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MANAGERIAL OWNERSHIP DYNAMICS AND FIRM VALUE

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ABSTRACT

From 1988 to 2003, the average change in managerial ownership is significantly negative every year for American firms. The probability of large decreases in ownership is strongly increasing in contemporaneous and past stock returns but the probability of large increases in ownership through managerial purchases of shares is not. The relation between changes in Tobin's q and past and contemporaneous changes in ownership depends critically on controlling for past stock returns. When controlling for past stock returns, past large decreases in managerial ownership are unrelated to current changes in Tobin's q but there is some evidence that past large increases in managerial ownership are positively related to current changes in Tobin's q . Because managers sell shares when a firm's stock is performing well, large contemporaneous decreases in managerial ownership are associated with increases in Tobin's q . We argue that our evidence is mostly inconsistent with existing theories and propose a managerial discretion theory of ownership consistent with our evidence.

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We examine the dynamics of managerial ownership for American firms from 1988 through 2003. We find that the average and median annual change in managerial ownership during that period is negative. In other words, a firm's managerial ownership is expected to decline. Further, we show that a firm that experiences an economically significant change in ownership is substantially more likely to experience a decline in ownership than an increase. High past and concurrent stock returns make it significantly more likely that a firm will experience an economically significant decrease in managerial ownership. In contrast, there is little evidence that low past and concurrent stock returns increase the probability of large increases in managerial ownership.

We investigate how changes in managerial ownership are related to changes in Tobin's q , taking into account the relation between managerial ownership and stock returns. We find no evidence that decreases in managerial ownership are associated with decreases in Tobin's q . In sharp contrast to the literature that examines the relation between managerial ownership and firm value in the cross section, we show that decreases in managerial ownership are associated with contemporaneous increases in Tobin's q . Further, there is some evidence that past and contemporaneous increases in managerial ownership are correlated with increases in Tobin's q , so that the contemporaneous relation between changes in Tobin's q and managerial ownership is u-shaped. Our findings are difficult to reconcile with existing theories of managerial ownership and with existing interpretations of the evidence on the firm value/managerial ownership relation. We argue that a new theory of managerial ownership which emphasizes managerial discretion and the firm's lifecycle is required to explain our findings.

There is a considerable literature devoted to understanding the impact of managerial ownership on firm value. Much of that research draws its inspiration from the agency literature (e.g., Jensen and Meckling (1976), Morck, Shleifer, and Vishny (1988), and Stulz (1988)). In that literature, greater managerial ownership benefits shareholders because it increases managers' incentives to increase firm value, but when managerial ownership becomes too large, it enables

managers to entrench themselves, so that firm value falls as managerial ownership increases. Because of these countervailing forces, the relation between firm value and managerial ownership is not monotonic. We call this view the agency approach to managerial ownership.

Following Demsetz (1983) and Demsetz and Lehn (1985), many authors argue that managerial ownership is endogenously determined. This view has led to an alternative approach, which we call the contracting theory approach to managerial ownership. The contracting approach posits that firms have an optimal level of managerial ownership that solves a principal-agent problem. Shareholders set the terms of a compensation contract for management which includes management's ownership in the firm. If actual managerial ownership is the solution to a contracting problem between management and shareholders and there are no adjustment costs, firm value would always be maximized given the constraints faced by shareholders. Hence, everything else constant, firm value could not be increased by changing managerial ownership.

There is considerable controversy as to which view is more appropriate. Recent papers attempting to differentiate between the two views use fixed-effect models and instrumental variables to address the problems created by the endogeneity of managerial ownership. Both approaches have been shown to have serious limitations. Zhou (2001) shows that the fixed effects approach has limited power because most changes in managerial ownership are small. Coles, Lemmon, and Meschke (2006) provide examples of instrumental variable estimations in a fully specified structural model in which the instrumental variable approach finds a relation between q and managerial ownership when the structural model does not have such a relation. Though one influential paper (Himmelberg, Hubbard, and Palia (1999)) suggests that focusing on ownership changes would be useful to understand the relation between Tobin's q and ownership, the dynamics of managerial ownership and their relation to changes in Tobin's q have been neglected

in the recent literature.¹ Yet, considering separately the relation between changes in Tobin's q and past and contemporaneous economically significant changes in managerial ownership in a firm-fixed effects regression approach helps address the criticisms leveled at earlier approaches. Coles, Lemmon, and Meschke (2006) demonstrate that the firm-fixed effects approach has the potential to address endogeneity caused by unobservable firm characteristics, but caution that the lack of time variation in the level of ownership is an impediment to this approach. Because we focus on economically significant changes in managerial ownership, we eliminate the issues raised by Zhou (2001) in his criticism of the firm-fixed effects regression approach. Further, since we consider the relation between changes in Tobin's q and past changes in ownership within a firm, there is less ground to be concerned about the endogeneity issue that has befuddled much of the empirical work. A further advantage of looking at the relation between firm value and managerial ownership dynamically is that it is possible to decompose changes in managerial ownership into changes caused by purchases and sales of shares by managers and changes caused by increases or decreases in shares outstanding.

If economically significant decreases in ownership cause decreases in Tobin's q , we should see a positive relation between changes in Tobin's q and past or contemporaneous changes in ownership. We find no such relation for decreases in managerial ownership when we control for past stock performance, but we find such a relation for increases in managerial ownership. We show that it is important to control for past stock performance because it is an important determinant of ownership decreases.

Our findings can be explained by an alternative managerial ownership theory, which we call the managerial discretion theory of inside ownership. This theory emphasizes that managers own shares to maximize their welfare subject to constraints and that firms start their life with highly concentrated ownership (see Helwege, Pirinsky, and Stulz (2007) for evidence). The highly

¹ An important exception is McConnell, Servaes, and Lins (2006). They investigate the contemporaneous stock-price reaction to the announcement of insider purchases. We discuss their results in more detail in Section 6.

concentrated ownership of young firms is partly explained by the fact that early in the life of the firm managerial ownership is a cheap form of financing. Later in the life of the firm, managers would rather diversify their wealth and reduce their ownership, but they have to take into account the impact of their sales on the value of their stake and on their ability to control the firm. First, the market for the firm's stock may not be sufficiently liquid for managers to be able to sell their shares without affecting adversely the share price, so that they may be better off to wait. Second, the market can infer from managerial sales that management has adverse information and that its interests might become less well-aligned with those of shareholders, so that sales may affect adversely the value of the shares held by management. Third, as management holds fewer shares, its ability to control the firm falls. Hence, we expect managers to sell shares when the market for the firm's shares is liquid enough and receptive enough to an increased supply of shares so that the managerial sales do not have a substantial adverse impact on the share price. In addition, we expect managerial sales when managers are not concerned that they will face competition in controlling the firm. These considerations imply that management will sell when the firm has performed well. The reasons that lead management to buy shares are more complex. It is costly for management to increase its stake in the firm and there is no reason to expect that it pays for management to do so whenever a firm performs poorly – unless one believes that the stock market typically overreacts. However, management may increase its stake to help finance the firm directly or indirectly by signaling its belief in the firm. Further, if management's control is threatened, it may choose to buy shares to strengthen its control of the firm. Our evidence is consistent with these predictions.

The paper is organized as follows. In Section 1, we review the literature and elaborate on our theory of managerial ownership. The construction of our database is described in Section 2. In Section 3, we document the decrease in managerial ownership and describe more generally how managerial ownership evolves over our sample period 1988–2003. We then investigate in Section 4 why managerial ownership falls on average, focusing on economically significant changes in

ownership. The contemporaneous and lagged relation between firm value and managerial ownership is analyzed in Section 5. In Section 6, we examine the contemporaneous relation between changes in ownership and changes in Tobin's q . We conclude in Section 7.

Section 1. Managerial ownership and firm value

In this section, we review theories of the determinants of managerial ownership and their implications for the relation between firm value and managerial ownership. We consider three theories: the agency theory, the contracting theory, and the managerial discretion theory.

A. The agency theory approach

The agency theory takes managerial ownership as given. It then derives implications for firm value from the level of managerial ownership. Following Jensen and Meckling (1976), greater managerial ownership aligns the interests of management better with the interests of shareholders. However, with this view, managers' interests can be aligned with the interests of shareholders without managers actually owning shares – all that is required is that managers' wealth increases when the share price increases. When managers hold shares, they also control votes. As managers control more votes, they become more entrenched and can use their position to further their interests even when doing so does not benefit shareholders (see Morck, Shleifer, and Vishny (1988) and Stulz (1988)). Consequently, too much ownership can adversely affect firm value, perhaps because it makes it difficult or even impossible for outsiders to take the firm over. For low levels of ownership, the interest alignment benefit of managerial ownership dominates the costs associated with entrenchment because at low levels of ownership managers' ownership does not entrench them. However, there is a level of ownership beyond which the entrenchment effect dominates, so that increases in managerial ownership beyond that level do not increase firm value. At some even higher level of ownership, management is completely entrenched so that

further increases in ownership may increase firm value because they only have an incentive effect.

