restrictions has a higher and more significant coefficient than the illiquidity discount with soft restrictions. The combined evidence suggests that target CEOs with a higher illiquidity discount and acquirer CEOs with higher market value of holdings speed up the acquisition completion as predicted.

¹⁴ Many merger agreements include a collar provision. If the acquirer stock price falls below a certain threshold, the exchange ratio is increased so that the target shareholders receive a relatively predictable price for their shares.

Table VIII
Do Target CEOs with a Higher Illiquidity Discount
and Acquirer CEOs with Higher Stock and Option Holdings
Speed Up the Acquisition Completion?

The sample of 250 acquisitions announced and completed during 1993 to 2001 is described in Section II. The dependent variable in all regressions of this table is the number of trading days between the acquisition announcement date and the acquisition completion date. The acquisition announcement date represents the last trading day before the first *Wall Street Journal* publication date, and the acquisition completion date represents the delisting date of the target stock. The independent variables include the illiquidity discount of holdings for the target CEO, the market value of holdings for the acquirer CEO, the target market value, the relatedness dummy, and the target CEO's side payment. The illiquidity discount for the target CEOs is calculated as the difference between the with-acquisition unrestricted value and the without-acquisition executive value of their stock and option holdings on AD-21. The calculation of these values is described in Section II. The illiquidity discount is further divided into illiquidity discount with hard restrictions or soft restrictions as described in Section I. The market value of acquirer CEO holdings is also calculated on AD-21. Both market value of holdings and illiquidity discount are highly skewed, so they are log transformed. The target market value is calculated on AD-21. The relatedness dummy equals one if the target and acquirer have the same two-digit SIC code, and zero otherwise. Target CEO's side payment equals the sum of five dummy variables that indicate whether the target CEO receives golden parachute payment, consulting agreement payment, new equity grants, special merger bonus, or an executive position in combined firm. The *t*-statistics are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Independent Variables and Statistics	Dependent Variable = Number of Days Between Announcement and Completion	
	(19)	(20)
Intercept	155.73 (4.77)***	126.51 (3.96)***
Illiquidity discount for target CEO	-11.91 (-4.31)**	
Illiquidity discount with hard restrictions for target CEO		-8.10 (-3.43)**
Illiquidity discount with soft restrictions for target CEO		-2.79 (-2.63)***
Market value of acquirer CEO holdings	-9.56 (-3.64)***	-10.11 (-3.82)***
Target market value	22.69 (6.64)***	22.63 (6.74)***
Relatedness dummy	7.44 (0.74)	10.58 (1.04)
Target CEO's side payment	-6.34 (-1.22)	-6.51 (-1.24)
<i>N</i>	250	250
Adjusted <i>R</i> ²	0.246	0.234

F. Are Target CEOs with a Higher Illiquidity Discount Less Likely to Contest the Offer?

A higher ex ante illiquidity discount means that the target CEO has a greater potential wealth gain from the removal of restrictions through acquisition. This

may discourage him from contesting the offer, as contesting may delay or kill the offer. Conversely, target CEOs with a lower illiquidity discount may seek higher wealth gains by contesting the offer in an attempt to preserve their jobs.

Table IX tests this prediction. The dependent variable is the contest dummy, which equals one if the acquisition is hostile, the payment terms are changed after the initial announcement, or there are multiple bidders, and zero otherwise. We find 29 contested acquisitions in our sample. The key independent variables are either the total illiquidity discount or the illiquidity discounts with hard and soft restrictions for target CEOs. Control variables include the acquirer book-to-market ratio, as acquisitions by possibly overvalued firms may be more likely to be contested; the relative size, as CEOs of large target firms may have more bargaining power; the acquisition premium, as a low premium offer is more likely to be contested; and a target CEO's side payments, which are like a bribe. Regression (21) shows that the total illiquidity discount has a negative coefficient, significant at the 5% level. Regression (22) shows that the illiquidity discount with hard restrictions also has negative coefficients, significant at the 10% level. This is consistent with our prediction that target CEOs with a higher illiquidity discount are less likely to contest.