To summarize, the agency theory does not offer predictions about the determinants of ownership structure: it is assumed to be exogenous. However, the agency theory implies that there is a relation between changes in ownership and changes in Tobin's q . If the relation between firm value and ownership is concave, a decrease in managerial ownership brings about an increase in Tobin's q if managerial ownership is greater than the optimal amount. If the relation between firm value and ownership is curvilinear with two segments with positive slope, increases in managerial ownership increase firm value for both low and high levels of ownership but decrease firm value for intermediate levels of ownership.

McConnell and Servaes (1990) examine a large sample of firms with ownership data from the Value Line Investment Survey and find a curvilinear relation between managerial ownership and Tobin's q . In their cross-sectional regressions for both 1976 and 1986, Tobin's q increases with ownership up to 50% (1976) and 40% (1986), respectively, and decreases for larger ownership levels. Morck, Shleifer, and Vishny (1988) estimate a piecewise linear regression of Tobin's q on insider ownership, which they define as ownership by the company's directors. In their sample of 460 large firms in 1980 provided by the Corporate Data Exchange, they find that Tobin's q significantly increases for director ownership levels between zero and five percent, decreases between 5 and 25 percent, and again increases for levels of ownership above 25 percent. Hermalin and Weisbach (1991) also estimate a piecewise linear regression of Tobin's Q on managerial ownership, which is measured by the ownership of the current CEO and of directors who are former CEOs. They find a positive relation between Q and ownership for ownership levels between 0 and 1 percent and between 5 and 20 percent, and a negative relation for ownership levels between 1 and 5 percent and above 20 percent.

Holderness, Kroszner, and Sheehan (1999) use data on large firms for 1935 and 1995 to re-estimate the Morck, Shleifer, and Vishny (1988) regression. They find support for the saw-

toothed relationship in the 1935 sample, but not in the 1995 sample. More recently, McConnell, Servaes, and Lins (2006) find a curvilinear relationship between announcement returns of insider purchases and the level of insider ownership.

B. The contracting theory approach

The evidence of a positive relation between firm value and managerial ownership is interpreted by proponents of the agency theory as evidence that higher managerial ownership increases shareholder wealth because it aligns the interests of management better with the interests of shareholders as long as managerial ownership is not so high that it becomes a vehicle for managerial entrenchment. Managers choose their ownership in the firm and they ought to be encouraged to choose an even higher ownership. The problem with the agency theory approach is that it is not clear why managers hold shares in the first place and why they would choose to hold more shares. If there is a cost to managers of holding shares, they would hold more shares only if they are compensated for doing so. Since shareholders would have to compensate managers for holding shares, on net, shareholders might be worse off even if an increase in managerial ownership increases the incentives of managers to maximize shareholder wealth. The contracting approach, which builds on principal-agent models such as Holmstrom (1979), attempts to take these costs explicitly into account.

Consider a firm owned by atomistic shareholders. The shareholders have somehow managed to resolve their collective action problem, so that they can act as a group. They have to hire managers and set incentives for these managers so that firm value will be maximized. In this situation, the shareholders have to solve an optimization problem where the terms of the managers' contract have to be such that the managers' participation constraint is met. The shareholders' problem is made more difficult by the fact that, typically, they cannot observe all of the managers' actions. This hidden action problem makes it possible for managers to pursue their own objectives at the expense of shareholders. For instance, managers could choose to shirk

because shareholders might not be able to find it out. Once managers are in place, shareholders face the additional problem that managers have information they do not have.

Because managers have better information than shareholders and because shareholders cannot always establish whether actions undertaken by managers maximize firm value, the contracting approach generally reaches the conclusion that the optimal contract for managers involves compensation that is sensitive to changes in firm value. This sensitivity of compensation to changes in firm value can be achieved without management owning any shares – management could simply receive the change in value on phantom shares, for instance, if the optimal contract is linear in the share price. However, it is common to interpret the optimal solution as involving ownership of shares. As a result, firm value is maximized when managers have an optimal stake in the firm's cash flows, or an optimal level of managerial ownership. Contracting models differ a great deal in their complexity and in the issues they emphasize.

With the contracting view, shareholders face a tradeoff. As the managers' stake in the firm increases, their incentives become better aligned with those of shareholders in that, if they increase firm value by one dollar, their wealth increases by a greater fraction of that dollar. However, when managers have a large stake in the firm, they are exposed to the risk of the firm. Everything else equal, managers would rather hold a diversified portfolio. Consequently, for managers to be willing to hold a large stake in the firm, their compensation has to be higher. It follows that shareholders benefit from an increase in managerial ownership because of better alignment of incentives but incur additional costs because they have to pay managers more.

If all managers have the same risk aversion and the same wealth, their ownership in the firm they manage will depend on the extent of agency problems in the firm and on the risk to managers of investing in the firm. As agency problems worsen, managerial ownership increases. We would expect agency problems to be more important for firms with more information asymmetries. Consequently, everything else equal, managerial ownership should be higher for younger firms, firms with more intangible assets, with more R&D investment, and with more

capital expenditures. The prediction of the model with respect to stock return volatility is ambiguous. On the one hand, greater stock return volatility imposes costs on managers by forcing them to bear more risk for a given level of ownership; on the other hand, greater stock return volatility may be associated with greater moral hazard since it indicates greater information asymmetries and hence greater opportunities for management to take actions that do not benefit shareholders. Finally, it is not clear how stock returns affect managerial ownership in the contracting model. Keeping everything else unchanged, an increase in the stock price means that managers are less diversified since the value of their holdings in the firm increases. This effect would predict a decrease in managerial ownership. However, if the firm's stock price increases because the firm has more growth opportunities (but larger information asymmetries), one would expect optimal managerial ownership to increase.

With the contracting view, assuming that the optimal contract with management has been selected and that circumstances have not changed, it would be impossible to increase firm value by changing managerial ownership. Requiring managers to hold more shares would decrease shareholder wealth because the increase in expected compensation needed to satisfy the managers' participation constraint would cost more than the gain from greater incentive alignment. Alternatively, requiring managers to hold fewer shares would have a cost through its adverse impact on incentive alignment that is greater than the benefit of reduced expected managerial compensation.

Demsetz (1983), Demsetz and Lehn (1985), and Himmelberg, Hubbard, and Palia (1999) find support for the predictions of the contracting model of managerial ownership. Variables proxying for asymmetric information are positively and significantly related to the level of inside ownership. Himmelberg, Hubbard, and Palia (1999) further point out that unobservable firm characteristics, as captured by firm fixed effects, explain a considerable amount of variation in managerial ownership. A concave or curvilinear relation between Tobin's q and managerial ownership is not inconsistent with the contracting model of managerial ownership. Himmelberg,

Hubbard, and Palia (1999) show that the contracting model predicts a positive relation between Tobin's q and managerial ownership if firms with more intangible assets have a higher Tobin's q and optimally also have higher managerial ownership. However, it is not the case that the higher managerial ownership causes the higher Tobin's q . Rather, firm characteristics that lead to the higher Tobin's q also lead to higher managerial ownership, so that both the high Tobin's q and the high managerial ownership are the consequences of firm fundamentals. Coles, Lemmon, and Meschke (2006) present a model which has these implications. They show through simulations that their model can replicate a concave cross-sectional relation between managerial ownership and Tobin's q . Himmelberg, Hubbard, and Palia (1999) find support for their view by using firm fixed-effects in a regression of Tobin's q on managerial ownership. In that regression, they find no relation between Tobin's q and managerial ownership. Zhou (2001) shows, however, that the power of their approach is questionable because most changes in ownership are small and large changes are infrequent in the relatively homogeneous set of firms Himmelberg, Hubbard, and Palia (1999) study.

C. The managerial discretion approach

With the managerial discretion approach, managers make their decisions subject to constraints imposed by shareholders. If shareholders solve their collective action problem in such a way that they behave as a group and choose the optimal compensation contract for managers, there is no difference between the managerial discretion approach and the contracting approach. For the two approaches to be meaningfully different, we follow the existing managerial discretion models (for early models, see Stulz (1990), and Zwiebel (1996)) and assume that shareholders cannot solve the collective action problem to devise an optimal contract for managers. Instead, shareholders can vote with their feet and the stock price reflects the actions the market anticipates managers to take. Further, the company can be the subject of a tender offer, so that managers may

lose their position. Finally, managers may also lose their position if the firm performs poorly and defaults on debt or requires help from banks to avoid default.

With the managerial discretion approach, managers choose their ownership stake to maximize their welfare. This makes ownership endogenous. The crucial difference between the contracting approach and the managerial discretion approach is that the contracting approach typically takes a narrow view of private benefits from control, focusing on the effort decision of managers, and ignoring financing constraints. In contrast, we assume that managers are able to extract a fraction of the firm's cash flows for their own benefit, but at a cost. Their welfare increases as cash flows increase – i.e., as the firm performs well – because a given fraction of cash flows is worth more to them. Acquiring a stake in the firm that they manage is therefore valuable for managers if the acquisition of that stake increases the resources available to the firm, lowers its cost of funding, allows it to grow, and allows them to preserve their control over the firm. When the firm is financially constrained or its investors face serious information asymmetries, managers may be the cheapest providers of funds to the firm. If shares are issued in exchange of cash or services from managers, the acquisition of the managers' stake or the increase of that stake infuses additional resources into the firm. To the extent that the acquisition of a stake leads outsiders to infer that the firm is valuable in the eyes of managers, it increases the value of the firm and hence makes it easier for managers to raise funds. Finally, the acquisition of a stake increases managers' power in the firm through their ownership of votes.

The cost to managers of acquiring a stake in the firm they manage is that it forces them to bear more of the firm's risk and limits their ability to make other investments. Managerial ownership will therefore not be high when the firm can finance itself at low cost in the capital markets, when managers do not expect to be threatened in their position, and when the market value of the firm reflects or exceeds managers' assessment of firm value. Consequently, as a firm becomes better established, management will gradually decrease its stake because sales of shares by management have little impact on the firm's stock price. The firm's equity is traded in a liquid

market and external monitoring reduces information asymmetries and limits discretion of management.

With the managerial discretion approach, we would expect managerial ownership to be high for firms which are constrained from accessing external finance, which have significant information asymmetries, and which have a market for their equity that lacks liquidity. In contrast, we expect managerial ownership to be low for well-established firms. We would expect increases in managerial ownership for firms that become financially constrained or are subject to potential or actual threats from the market for corporate control. Everything else equal, we would expect managerial ownership to fall as a firm becomes older and better established.

The managerial discretion approach also leads to a positive relation between Tobin's q and managerial ownership over some range of ownership levels, but it is somewhat more tentative. With this view, young firms have high q 's because they are rich in investment opportunities. As young firms tend to have limited access to equity markets, their managerial ownership is high. As firms exploit their investment opportunities, their q falls. If they are successful, their managerial ownership also falls because the market for their shares becomes more liquid and because information asymmetries fall. With the managerial discretion approach, we would not expect a causal relation from decreases in managerial ownership to decreases in q . Rather, ownership changes would be largely driven by changes in a firm's circumstances as long as the managers stay the same. As managers change, ownership would change because the new managers might value private benefits differently or might have a different level of wealth. Changes in a firm's circumstances will also lead insiders to buy shares when doing so is beneficial to them. They may do so when a contest for control becomes more likely, when they want to decrease the firm's cost of capital, and when they are the cheapest source of financing for the firm. It is possible for all these motives for managerial ownership increases to lead to increases in the share price and to an increase in Tobin's q . The managerial discretion approach also implies that managerial ownership is at least partly path-dependent. If management has a high ownership at some time, its ability to

reduce that ownership if it wants to depends on the liquidity of the stock. The same firm might have a different level of ownership if its management had lower ownership in the past.

Finally, it is important to note that the managerial discretion theory of ownership recognizes two aspects of managerial ownership which are completely ignored by the contracting approach and partly ignored by the agency approach. First, it takes into account that managerial ownership affects the ability of management to consume private benefits. Second, it explicitly allows for the financing role of managerial ownership.

With the managerial discretion theory of ownership, managerial ownership is endogenous. However, whereas the contracting theory of managerial ownership is really a theory of the pay/performance sensitivity, the managerial discretion theory of ownership recognizes that managers play a complex role in firms that includes, at times, a financing role, and that they may use their ownership to preserve private benefits rather than to maximize shareholder wealth. The two theories have different implications for the determinants of managerial ownership. With the contracting theory, we would expect that a change in a firm characteristic which makes it more likely that management will sell shares makes it equally less likely that management will buy shares. Such a symmetrical relation is unlikely to hold with the managerial discretion theory because management is looking to reduce its stake in the firm when that stake is large because management helped finance the firm through share acquisition. With the contracting theory, management's sales of shares always maximize firm value so that management does not have to be concerned about a possible negative impact of its sales on firm value. In contrast, with the managerial discretion theory, management sells shares when doing so has little adverse impact on the share price. Management therefore sells when the market for the firm's shares is receptive to sales of shares by management.

Section 2. Data

We obtain data on insider ownership from Compact Disclosure, which is a CD-Rom produced each month. Compact Disclosure attempts to provide information on all firms that file with the SEC and have assets in excess of \$5 million. Our main variable of interest is the aggregate percentage ownership of equity securities by all directors and officers of a company.² Our ownership variable is therefore the same as the one used in Himmelberg, Hubbard, and Palia (1999), Helwege, Pirinsky, and Stulz (2007), or Holderness, Kroszner, and Sheehan (1999).³

Compact Disclosure contains text versions of SEC filings and has the ability to create summary reports of many variables. We download the total number of shares held by officers and directors from all monthly Compact Disclosure CDs that we have access to, and update this number whenever the proxy date in Compact Disclosure changes from one year to the next. We use CDs from January 1988 to August 2005. Three dates are important in the calculation of the fraction of shares held by insiders, the fiscal year end date, the record date, and the proxy date. A typical company in our database has a fiscal year end of December 31st, a record date of February 28th, and a proxy date of April 30th. The annual report, which is sent to investors about a month prior to the proxy date, typically lists the number of shares held by officers and directors as of the record date. Compact Disclosure reports the number of shares outstanding, but the latter is often the fiscal-year end data. If, e.g., a stock split or an equity issue occurs between the fiscal year end date and record date, we would calculate the wrong percentage ownership. We therefore use the number of shares outstanding from CRSP for the month prior to the proxy date.

² The laws regulating a company's proxy disclosure requirements of beneficial ownership of officers and directors to shareholders are detailed in Regulation 14A ("Solicitation of Proxies") and Schedule 14A of the Securities Exchange Act of 1934 (§240.14a). Pursuant to Schedule 14A(6-d) with reference to Item 403 of Regulation S-K (§229.403) entitled "Security Ownership of Certain Beneficial Owners and Management," a company is required to disclose any ownership of equity securities by all directors and officers of the company.

³ Note that the early literature on the interaction of Tobin's q and ownership sometimes uses slightly different definitions. For example, Morck, Shleifer, and Vishny (1988) study the ownership by the company's directors, and Demsetz and Lehn (1985) study the ownership by the five (or twenty) largest shareholders of a corporation.

Researchers have compared inside ownership data from Compact Disclosure to ownership data from other data sources as well as from proxies. They have found that Compact Disclosure is a high quality data source for single class firms, but that there are considerable errors in voting ownership for dual class firms (e.g., Anderson and Lee (1997)). Further, differences between cash flow rights and voting rights complicate the analysis substantially. We therefore exclude dual class firms from our sample.

Denis and Sarin (1999) find that large ownership changes are correlated with concurrent turnover of key executives. We identify changes in the position of CEO and chairman of the board for each firm-year observation. The data on officers and directors is derived from the director and officer text lists also provided by Compact Disclosure.⁴

We match the Compact Disclosure data to CRSP and Compustat using 6-digit cusips. We require that a firm is present in at least two adjacent years to calculate the change in insider ownership. This leaves us with approximately 44,000 single-class firm-year observations. We remove approximately 10,000 firm-years because firms are regulated utilities (SIC codes 4900-4949) or belong to the financial sector (SIC codes 6000-6999). We lose about 6,000 observations for which we cannot calculate Tobin's q due to missing data in Compustat and CRSP. In the specifications where we condition on a concurrent change in CEO or chairman, we lose an additional 6,000 firm-years, because Compact Disclosure does not report data for all firm-year observations. Our final sample contains 22,000 firm-year observations for 4,925 different firms.

⁴ The director and officer lists contain spelling mistakes and inconsistencies across sample observations. We use a sequence of automated programs to standardize names and match directors and officers across years in the Compact Disclosure database so that we can identify changes in the CEO and chairman position.

Section 3. Managerial ownership in U.S. firms: Time-series evidence

Table 1 shows time-series summary statistics of our ownership data. The data is grouped by fiscal year. Our dataset has more than 1,500 firms every year except for the first three years. The number of firms peaks in 1999 and falls afterwards.

The next two columns in Table 1 show the mean and median managerial ownership for our sample years. Both the average and the median fluctuate over time, but there is no clear evidence of a time trend. It is well-known that smaller and younger firms have higher managerial ownership, so that we would expect the average and median managerial ownership to be affected by entrants and exits.

In their well-known study of corporate ownership, La Porta, Lopez-de-Silanes, and Shleifer (1999) consider firms to be widely held when the controlling shareholder holds less than 20% of a firm's votes according to one metric and less than 10% according to the other metric. Here, we have data on ownership of cash flow rights by directors and officers. We see that, on average, more than 40% of the firms in our sample would not be widely held according to a 20% threshold.⁵ The fraction of firms with more than 20% managerial ownership stays relatively constant over time. We also see that in a typical year managers have majority control in more than 10% of the firms.