G. Are Acquirer CEOs with Higher Stock and Option Holdings More Likely to Buy Relatively Undervalued Targets?

Corporate acquisitions may be motivated by synergy reasons, valuation reasons, or both. In stock acquisitions, both target and acquirer shareholders care about the potential accretion or dilution to their book value and future earnings, which depend on the relative valuations of the two stocks. In the Shleifer and Vishny model, acquisitions are motivated by the relative undervaluation of target stock, which means that absent market sentiments the acquisitions would likely be accretive to the acquirer shareholders and dilutive to the target shareholders. Such acquisitions would require extra effort and persuasion from acquirer managers in justifying the acquirer stock price, for instance, by presenting future growth prospects and building synergistic scenarios. We argue that acquirer CEOs with a higher long-term interest in their firms as measured by the market value of their holdings would be more motivated to undertake such acquisitions of relatively undervalued or less overvalued targets.

Consider a target shareholder who owns \$1 of target stock. She exchanges this for $\$(1+y)$ of acquirer stock, where y is the acquisition premium. Ignoring synergies, the acquisition will dilute her book value if the target book-to-market is higher than $(1+y)$ times the acquirer book-to-market, in which case our relative book-to-market dummy equals one. In the opposite case, it equals zero.

Regression (23) in Table X uses this dummy as the dependent variable. The key independent variable is the market value of the acquirer CEO's holdings. Control variables include the relatedness dummy, since there is an industry factor in both dependent variables; relative size, which also affects the changes in valuations; and unreported calendar year dummies. The market value of

Table IX
Are Target CEOs with a Higher Illiquidity Discount
Less Likely to Contest the Offer?

The sample of 250 acquisitions announced and completed during 1993 to 2001 is described in Section II. The dependent variable in both regressions of this table is the contest dummy, which equals one if any of the following three conditions is satisfied, and zero otherwise: (1) The acquisition is classified as hostile; (2) the acquisition payment terms have changed since the initial announcement; or (3) there are multiple bidding firms for the target firm. Given the binary nature of the dependent variable, this table shows the results of Logit regressions. The independent variables include the illiquidity discount for the target CEO, the acquirer book-to-market, the relative size, the acquisition premium, and the target CEO's side payment. The illiquidity discount is calculated as the difference between the with-acquisition unrestricted value and the without-acquisition executive value of a CEO's stock and option holdings on AD-21. The calculation of these values is described in Section II. The illiquidity discount is further divided into illiquidity discount with hard restrictions or soft restrictions as described in Section I. These variables are highly skewed, so they are log transformed. The relative size is calculated as the ratio of target to acquirer market value on AD-21. The acquisition premium is calculated as the acquisition price divided by the target stock price on AD-21 minus one, where the acquisition price is the acquirer stock price on AD+1 multiplied by the exchange ratio in case of stock payment, and the cash amount in case of cash payment. The acquirer book-to-market ratios equal the book value of equity at last fiscal year-end divided by the market value of equity as of AD-21. Target CEO's side payment equals the sum of five dummy variables that indicate whether the target CEO receives golden parachute payment, consulting agreement payment, new equity grants, special merger bonus, or an executive position in combined firm. The *t*-statistics are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Independent Variables and Statistics	Dependent Variable = Contest Dummy	
	(21)	(22)
Intercept	-0.23 (-0.19)	-1.10 (-1.08)
Illiquidity discount for target CEO	-0.28 (-2.39)**	
Illiquidity discount with hard restrictions for target CEO		-0.17 (-1.85)*
Illiquidity discount with soft restrictions for target CEO		-0.06 (-1.14)
Acquirer book-to-market	-0.75 (-0.81)	-0.59 (-0.69)
Relative size	1.62 (2.59)***	1.62 (2.60)***
Acquisition premium	0.01 (0.77)	0.01 (0.82)
Target CEO's side payment	-0.05 (-0.20)	-0.05 (-0.20)
<i>N</i>	250	250

holdings has a positive coefficient, significant at the 1% level. The evidence supports our prediction that acquirer CEOs with higher stock and option holdings are more likely (or motivated) to buy relatively undervalued targets.