The managerial discretion model predicts that managerial ownership falls as a firm ages, everything else equal. The evidence of Table 1 is supportive of this prediction. For existing firms inside ownership decreases each year by 0.9% on average. The average decrease in ownership is statistically significant at the 10% level in all 16 sample years and statistically significant at better than the 1% level in 13 out of 16 years. The median change is negative, but smaller in absolute value. Though the median is positive in some years, the overall median is significantly negative at the 1% level. The difference between the average and the median is not surprising. A large

⁵ Because we use ownership by directors and officers, we may overstate the number of widely held firms. For instance, institutional investors could own large blocks without having board representation.

number of changes in managerial ownership are extremely small and are not economically meaningful. This fact is emphasized by Zhou (2001) who points out that managerial ownership is typically slow-moving. The median is dominated by such small changes, while the mean is not.

Another perspective on ownership changes can be obtained by considering separately positive changes versus negative changes. It is immediately apparent that every year the mean of negative changes is about 50% higher in absolute value than the mean of positive changes. Consequently, decreases in ownership tend to be on average substantially larger than increases.

To focus on economically meaningful changes, we investigate changes of ownership larger than 2.5% in absolute value. On average, about a third of firms experience such large changes in a year. A firm is much more likely to experience a large drop than a large increase. The probability of a large decrease (21.2%) is almost twice the probability of a large increase (12.4%). This result is striking because, in our sample, all firms can experience a large increase but some firms cannot experience a large decrease because their managerial ownership is already below 2.5%.

Changes in ownership in excess of 2.5% in absolute value explain most of the variation in changes in managerial ownership. In Table 2, we establish that the change in ownership is primarily caused by large changes in ownership. We estimate the following regression for each year of our sample period:

$$\begin{aligned} \text{Change in ownership}_t &= c + \beta \times \text{Change in ownership}_t | \text{Change} < -2.5\% \\ &+ \gamma \times \text{Change in ownership}_t | \text{Change} > 2.5\% + \varepsilon_t \end{aligned}$$

The R-squared of the regressions in Table 2 exceeds 98% each year. Therefore, the change in managerial ownership is mostly determined by large changes, and we focus the analysis of the determinants of managerial ownership on the large changes in ownership. We acknowledge that the 2.5% cut-off is arbitrary. We have repeated our analysis by defining a large change as a 1%, 4%, and 5% change, with quantitatively and qualitatively similar results.

Section 4. The determinants of large changes in ownership

The contracting and managerial discretion approaches discussed in Section 2 make predictions about the determinants of changes in managerial ownership. In this Section, we investigate the determinants of changes in ownership in excess of 2.5%. We estimate probit regressions for large increases and large decreases in ownership. Table 3 describes the data we use for this investigation. The sample includes 6,015 large decreases, 3,488 large increases, and 18,609 observations with no large changes. Interestingly, both firms experiencing large increases and large decreases have significantly higher ownership than firms experiencing no large changes. Firms experiencing large decreases have significantly higher ownership before the decrease than firms with large increases, but after the change they have significantly lower ownership than the firms that experienced a large increase.

Firm characteristics differ significantly among the three groups of firms. However, because of the large number of observations, relatively small differences in firm characteristics are significant. As we discuss in Section 2, firms with greater information asymmetries should have higher ownership according to the contracting theory. Strikingly, firms that experience large decreases in ownership appear to be firms with greater information asymmetries if one believes that firms with greater information asymmetries are firms with more R&D expenditures, with more capital expenditures, with a lower ratio of PPE/Assets, and with no dividends. The univariate statistics are therefore largely inconsistent with the contracting theory. Firms which experience large drops in ownership have the highest average Tobin's q. Such a result is puzzling given the predictions of both the agency and contracting theories.

The result that firms which experience a large drop in ownership have a high Tobin's q is consistent with existing literature. For instance, Jenter (2005) provides evidence that managers sell when firms have done well and ascribes a timing motive to managers. Even though the timing motive does not provide a theory of the level of managerial ownership, it does offer predictions

for the dynamics of ownership. With the timing motive, we would expect firms to perform poorly following managerial sales. Jenter (2005) does not find evidence supportive of this prediction.

We also investigate whether firms experience changes in CEO or in the chairman of the board that could be associated with large changes in ownership (e.g, Denis and Sarin (1999)). For instance, a retiring CEO who has a large ownership stake could sell shares upon retirement. There is evidence that firms experiencing a large drop are more likely to have a concurrent change in CEO or in the chairman of the board. Such a result is not consistent with simple contracting theories in which managerial ownership is determined by firm fundamentals only.

In the last panel, we summarize the Center for Research in Security Prices (CRSP) variables we use. There are extremely large differences in stock performance between the three groups of firms. Firms experiencing large drops in ownership are extremely good performers in the year of the drop and the year before. In contrast, firms experiencing large increases are poor performers. We also see that NASDAQ firms experiencing large decreases in ownership have high turnover compared to the other firms, but this is not the case for NYSE firms. Differences in idiosyncratic volatility between the three groups of firms do not seem to be economically meaningful. Firms that experience large changes are younger and the firms that experience large decreases are the youngest.

To better understand which type of firms experience large changes, we estimate multiple probit regressions in Table 4. Strikingly, high managerial ownership is a good predictor of a large drop in managerial ownership. This is consistent with the prediction of the managerial discretion theory that firms start with high managerial ownership and that managers want to reduce their ownership. With that theory, a high level of managerial ownership is typically not a steady-state level of managerial ownership.

Older, larger dividend-paying firms are less likely to experience a large drop in ownership. Concurrent changes in the CEO or in the chairman of the board make it more likely that a firm will experience a large drop in managerial ownership. Such a result is hard to explain with

contracting models in which managerial ownership depends only on firm characteristics. It is consistent with the managerial discretion model because in that model ownership depends on the preferences and wealth of the management.

Firms are more likely to experience large drops in ownership if they have more R&D, a smaller ratio of PPE to assets, and smaller idiosyncratic volatility. Though the idiosyncratic volatility result could be reconciled with the contracting approach, the other two results are inconsistent with the predictions of that approach. Finally, firms are more likely to experience a large drop if they have high share turnover and high contemporaneous and lagged stock return performance. These results are again consistent with the managerial discretion approach.

When we turn to the firms that experience a large increase, we see that firms with high levels of managerial ownership are less likely to experience a large increase. We find again that more established firms are less likely to experience a large change, but the number of years since listing is not significant. Firms with better performance and higher turnover are less likely to experience a large increase.

The contracting and managerial discretion approaches suggest that changes in ownership should result from changes in firm characteristics. To explore the predictions from the theories, we use as explanatory variables the changes in firm characteristics from the year before to the year of the large change in ownership. Since returns are changes in the value of the common stock, we do not difference returns. The results are shown in Table 5.

Table 5 shows that a firm's contemporaneous and lagged stock returns are significant predictors of large decreases in ownership. In contrast, the contemporaneous stock return is not significant in the regression for large increases and the lagged stock return is only significant at the 10% level with a coefficient in absolute value roughly half the coefficient of the large decrease regression. The regressions demonstrate a lack in symmetry in the relation between stock returns and large ownership changes when we separate large decreases and large increases. This asymmetry can not be explained by contracting models which predict a monotonic, but not

causal, relation between optimal managerial ownership and firm value. However, such an asymmetry makes sense in the context of the managerial discretion theory. With that theory, we expect ownership to fall as the firm does well enough that managers can reduce their ownership without any adverse effect. In contrast, managers increase their stake when doing so helps them maintain or increase the value of their stake in the firm and the value of their private benefits. There is no reason for poor stock returns alone to indicate to management that a greater stake will be beneficial.

Large decreases and increases in managerial ownership are more likely if the level of managerial ownership is high. The probability of a large decrease in managerial ownership as well as the probability of a large increase is negatively related to the change in managerial ownership of the previous year. It would not be surprising if managers reduced their ownership over time in such a way as to limit the market impact of their trades. In this case, past decreases would predict future decreases, which is what we observe. However, it is puzzling that large increases are more likely following decreases in ownership.⁶ Firms with an increase in R&D are more likely to experience a decrease in ownership and less likely to experience an increase in ownership, which seems inconsistent with the contracting theory. Firms that stop paying dividends are more likely to experience an increase in managerial ownership, but there is no association of dividend termination or initiation with a large decrease in ownership. Firms that increase in size are more likely to experience a large decrease in ownership and less likely to experience a large increase. Changes in turnover are never significant for NYSE firms. For NASDAQ firms, an increase in turnover makes it less likely that a firm will experience a large increase in ownership and more likely that a firm will experience a large decrease in ownership. Finally, firms with a COB or CEO change are more likely to experience a decrease in ownership

⁶ One concern we had with this result is that it could be driven by reversals due to data errors. We therefore investigated cases of large decreases followed by large increases. We concluded that the cases we examined were not explained by data errors, but rather by managerial changes.

but not more likely to experience an increase in ownership. The probability of a large change in ownership is not related to a change in the chairman of the board.

A concern one might have with our regression estimates is that we estimate the same equation for firms with very different levels of ownership. To investigate whether our results depend on the level of ownership, we re-estimate the regressions for large decreases and increases in ownership for quintiles of ownership with breakpoints determined annually but do not report the results in a table. The sample for each regression is one fifth of the sample for the regressions of Table 5. It is not surprising, therefore, that the level of significance drops. Most variables are not consistently significant across the five quintiles. However, the contemporaneous return is positive and significant across the five quintiles for large decreases in ownership. The coefficients on R&D, firm size, and the past return are positive and significant for four quintiles in the probit regressions for large decreases. The ownership level is significant in three regressions, but it is negative and significant for the two quintiles with the lowest ownership and positive and significant for the quintile with the highest ownership in the large decrease regressions. The other firm characteristics are significant in at most two regressions. These regressions suggest therefore that the coefficients on firm characteristics other than R&D, firm size, and returns are fragile once we split the sample into ownership quintiles and re-estimate the large decrease regressions. As for the regressions by ownership quintile of large increases, very few variables are significant. The contemporaneous return is never significant at the five percent level. The lagged change in ownership is negative and significant in the three highest quintiles. Decreases in the book value of assets in the prior period make it more likely that ownership increases in three out of five quintiles.

Managerial ownership is defined as the ratio of the number of shares held by managers divided by the total number of shares outstanding. This definition is conventional, but it provides an incomplete assessment of the incentive effects of managerial ownership changes because managerial ownership defined this way could fall even though managers increase the number of

shares they hold. Such an outcome is possible if a firm increases its number of shares by a sufficiently large amount. We know from the literature that firms issue shares following good performance and when q is high. Hence, it could be that the negative relation between the probability of a large decrease in managerial ownership and q is simply due to an increase in the number of shares. One would generally expect a decrease in managerial ownership brought about by an increase in the number of outstanding shares to affect managerial incentives differently from a decrease in managerial ownership resulting from a sale of shares by management. To allow for such a differential effect, we decompose the change in the ownership share of insiders. To perform this decomposition, we follow Helwege, Pirinsky, and Stulz (2007) and define $\Delta\alpha_t$ to be the change in the ownership share of insiders from t to $t+1$, S_t to be the number of shares held by insiders at date t , $S_{t+1} = S_t + \Delta S$ the number of shares held by insiders at date $t+1$, and N_t the firm's number of outstanding shares at date t . The ownership share of insiders at t , α_t , is equal to S_t/N_t . With this notation, we have:

$$\begin{aligned}
\Delta\alpha_t &= \left(\frac{S_{t+1}}{N_{t+1}} \right) - \left(\frac{S_t}{N_t} \right) = \frac{S_{t+1}}{N_{t+1}} - \frac{S_{t+1} - \Delta S}{N_t} = \frac{\Delta S}{N_t} + \frac{S_{t+1}}{N_{t+1}} - \frac{S_{t+1}}{N_t} \\
&= \frac{\Delta S}{N_t} + \frac{S_{t+1}N_t}{N_{t+1}N_t} - \frac{S_{t+1}N_{t+1}}{N_tN_{t+1}} = \frac{\Delta S}{N_t} - \frac{S_{t+1}\Delta N}{N_{t+1}N_t} \\
&= \frac{\Delta S}{N_t} - \alpha_{t+1} \frac{\Delta N}{N_t}
\end{aligned} \tag{1}$$

The first term in the last line of equation (1) is the change in α explained by changes in the number of shares held by insiders (the numerator of the fractional ownership formula). The second term is the change in insider ownership brought about by a change in the number of shares outstanding (the denominator of the fractional ownership formula).

Table 6 shows the marginal effects of probit regressions of the decomposed large decrease in ownership (columns 1 and 2) and of the decomposed large increase in ownership (columns 3 and 4) on economic determinants. We set the indicator variable for a large decrease or increase in

shares held equal to one if the first term of equation (1) exceeds 2.5% in absolute value, and we set the indicator variable for a large increase or decrease in shares outstanding equal to one if the second term is greater than 2.5% in absolute value. It is quite clear that managers are more likely to sell shares when the firm's stock market performance is good contemporaneously and was good the previous year. There is no evidence that they make large purchases of shares when the firm's stock market performance is poor or was poor. Such evidence is hard to reconcile with timing theories of changes in managerial ownership. Firms whose assets grow are more likely to experience managerial sales and equity issues, and are less likely to experience managerial purchases and share repurchases. An increase in leverage, a termination of dividends, and a drop in turnover (for NASDAQ firms only) make it more likely that insiders will buy shares. As idiosyncratic volatility increases, managers are less likely to increase the firm's total number of shares. Changes in idiosyncratic volatility are not related to the probability of large sales or large purchases of shares by managers. A change in the chairman of the board or in the chief executive officer makes it more likely that shares held by managers will experience a large drop.

The evidence in Table 6 suggests that managers sell shares when the firm's stock is performing well and its assets are growing. In contrast, contemporaneous and lagged firm returns are not significant in the regression for large purchases of shares. The variables that are significantly related to large purchases are variables that proxy for financial constraints. In particular, managers are more likely to buy shares if the firm stops paying dividends and if the firm's leverage increases. Asset growth makes it less likely that managers will buy shares. There is no evidence that managerial ownership changes are negatively related to idiosyncratic volatility changes.

There is a striking asymmetry between the determinants of large decreases in managerial ownership and of large increases in managerial ownership. Firm characteristics besides returns seem more important in explaining large increases in the number of shares than large decreases in shares held by managers. In contrast, firm characteristics besides returns seem more important in

explaining large increases in shares held by managers than they are in explaining large decreases in shares outstanding. There is nothing in the contracting theory which suggests such an asymmetry. In fact, with that theory, firm characteristics besides returns should play a key role in explaining changes in managerial ownership and they should explain changes in managers' share holdings.

Section 5. Dynamics of managerial ownership and Tobin's q

In this section, we examine how changes in managerial ownership are related to changes in Tobin's q. We start with an investigation of the relation between changes in Tobin's q and past changes in managerial ownership. These regressions answer the question of whether a decrease in managerial ownership is followed by a decrease in q. Since the changes in q follow the change in managerial ownership and we estimate a firm-fixed effects regression to control for unobservable firm characteristics, it is reasonable to treat the change in managerial ownership as exogenous relative to the change in q.

Table 7 reports the results of the regressions of changes in q on lagged changes in ownership. We control for firm and year fixed effects and allow for clustering at the firm level. Strikingly, the first regression is extremely supportive of the literature that concludes that there is a positive impact of ownership on firm value. The coefficient on the lagged change in ownership is positive and significant. The result might seem surprising in light of the inability of Himmelberg, Hubbard, and Palia (1999) to find a significant relation in regressions using fixed effects. However, their regressions use levels of variables instead of changes, and they focus on the contemporaneous relation between Tobin's q and ownership. Further, our panel is larger, both with respect to the cross-section and the time series, and has more heterogeneous managerial ownership. In the next regression, we distinguish between lagged increases in ownership and lagged decreases. The regression coefficients are significant for the lagged increases as well as

the lagged decreases. Note that a positive coefficient on lagged decreases means that a decrease in ownership precedes a decrease in Tobin's q . The regressions reproduced in columns 1 and 2 use explanatory variables that are common in the literature. In columns 3 and 4, we re-estimate these regressions but include the stock performance variables we found to be particularly important in predicting changes in ownership. Adding the stock performance variables reduces sharply the size of the coefficient on lagged changes in ownership. The coefficient is still significant, but now it is only significant at the 10% level. In column 4, we re-estimate the regression where we allow for different slopes for lagged increases in ownership and lagged decreases. Now, the coefficient on lagged decreases in ownership is no longer significant but the coefficient on lagged increases in ownership is similar to what it was in column 2. The final two columns use indicator variables for large changes. Column 5 shows that large increases and large decreases have again significant coefficients indicating that large increases precede an increase in q and large decreases precede a decrease in q . However, when the stock market performance variables are added, there is no relation between large decreases in ownership and subsequent changes in q . The relation between large increases in ownership and increases in q is preserved.

Table 7 shows that it is critical in such regressions to control for stock market performance because large decreases in ownership are much more likely to occur after good performance. If there is a relation between stock market performance and future changes in q , the coefficient on the change in managerial ownership is biased when stock market performance is omitted. In Tables 5 and 6, we saw that stock market performance plays a much bigger role in explaining large decreases in ownership than it does in explaining large increases in ownership. It is therefore not surprising that controlling for concurrent and past stock returns has a much greater impact on the coefficient for ownership decreases than for ownership increases.