Table X
Are Acquirer CEOs with Higher Stock and Option Holdings More Likely to Buy Relatively Undervalued Targets, Make Diversifying Acquisitions, and Make Stock Acquisitions?

The sample of 250 acquisitions announced and completed during 1993 to 2001 is described in Section II. We exclude 6 cash acquisitions in regression (23) since the relative valuation is irrelevant in cash acquisitions. The dependent variable in this regression is the relative book-to-market dummy, which equals one if the target firm book-to-market is greater than the acquirer firm book-to-market multiplied by one plus the acquisition premium, and zero otherwise. The dependent variable in regression (24) is the diversification ratio, which equals the sum of the target firm values of all diversifying acquisitions made by an acquirer CEO divided by the average acquirer firm value of all acquisitions made by the same CEO. An acquisition is treated as a diversifying acquisition if the target and the acquirer firms have different two-digit SIC codes. If a CEO did not make a diversifying acquisition in our sample, the diversification ratio equals zero. The sample size of 201 in regression (24) represents the 201 individual acquirer CEOs in our sample. Given that the dependent variable is censored at zero, we use the Tobit model to estimate this regression. The dependent variable in regression (25) is the stock payment dummy, which equals one if entire payment is in the form of acquirer stock, and zero otherwise. Given the binary nature of dependent variables in regressions (23) and (25), we use the Logit model to estimate these two regressions. The independent variables include the market value of the acquirer CEO holdings, the relatedness dummy, the relative size, and the acquirer firm book-to-market ratio. The market value of acquirer CEO holdings is calculated on AD-21. This variable is highly skewed, so it is log transformed. The relatedness dummy equals one if the target and acquirer have the same two-digit SIC code, and zero otherwise. The relative size is calculated as the ratio of target to acquirer market value on AD-21. The acquirer book-to-market ratios equal the book value of equity at last fiscal year-end divided by the market value of equity as of AD-21. In regression (24), the independent variables take the average value of these variables across all acquisitions made by an acquirer CEO. To control for the secular trend in stock market overvaluation, all regressions include unreported calendar year dummies as independent variables. The *t*-statistics are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Independent Variables and Statistics	Dependent Variables		
	Relative Book-to-Market Dummy (23)	Diversification Ratio (24)	Stock Payment Dummy (25)
Intercept	-4.412 (-3.60)***	-1.15 (-3.21)***	-1.95 (-0.99)
Market value of acquirer CEO holdings	0.300 (3.47)***	0.06 (2.17)**	0.27 (1.89)*
Relatedness dummy	0.010 (0.03)		0.68 (1.47)
Relative size	-0.283 (-0.65)		0.49 (0.72)
Acquirer book-to-market		0.41 (2.33)**	-1.26 (-1.51)
Calendar year dummies	Yes	Yes	Yes
<i>N</i>	244	201	250

H. Are Acquirer CEOs with Higher Stock and Option Holdings More Likely to Make Diversifying Acquisitions and Stock Acquisitions?

Larger stock and option holdings make acquirer CEOs less diversified. This should motivate them to reduce their stock risk by making diversifying acquisitions. Besides, given the higher hurdles in acquiring and integrating firms from unrelated industries, only acquirer CEOs with a higher personal incentive may pursue such acquisitions. Regression (24) in Table X tests this prediction. The dependent variable is the diversification ratio, which equals the sum of the target firm values of all diversifying acquisitions made by an acquirer CEO divided by the average acquirer firm value of all acquisitions made by the same CEO. An acquisition is treated as a diversifying acquisition if the target and the acquirer firms have different two-digit SIC codes. The coefficient of the market value of acquirer CEO holdings is positive and significant at the 5% level. The evidence supports our prediction that the acquirer CEOs with higher stock and option holdings are more likely to make diversifying acquisitions.¹⁵