To understand better the relation between managerial ownership changes and changes in Tobin's q , we now decompose the managerial ownership change into the change caused by managerial purchases or sales and the change caused by changes in the number of shares

outstanding. We report the results in Table 8. The results strengthen the asymmetry highlighted in Table 7. We see that there is no relation between past large decreases in shares owned by management and future changes in Tobin's q . Though there is a negative relation between large increases in shares outstanding and future changes in Tobin's q when we do not control for past stock returns, this relation is weaker when we use the indicator variable and disappears for the level variable. In contrast, the relation between past large increases in shares held by management and future changes in Tobin's q is positive and significant at the 10% level in each specification. The relation between decreases in shares outstanding and Tobin's q is insignificant in three specifications out of four.

Tables 7 and 8 provide no evidence that large decreases in managerial ownership lead to decreases in Tobin's q . However, there is evidence that large increases in managerial ownership lead to increases in Tobin's q . A concern with our evidence is that theories do not necessarily predict a monotone relation between ownership and firm value. For instance, Morck, Shleifer, and Vishny (1988) and Stulz (1988) predict that firm value increases with share ownership up to a point and falls after that point over some range. It could be, therefore, that we do not find a negative relation between a decrease in ownership and change in firm value because we include both firms for which ownership decreases increase firm value and firms for which they decrease firm value. Following Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990), the cross-sectional literature takes into account the non-monotonicity of the relation between firm value and ownership by allowing this relation to be non-linear. With our approach, allowing for non-linearities does not really address the issue we are concerned about. A large decrease in ownership could have a positive impact if ownership is high and a negative impact if ownership is low.

We could re-estimate our regressions allowing the relation between ownership changes and changes in q to be conditional on the level of ownership. Alternatively, we can estimate our regressions separately for firms that have different levels of ownership. Table 9 shows estimates

of the regression of column 2 of Table 8 for different ownership quintiles. We form quintiles yearly, but the breakpoints remain stable over time. The results in Table 9 show that the coefficients on large increases and decreases in shares held by management are never significant. The coefficient on the large increase in shares outstanding indicator variable is negative and significant in three quintile regressions, which suggests that decreases in Tobin's q are driven by past increases in shares outstanding rather than active selling by managers.

One may argue that the quintile regressions of Table 9 are more likely to suffer from the critique by Zhou (2001) that a firm-fixed effects regression would not be able to identify effects when there is little time variation. We therefore repeat the regressions of Table 9 with industry-fixed effects (not reported). At the five percent level, there is no quintile in which large decreases in shares held by management are associated with changes in Tobin's q and one quintile (quintile 3) in which large increases in shares held by management are positively associated with changes in Tobin's q .

Together, Tables 7 through 9 show that estimates of the relation between past changes in managerial ownership and changes in Tobin's q are sensitive to controlling for past stock returns. Without controlling for past stock returns, there is a linear relation between changes in Tobin's q and past changes in managerial ownership. However, after controlling for past stock returns, there is only evidence of a relation between large increases in managerial ownership and changes in Tobin's q . When we decompose the change in managerial ownership into changes in the numerator (shares held by managers) and changes in the denominator (shares outstanding), we find that increases in shares held by managers are associated with future increases in Tobin's q , but the effect is not strong enough to hold up when we split the sample into size quintiles. All this evidence is inconsistent with the predictions of the agency theory and of the contracting theory since neither of these theories predict that there is a relation between Tobin's q and past changes in managerial ownership only for past increases in managerial ownership. The evidence is consistent with the managerial discretion theory, because it predicts that managers will not sell

shares when doing so will have an adverse impact on the firm, but may buy shares to increase firm value, perhaps for signaling reasons or to provide financing to a financially constrained firm.

Section 6. Dynamics of managerial ownership and Tobin's q: The contemporaneous relation

We now turn to the contemporaneous relation between changes in Tobin's q and changes in ownership. Admittedly, the contemporaneous relation is harder to evaluate because the change in Tobin's q could be causing the change in ownership. However, the focus of the existing literature has been on how endogeneity could explain a positive relation between Tobin's q and managerial ownership. If we were to find a different relation or no relation at all, our finding would have important implications for that literature. In column 1 of Table 10, we use indicator variables for large changes. Surprisingly, both large increases and large decreases in managerial ownership are associated with positive increases in Tobin's q. One might be tempted to argue that this shows that firms always move towards the optimum, but things are more complicated as revealed when we decompose the large increases and the large decreases as we did before. In column 2, we use indicator variables. We find that there is no contemporaneous relation between large decreases in shares held by managers and changes in Tobin's q, but there is a positive relation between changes in q and large increases in shares held. We find that large increases in shares outstanding are associated with an increase in q and large decreases with a decrease in q. In the last column, we use actual changes in the ownership variables conditional on large changes. We show that the variables associated with large increases in shares held by management are insignificant. In contrast, the variables associated with large decreases are significant. Large decreases in shares held by management are associated with firm value increases and large increases in shares outstanding are associated with firm value increases as well. Though we do not reproduce the results in a table, we also estimate regression (1) of Table 10 for quintiles of ownership. We find

that the coefficient on large increases in ownership is never significant but the coefficient on large drops is positive and significant for quintiles 2, 3, and 4.

McConnell, Servaes, and Lins (2006) examine the announcement return associated with insider purchases. They find that the announcement return first increases in pre-purchase insider ownership and then falls. In contrast, we find mixed evidence on the relation between changes in firm value and large increases in firm ownership. We show that there is a positive relation between the change in q and the indicator variable for large increases in insider ownership, but we find no relation between the change in q and the level of the large increase in insider ownership. When we investigate whether the relation between the change in q and the change in insider ownership depends on the level of insider ownership, we find no evidence that q increases for large increases in ownership by managers with low insider holdings.

The sample of McConnell, Servaes, and Lins (2006) differs substantially from ours. In particular, they use insider purchases from 1994 through 1999, while we investigate changes in managerial ownership from 1988 through 2003. Much of our analysis focuses on managerial ownership changes of at least 2.5%. In contrast, their median insider purchase is for 0.15% of a firm's outstanding number of shares (even though they only include purchases of at least 10,000 shares). They focus only on open market insider purchases whereas we focus on the change in managerial ownership irrespective of how that change came about. These sample differences could explain the difference in the results. They argue that an advantage of their approach is that it is less likely that other events will affect the change in firm value over the short period of time over which they measure the change in firm value. This advantage might also contribute to the difference between our results and theirs, but our approach is powerful enough to find coefficients that are inconsistent with the agency approach when we investigate managerial ownership decreases (which they do not consider).

Section 7. Conclusion

In this paper, we investigate the dynamics of managerial ownership and their implications for firm value. We find that managerial ownership is more likely to fall when the firm's stock performs or has performed well. However, managerial ownership is not more likely to increase when the stock is performing poorly and there is only a weak relation between past poor performance and managerial ownership increases. Such an asymmetry in the relation between managerial ownership and stock returns cannot be explained in a straightforward way by contracting models. We also find that the relation between the probability of large changes in ownership and changes in firm characteristic is, for some variables such as R&D, inconsistent with the predictions of contracting models.

We then turn to the relation between changes in ownership and changes in Tobin's q . We find the same asymmetry we document when studying the dynamics of managerial ownership. We find no evidence that past decreases in managerial ownership lead to decreases in Tobin's q , but we find some evidence that past increases in managerial ownership lead to increases in Tobin's q . When we estimate the contemporaneous relation between changes in Tobin's q and changes in managerial ownership, we find that both large decreases and large increases in managerial ownership are associated with an increase in Tobin's q . Consequently, the relation between changes in firm value and changes in ownership is u-shaped. The correlation between ownership decreases and Tobin's q increases is driven by the fact that insiders sell when the stock is performing well and firms issue equity when the stock is performing well. While none of our evidence is consistent with a negative relation between ownership changes and changes in Tobin's q for some range of ownership levels, some of our evidence supports the view that an increase in managerial ownership is associated with an increase in Tobin's q . The lack of a negative relation between changes in Tobin's q and contemporaneous or lagged decreases in managerial ownership for any level of managerial ownership is hard to reconcile with the agency theory.

To make sense of our evidence, we argue that a new theory of managerial ownership is required. With this theory, managerial ownership is driven by insiders' objective to maximize their welfare. Insiders own shares to provide financing, to signal that the firm has high value, to convince outsiders that they have the right incentives, and to protect their control of the firm. Insiders reduce their ownership when they can do so without taking the risk of losing control of the firm, of decreasing the value of their stake, and of decreasing the value of their private benefits of control. As a result, insiders sell when the firm is doing well and has done well because the market for the shares is liquid and because their control of the firm is secure. Insiders buy shares when doing so is beneficial to them. They may do so when a contest for control becomes more likely, when they want to decrease the firm's cost of capital, and when they are the cheapest source of financing for the firm. It is possible for all these motives for managerial ownership increases to lead to increases in the share price. It is perfectly possible for the firm's performance to be poor and yet for insiders to choose not to increase their ownership stake. We call this the managerial discretion theory of inside ownership. Future work should develop and test this theory further, but we are optimistic that it provides a good foundation for understanding both the dynamics of managerial ownership and the relation between changes in managerial ownership and firm value.

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Table 1: Summary Statistics for Average Ownership Levels and Changes by Calendar Year

The table shows sample summary statistics of the director and officer ownership data. The sample period is fiscal year end 1988 to 2003. The data is listed by fiscal year. Number of firms is the number of firms for each fiscal year for which we have complete data on the change in ownership and other key variables as explained in section 2. D & O ownership is the average level of officer and director ownership as of the record date. Change in ownership is the average change in D & O ownership from one fiscal year to the next. Positive change is the change in D & O ownership conditional on a positive change, and negative change is the change in D & O ownership conditional on a negative change. A large drop (large increase) in the level of D & O ownership is defined as a change in ownership of at least minus (plus) 2.5 percent. The last four columns show the percentage of firms that have an ownership level of at least 20, 30, 40, or 50 percent, respectively.

Fiscal Year	Number of Firms	D&O ownership		Change ownership		Positive change		Negative change		% of firms with		% of firms with ownership level			
		Mean	Median	Mean	Median	Mean	Median	Mean	Median	Large drop	Large increase	> 20 %	> 30%	>40%	> 50%
1988	845	23.1%	17.4%									45.2%	31.8%	21.9%	13.4%
1989	1396	24.4%	19.6%	-0.6%	-0.1%	1.6%	0.0%	-2.1%	-0.1%	19.5%	14.0%	49.3%	33.9%	22.5%	13.8%
1990	1404	24.8%	19.9%	-0.5%	0.0%	1.6%	0.0%	-2.1%	0.0%	19.2%	13.7%	49.8%	35.8%	23.4%	14.9%
1991	1532	24.4%	19.1%	-1.2%	-0.2%	1.4%	0.0%	-2.7%	-0.2%	23.3%	12.8%	48.6%	34.9%	23.2%	13.7%
1992	1588	23.3%	17.6%	-1.0%	-0.2%	1.4%	0.0%	-2.3%	-0.2%	21.9%	11.1%	45.8%	32.6%	21.2%	13.2%
1993	1668	21.2%	15.2%	-1.5%	-0.3%	1.1%	0.0%	-2.7%	-0.3%	23.5%	8.5%	41.3%	28.6%	17.3%	10.0%
1994	1812	21.1%	14.9%	-1.1%	-0.1%	1.0%	0.0%	-2.1%	-0.1%	19.9%	9.1%	41.9%	27.6%	17.3%	10.2%
1995	1761	21.8%	15.9%	-1.3%	-0.2%	1.2%	0.0%	-2.5%	-0.2%	23.2%	10.2%	42.6%	28.5%	17.8%	10.7%
1996	1575	21.7%	14.6%	-1.4%	-0.2%	1.3%	0.0%	-2.6%	-0.2%	24.4%	10.5%	41.1%	28.6%	18.6%	11.5%
1997	1746	21.4%	14.8%	-1.7%	-0.2%	1.2%	0.0%	-2.8%	-0.2%	24.6%	10.4%	40.3%	28.1%	17.4%	11.2%
1998	2134	22.4%	15.8%	-0.3%	0.0%	1.6%	0.0%	-2.0%	0.0%	19.0%	14.7%	42.4%	29.7%	19.4%	11.9%
1999	2313	22.9%	16.4%	-0.5%	0.1%	1.7%	0.1%	-2.1%	0.0%	20.6%	16.3%	44.1%	30.2%	19.7%	12.5%
2000	2270	23.0%	15.6%	-0.7%	0.0%	1.5%	0.0%	-2.2%	0.0%	21.1%	16.3%	43.5%	30.1%	21.4%	13.8%
2001	2070	22.4%	15.1%	-0.7%	0.0%	1.6%	0.0%	-2.3%	0.0%	20.8%	13.4%	41.7%	29.0%	19.7%	12.9%
2002	1743	21.5%	14.5%	-0.6%	0.1%	1.3%	0.1%	-1.9%	0.0%	17.5%	14.0%	40.3%	27.2%	19.2%	11.6%
2003	1779	19.1%	11.8%	-1.7%	-0.2%	1.2%	0.0%	-2.9%	-0.2%	25.0%	8.5%	34.6%	22.3%	15.3%	8.6%
Overall	27636	22.4%	15.8%	-0.9%	-0.1%	1.4%	0.0%	-2.3%	-0.1%	21.2%	12.4%	43.3%	29.9%	19.7%	12.1%

Table 2: Are ownership changes caused primarily by large increases and decreases of at least 2.5 percent?

The table shows results of annual ordinary least squares regressions of the percentage D&O ownership change on decomposed changes in percentage ownership. The two independent variables, large negative change and large positive changes, are defined as follows. Large negative change is equal to the change in D&O ownership if D&O ownership is smaller than -2.5%, and zero otherwise. Large positive change is equal to the change in D&O ownership if D&O ownership is larger than 2.5%, and zero otherwise. The last row reports coefficients from a pooled time-series/cross-sectional regression. All coefficients are highly significant. The sample is described in detail in section 2.

Fiscal Year	Number of obs.	Large neg. change	Large pos. change	Adjusted R-square
1988	845	1.002	0.997	0.986
1989	1396	0.998	1.002	0.990
1990	1404	1.000	1.000	0.989
1991	1532	0.996	1.004	0.991
1992	1588	0.995	1.004	0.990
1993	1688	0.995	1.004	0.990
1994	1812	0.998	1.002	0.982
1995	1761	0.997	1.003	0.988
1996	1575	1.000	1.000	0.987
1997	1746	0.999	1.001	0.989
1998	2134	1.004	0.997	0.986
1999	2313	1.008	0.993	0.985
2000	2270	1.002	0.998	0.986
2001	2070	1.003	0.998	0.989
2002	1743	1.006	0.991	0.984
2003	1779	0.999	1.000	0.990
Pooled	27636	1.000	1.000	0.988

Table 3: Summary Statistics of data by data source

The table reports means and medians of the variables employed in the regressions. Variables are reported by database of origin. The first two columns report means and medians for all firm-year observations in which neither a large increase or decrease of at least 2.5% in D&O ownership is observed. Columns 3 and 4 report means and medians across all firm-year observations in which a decrease of at least 2.5% in D&O ownership is observed. Columns 5 and 6 report means and medians across all firm-year observations in which an increase of at least 2.5% is observed. The last three columns report p-values of Wilcoxon rank tests for equality of medians across the three groups. From the main Compact Disclosure database, we derive all variables for D&O ownership. From the CompactDisclosure Director database, we derive changes in the chief executive officer and chairman of the board position. From the CRSP database, we calculate firm-, industry- and market-returns over the previous two fiscal years, annualized average daily NYSE turnover, annualized average daily NASDAQ turnover, idiosyncratic volatility estimated from a market model and based on daily returns, and years since the first listing on CRSP. From the Compustat database, we derive research and development expenditures over assets; a no R&D dummy equal to 1 if the firm has missing research and development expenditures for that year; a dividend payer indicator variable, equal to 1 if the firm has paid a dividend in that year; the logarithm of book-value-of-assets; capital expenditures over assets; a proxy for Tobin's q, defined as the ratio of the market value of assets to the book value of assets, where the market value is calculated as the sum of the book value of assets and the market value of common stock less the book value of common stock and deferred taxes; free cash flow, defined as EBITDA over sales; property, plant, and equipment over total assets; and leverage, defined as total liabilities over book value of assets. All Compustat variables are winsorized at the 1% and 99% level, respectively

	No change 18609 obs.		Large Drop 6015 obs.		Large Increase 3488 obs.		Wilcoxon Test of equality of medians (p-values)		
	Mean	Median	Mean	Median	Mean	Median	No chg. vs.	No chg. vs.	Lg. drop vs.
							Large drop	Lg. increase	Lg. increase
CompactDisclosure Variables									
Percentage ownership	18.9%	11.0%	24.4%	20.6%	36.3%	32.9%	0.000	0.000	0.000
Percentage ownership (t-1)	18.9%	11.1%	34.1%	30.7%	27.4%	23.3%	0.000	0.000	0.000
Percentage ownership (t-2)	19.5%	11.7%	35.2%	32.4%	28.6%	25.1%	0.000	0.000	0.000
Change in percentage ownership	0.0%	0.0%	-9.7%	-6.4%	8.9%	5.2%	0.000	0.000	0.000
Ownership > 20%	34.4%	0.0%	51.1%	100.0%	73.5%	100.0%	0.000	0.000	0.000
Ownership > 30%	23.9%	0.0%	32.4%	0.0%	54.8%	100.0%	0.000	0.000	0.000
Ownership > 40%	16.1%	0.0%	18.6%	0.0%	38.8%	0.0%	0.000	0.000	0.000
Ownership > 50%	9.9%	0.0%	10.0%	0.0%	26.1%	0.0%	0.890	0.000	0.000