In the Shleifer and Vishny model, stock payment is a necessary condition for the overvalued acquirer firm to improve its long-term valuation by merging with a less overvalued target firm. Given that the market value of acquirer CEO holdings is a measure of his long-term interest in the firm, we predict that acquirer CEOs with higher holdings are more likely to use the overvalued acquirer stock to buy the less overvalued target firm. Regression (25) in Table X tests this prediction. The dependent variable is the stock acquisition dummy, which equals one if the acquisition is paid entirely by acquirer stock, and zero if paid partly or entirely by cash. The key independent variable is the market value of acquirer CEO stock and option holdings. The control variables include relative size, as it may be harder to pay for larger acquisitions with cash; the relatedness dummy, as firms in the same industry are more likely to share generally high or low valuations; acquirer book-to-market, as overvalued firms are more likely to use stock payment; and unreported calendar year dummies. We find that the coefficient of the market value of acquirer CEO holdings is positive and significant at the 10% level, supporting our prediction.

IV. Robustness Tests and Alternative Hypotheses

A. Robustness Tests

The following results are not reported in the paper, but are available from the authors upon request.

¹⁵ Hubbard and Palia (1995) find that firms are more likely to make diversifying acquisitions when managers as a group own more than 5% of the firm's equity than when they own less. Morck, Shleifer, and Vishny (1990) also find that diversification is an important motivation in acquisitions.

A.1. Do CEOs Get More Stock and Option Grants in Anticipation of an Acquisition?

We have treated the stock and option holdings of target and acquirer CEOs as exogenous to their acquisition decisions since their value is known long before acquisition announcements. However, one may argue that they could be partly endogenous if CEOs receive extra stock or option grants in anticipation of an acquisition. To make sure that our study does not suffer from this endogeneity problem, we examine the relation between stock and option grants and future acquisitions. Using the sample of all available firms during 1993 to 2001, we regress the dollar or percent change in stock and option grants from the last fiscal year on the target dummy and acquirer dummy of next year along with control variables. We find very insignificant coefficients for both dummies, suggesting that CEOs do not receive extra stock and option grants before an acquisition. This shows that the incentive effects arising from stock and option holdings of both CEOs are exogenous to their acquisition decisions.

A.2. Alternative Specifications of Acquirer CEO's Stock and Option Holdings

We measure acquirer CEO's stock and option holdings in dollar terms, which is the correct specification if the acquirer firm's gains from a merger are proportional to its size. If the acquirer firm's gains are a fixed dollar amount regardless of its size, the CEO holdings should be measured in percent terms. The reality probably lies somewhere between the two extreme cases. To test the robustness of our results, we calculate the percent holdings of acquirer CEOs as the dollar holdings divided by the firm value. This variable is also highly skewed, so we log-transform it in all regressions. We then estimate all relevant regressions using the percent holdings in place of the dollar holdings. We find qualitatively similar results, although the statistical significance of the acquirer CEO's percent holdings is lower than that of the dollar holdings in some regressions (sometimes becoming insignificant).

A.3. Using an Alternative Model to Estimate the Illiquidity Discount

We have used the Cai and Vijh (2005) model to estimate the executive value of the CEO's stock and option holdings as the amount of unrestricted outside wealth that gives him the same expected utility as the holdings. To test the robustness of our results to this model specification, we estimate the illiquidity discount using an alternative model by Meulbroek (2001) in which the CEO prices his firm's stock and option holdings to give the same Sharpe ratio as his outside wealth. We find similar results, which shows that our results are not specific to the Cai and Vijh (2005) model.

A.4. Alternative Assumptions of Hedging Cost

We have assumed that after acquisition, the former target CEO can hedge his options with monthly rebalancing and a round-trip transaction cost of 4% for

stock. To test the robustness of our results to these assumptions, we estimate the illiquidity discount under three alternative scenarios. First, we assume quarterly rebalancing of the hedge portfolio. Second, we assume the transaction cost to be 2%. Third, we assume that the options are not hedged, which amounts to assuming very high transaction costs. We find similar results under all three scenarios.

A.5. Other Robustness Tests

We perform the following additional robustness tests and find similar results in all relevant tests: (1) Include the long-holder measure of overconfidence in regressions where it is not already included (i.e., Tables VI–X); (2) use the ranks of illiquidity discount and market value of CEO holdings in place of log transforms; (3) use six alternative assumptions in classifying the target CEO's holdings subject to hard and soft restrictions (as mentioned in footnote 6); (4) assume the target CEO's risk aversion coefficient equals 4.0 in estimating the illiquidity discount; and (5) assume the target CEO's outside wealth equals six times his annual salary and bonus.

B. Alternative Hypotheses: Can Our Results Be Explained by the Traditional Incentive Alignment or Entrenchment Effects?

The stock and option holdings may have alternative interpretations under alternative hypotheses. First, it can be argued that an increase in the holdings, at least initially, aligns the interests of the target and acquirer CEOs with their shareholders. This is typically known as the incentive alignment hypothesis. Second, it can be argued that the size of holdings is related to the CEO's control of the firm, and a CEO with too much control becomes entrenched and pursues his own interests at the cost of his shareholders' interests. This is known as the entrenchment hypothesis. Notice that in these traditional hypotheses there is no distinction between short-term and long-term shareholders as in the Shleifer and Vishny model.

These alternative hypotheses cannot explain many of our results. For example, the traditional incentive alignment hypothesis cannot explain the negative announcement and long-term excess returns to acquirer firms, nor why despite negative returns the acquirer CEOs with higher market value of holdings are more acquisitive, pay higher acquisition premiums, and make diversifying acquisitions. It also does not explain why target CEOs with a higher illiquidity discount accept a lower acquisition premium. The entrenchment hypothesis cannot explain why acquirer CEOs with a higher market value of holdings speed up the acquisition completion, buy relatively undervalued target firms, and pay with stock. It also cannot explain why entrenched target CEOs with a higher illiquidity discount are more likely to be acquired, less likely to contest the acquisition terms, more likely to relinquish control, and speed up the acquisition completion. The only hypothesis that is consistent with all our results is that the stock and option holdings measure the target CEO's incentive to cash out of his holdings and the acquirer CEO's incentive to improve the long-term

value of his holdings. This meeting of self-interests of the target and acquirer CEOs can explain all aspects of their behavior in acquisitions documented in this paper.

V. Conclusions

In recent years, there has been a sharp increase in the stock and option holdings of CEOs. Previous literature shows that the executive value of such undiversified holdings is lower than the market value. We argue that acquisitions offer an attractive route for target CEOs to remove many restrictions that prevent them from selling or hedging their holdings. This increases the personal value of their holdings by an amount equal to the difference between the with-acquisition unrestricted value and the without-acquisition executive value, which we refer to as the illiquidity discount. Following Shleifer and Vishny (2003), we further argue that for overvalued firms the acquisitions enable acquirer CEOs to improve the long-term value of their holdings by purchasing relatively undervalued target firms using stock payment. This paper examines the incentive effects of target CEOs as measured by the illiquidity discount and of acquirer CEOs as measured by the market value of their holdings.

Using an aggregate sample of 8,822 firm-years with relevant data during 1993 to 2001, we first show that CEOs with higher market value of stock and option holdings are significantly more likely to acquire other firms while CEOs with a higher illiquidity discount are more likely to get acquired. Using a further sample of 250 completed acquisitions during the same period, we next show that target CEOs who face a higher illiquidity discount accept a significantly lower acquisition premium and are more likely to relinquish control after an acquisition. Simply stated, this suggests that they want to cash out. We further find that a higher illiquidity discount is associated with lower resistance from target CEOs, and that it has a strong effect on speeding up the acquisition completion.

Other tests find additional support for the incentive effects of acquirer CEOs. Acquirer CEOs with a higher market value of holdings pay a significantly higher acquisition premium, speed up the acquisition process, pursue relatively undervalued targets, and make diversifying acquisitions using stock payment. Their actions are consistent with the hypothesis that they try to increase the long-term value and reduce the risk of their holdings through acquisitions.

Finally, we argue that our results cannot be explained by the traditional incentive alignment and entrenchment hypotheses. We therefore conclude that the hypothesized incentive effects arising from the stock and option holdings of target and acquirer CEOs are a significant factor in explaining the level of acquisition activity during 1993 to 2001 as well as the terms and characteristics of completed acquisitions. While these acquisitions clearly increase the CEOs' own welfare, we are not sure whether these actions increase the welfare of all their shareholders. In general, acquisitions increase the welfare of target shareholders who all receive a substantial acquisition premium, although long-term

target shareholders who hold on to the overpriced acquirer stock may eventually lose. In comparison, the short-term acquirer shareholders lose from the negative announcement effect, although the long-term acquirer shareholders may gain if the target stock is sufficiently undervalued relative to the acquirer stock or if the acquisition creates sufficient long-term synergies.

Appendix A

To calculate the illiquidity discount of a CEO's stock and option holdings, we need the contractual details of his holdings. Our procedure is based in large part on the methodology of Hall and Knox (2002), with additions related to the estimation of the vesting period for stock options and restricted stock.

A.I. Contractually Unrestricted Stock

The number of contractually unrestricted shares held by a CEO is calculated as the total number of shares minus the number of restricted shares reported by ExecuComp.

A.II. Restricted Stock

A CEO's holdings of restricted stock consist of all unvested previous grants. We start with his initial grant, which is the total restricted stock holdings when the CEO first enters the ExecuComp database. We assume the initial grant is vested at the end of the next fiscal year. Given the initial holdings, we can calculate a CEO's current holdings by adding new grants and removing vested grants. We assume a restricted stock grant is vested 4 years after the grant date if the vesting date is missing.¹⁶ Finally, we adjust the number of restricted shares granted so that our estimated total number of restricted shares held by a CEO at the end of any fiscal year equals the number from ExecuComp.¹⁷

A.III. Stock Options

A CEO may hold several option grants, each with different exercise price, maturity date, and number of options. Within each option grant, options are usually vested at different times. ExecuComp does not directly report the contractual details of a CEO's holdings. Instead, it reports the contractual details for each new grant. We infer the contractual details of a CEO's option holdings as follows.

¹⁶ This is because the SEC requires companies to report the time to vest of a restricted stock grant if the grant vests within 3 years.

¹⁷ Our estimated number of restricted shares held by a CEO may differ from ExecuComp's number for two reasons. First, CEOs sometimes receive restricted stock not included in restricted stock grants. For example, some companies pay their CEO salary or bonus by restricted stock or stock options. (See Section 2.2.2 of Hall and Murphy (2002) for details.) Second, we assume a restricted stock grant vests in 4 years if ExecuComp does not report the vesting period, which may sometimes understate the actual vesting period.

We first estimate the vesting date for each option grant. Most companies vest $1/N$ of the option grant on each of the N anniversaries of the grant date. The number N ranges from 1 to 10, with most values between 2 and 5. Given a value of N , we can calculate the number of unvested options held by a CEO from the option grants during the last N years. We then compare this estimated number of unvested options to the number of unvested options reported by ExecuComp, and choose the N that minimizes the difference between the two numbers. Each option grant to the CEO is then divided into N series of equal number of options. Each series has a different vesting date, ranging from 1 to N years after the grant date.

We next define a CEO's initial grant as his total number of option holdings when he first enters the ExecuComp database. We assume the initial option holdings have 7 years to maturity, and set the option exercise price to the stock price at the previous fiscal year-end. Given the initial holdings, we can calculate a CEO's current option holdings by adding new option grants and removing exercised options. Adding new option grants is straightforward since all contractual details of new grants are available. Removing exercised options is more difficult since ExecuComp only reports the number of options exercised, but not which specific options are exercised. We assume that CEOs exercise options in the following order. Among all vested options, CEOs exercise the deepest-in-the-money options first. For options with the same moneyness, they exercise the options with the earliest maturity date first. For options with the same moneyness and maturity date, they exercise the options with the earliest grant date first. For options with the same moneyness, maturity date, and grant date, they exercise the option series with the greatest number of options first. Occasionally, the number of options a CEO exercised in a year exceeds the number of vested options available.¹⁸ If this happens, we allow the CEO to exercise unvested options after exhausting all vested options.

After adding the new option grants and removing the exercised options, our estimated total number of options held by a CEO may still differ from the total number of options from ExecuComp.¹⁹ We adjust this difference annually by adding a new option grant or exercising more options. We assume the new grants are granted at the money at the end of the fiscal year, with 10 years to maturity. If we need to exercise more options, we follow the same exercising order discussed above.

Appendix B

Following Cai and Vijh (2005), we estimate the executive value of a CEO's stock and option holdings as the amount of outside wealth that gives him the same expected utility as the holdings. Below we briefly describe the model parameters and the estimation procedures.

¹⁸ This may be caused by the discrepancy between the estimated and actual vesting dates.

¹⁹ A potential source of the difference is that CEOs may receive options from sources not reported in ExecuComp. For example, part of their salary and bonus may be paid in options.

The stock beta, the stock volatility, the market volatility, and the correlation between stock and market returns are estimated during the 60-month period before the announcement month. We obtain the dividend yield from ExecuComp, and we set the risk-free rate to equal the 5-year T-note yield. We assume that the stock returns and the market returns follow a joint lognormal distribution and use the CAPM to calculate the expected stock returns. We assume that the outside wealth of a CEO equals three times his prior year cash compensation (salary plus bonus), but not less than 5% of his nonoption wealth. We assume that the expected market risk premium is 6.5% and the risk aversion coefficient is 2.5.²⁰

We calculate the executive value for each option series one at a time. To ensure this does not alter the CEO's diversification level too much, we use the total number of options for calculating the expected utility. To find the optimal portfolio choice p (the proportion of outside wealth in the market portfolio), we calculate the expected utility for 21 values of p from 0 to 1 in increments of 0.05 and choose the p that gives the highest expected utility.²¹ The executive value of stock is estimated in a similar fashion assuming that it is an option with zero exercise price.²² As discussed in Section I.A, we assume that CEOs are required to maintain their current holding of contractually unrestricted stock until they retire. The time to retirement is calculated as the difference between the CEO's current age and 65 years.²³ Similar to Cotter and Zenner (1994), we use 3 or 15 years if this difference is less than 3 or more than 15 years.

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²⁰ We test the robustness of our results with two alternative assumptions. First, we assume that the CEO's outside wealth equals six times his cash compensation. Second, we assume that the CEO's risk aversion coefficient equals four. We find similar results. Cai and Vijn (2005) also show that the model is robust to the assumption of market risk premium.

²¹ This step becomes very time consuming and intractable if we estimate a different optimal p for each option series. To make it tractable, we construct an average option series for each CEO, and estimate the optimal p for the average option series. This optimal p is used in estimating the executive values of all option series held by the CEO. The time to maturity, time to vest, and exercise price of the average option series equal the average time to maturity, the average time to vest, and the average exercise price of all options held by the CEO. The number of options of the average option series equals the total number of options held by the CEO.

²² We exclude the options when estimating the executive value of contractually unrestricted stock because including options makes the terminal utility path-dependent and numerically very expensive to calculate. The exclusion of options actually makes the CEO more diversified and reduces the magnitude of the illiquidity discount.

²³ We collect CEO age from ExecuComp and proxy statements. If age is missing, we assume it is 55 years.

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