Table 3, continued

	No change 18609 observations		Large Drop 6015 observations		Large Increase 3488 observations		Wilcoxon Test of eq. of medians (p-values)		
	Mean	Median	Mean	Median	Mean	Median	No-drop vs. Large drop	No-drop vs. Lg. increase	Lg. drop vs. Lg. increase
Compustat Variables									
R&D / assets	0.04	0.00	0.06	0.00	0.05	0.00	0.000	0.000	0.000
No R&D dummy	0.52	1.00	0.52	1.00	0.47	0.00	0.450	0.000	0.000
Dividend Payer	0.38	0.00	0.16	0.00	0.19	0.00	0.000	0.000	0.000
Log (book value of assets)	5.38	5.21	4.36	4.28	4.16	4.08	0.000	0.000	0.000
Capex / assets	0.07	0.05	0.07	0.05	0.07	0.04	0.000	0.000	0.000
Q	1.95	1.39	2.26	1.51	1.62	1.18	0.000	0.000	0.000
Free Cash Flow	0.09	0.11	0.03	0.09	0.03	0.08	0.000	0.000	0.000
PPE / Assets	0.31	0.26	0.27	0.20	0.28	0.22	0.000	0.000	0.002
Leverage	0.42	0.41	0.42	0.40	0.44	0.43	0.165	0.000	0.000
CompactDisclosure – Directors									
Concurrent change in CEO	10.6%	0.0%	12.7%	0.0%	11.1%	0.0%	0.000	0.386	0.031
Concurrent change in COB	8.7%	0.0%	12.3%	0.0%	8.7%	0.0%	0.000	0.969	0.000
Change in CEO over next year	9.1%	0.0%	10.2%	0.0%	8.6%	0.0%	0.010	0.367	0.011
Change in COB over next year	10.0%	0.0%	9.1%	0.0%	9.8%	0.0%	0.108	0.814	0.345
CRSP Variables									
Concurrent return	16.1%	4.3%	46.2%	13.1%	16.0%	-3.0%	0.000	0.000	0.000
Concurrent industry return	18.5%	12.1%	25.6%	16.1%	16.0%	9.8%	0.000	0.000	0.000
Concurrent market return	12.8%	14.0%	14.5%	15.2%	11.3%	13.7%	0.000	0.001	0.000
Lagged return	15.9%	2.3%	30.6%	7.1%	8.0%	-6.7%	0.000	0.000	0.000
Lagged industry return	13.6%	9.2%	14.0%	8.9%	12.9%	8.4%	0.393	0.028	0.205
Lagged market return	11.1%	13.6%	10.7%	13.0%	12.3%	13.7%	0.627	0.000	0.001
Turnover NYSE	0.38	0.00	0.19	0.00	0.19	0.00	0.000	0.000	0.002
Turnover NASDAQ	0.85	0.15	1.14	0.67	0.87	0.42	0.000	0.000	0.000
Idiosyncratic volatility	0.04	0.03	0.04	0.04	0.05	0.04	0.000	0.000	0.024
Years since first listing on CRSP	17.46	12.10	10.22	6.67	12.72	8.76	0.000	0.000	0.000

Table 4: Probit regressions of large changes in ownership on economic determinants

The table reports marginal effects of a probit regression of large decreases (column 1) and large increases (column2) in D&O ownership. The dependent variable is equal to one if ownership decreases (increases) by more than 2.5%, and zero otherwise. The regressions are estimated on the pooled time-series and cross-sectional sample. The independent variables are: the percentage of director and officer ownership at the beginning of the year, research and development expenditures over assets; a No R&D dummy, equal to 1 if the firm has missing research and development expenditures for that year; a dividend payer indicator variable, equal to 1 if the firm has paid a dividend in that year; the logarithm of book-value-of-assets; capital expenditures over assets; free cash flow, defined as EBITDA over sales; property, plant, and equipment over total assets; leverage, defined as total liabilities over book value of assets; annualized average daily NYSE turnover if traded on NYSE, and zero, otherwise; annualized average daily NASDAQ turnover if traded on NASDAQ, and zero, otherwise; idiosyncratic volatility estimated from a market model and based on daily returns; firm-, industry- and market-returns over the previous fiscal year; firm-, industry- and market-returns over the current fiscal year; years since the first listing on CRSP; and indicator variables equal to one if the firm has a concurrent change in the chairman or CEO position. All accounting variables are sampled at the end of the previous fiscal year. The regressions include year-fixed effects (not reported). Columns 3 and 4 contain mean and standard deviation of the independent variables to facilitate the interpretation of the marginal effects. Standard errors (not reported) are corrected for clustering at the firm level. (***), (**), and (*) indicate statistical significance of the underlying coefficient at the 1%, 5%, and 10% level, respectively.

	Large drop	Large Increase	Sample	
			Mean	Std. Dev.
D&O ownership (t-1)	0.507***	-0.044***	0.223	0.202
R&D / assets	0.112***	-0.190***	0.047	0.091
No R&D dummy	0.005	0.005	0.379	0.485
Dividend payer	-0.047***	-0.020***	0.324	0.468
Log (book value assets)	-0.008***	-0.033***	5.211	1.889
Capex / assets	0.099*	-0.121***	0.071	0.069
Free cash flow	-0.031***	-0.018*	0.075	0.261
PPE / Assets	-0.052***	0.017	0.301	0.22
Leverage	0.019	0.071***	0.424	0.221
Turnover NYSE	0.027***	-0.017***	0.353	0.585
Turnover NASDAQ	0.019***	-0.005**	0.932	1.46
Idiosyncratic volatility	-0.977***	0.371***	0.038	0.021
Concurrent return	0.034***	-0.006***	0.233	1.117
Concurrent industry return	0.038***	-0.028***	0.2	0.431
Concurrent market return	-0.013	0.030	0.126	0.193
Lagged return	0.023***	-0.015***	0.189	0.994
Lagged industry return	0.018	-0.023***	0.137	0.381
Lagged market return	0.015	0.054*	0.108	0.184
Years since first listing on CRSP	-0.003***	0.000	15.745	15.148
Concurrent change in chairman	0.094***	-0.007	0.092	0.29
Concurrent change in CEO position	0.026***	0.002	0.107	0.309
Number of observations	21792	21792		
Observed probability	0.207	0.120		
Predicted probability	0.172	0.100		
Pseudo-R2	0.138	0.082		

Table 5: Large changes in ownership on changes in explanatory variables

The table reports marginal effects of a probit regression of large decreases (column 1) and large increases (column 2) in ownership (column 2) on changes in dependent variables. The dependent variable in column 1 (column 2) is equal to one if ownership drops (increases) by more than 2.5%, and zero otherwise. The regressions are estimated on the pooled time-series and cross-sectional sample. The independent variables are: the percentage of director and officer ownership at the beginning of the year and the change in D&O ownership over the previous year. Research and development expenditures over assets; a No R&D dummy, equal to 1 if the firm has missing research and development expenditures for that year; a dividend initiation (termination) variable, equal to 1 if the firm has started (ceased) to pay a dividend; the logarithm of book-value-of-assets; capital expenditures over assets; free cash flow, defined as EBITDA over sales; property, plant, and equipment over total assets; leverage, defined as total liabilities over book value of assets; annualized average daily NYSE turnover if traded on NYSE, and zero, otherwise; annualized average daily NASDAQ turnover if traded on NASDAQ, and zero, otherwise; idiosyncratic volatility estimated from a market model and based on daily returns; firm-, industry- and market-returns over the previous fiscal year; firm-, industry- and market-returns over the current fiscal year. All accounting variables are calculated as changes from two fiscal years prior to the end of the previous fiscal year. The regressions include year-fixed effects (not reported). Standard errors (not reported) are corrected for clustering at the firm level. (***) (**), and (*) indicate statistical significance of the underlying coefficient at the 1%, 5%, and 10% level, respectively.

	Large drop	Large increase
Level of D&O ownership	0.534***	0.143***
Change in D&O ownership	-0.257***	-0.181***
Change R&D / assets	0.310***	-0.130**
Change in No R&D dummy	-0.019	-0.006
Dividend initiation	-0.002	-0.020
Dividend termination	-0.025	0.045**
Change in Log (book value assets)	0.092***	-0.054***
Change in Capex / assets	-0.099*	-0.048
Change in Free cash flow	0.009	0.021
Change in PPE / Assets	0.102*	-0.017
Change in Leverage	0.027	0.078***
Change in Turnover NYSE	-0.004	-0.001
Change in Turnover NASDAQ	0.007*	-0.008**
Change in Idiosyncratic volatility	-0.245	0.339
Concurrent return	0.036***	-0.004
Concurrent industry return	0.058***	-0.029***
Concurrent market return	-0.051	0.038
Lagged return	0.023***	-0.013*
Lagged industry return	0.036***	-0.020**
Lagged market return	0.016	0.080**
Concurrent change in COB	0.090***	-0.012
Concurrent change in CEO	0.024**	-0.006
Number of observations	17040	17040
Observed probability	0.195	0.115
Predicted probability	0.169	0.106
Pseudo R2	0.116	0.038

Table 6: Decomposition of ownership changes and changes in explanatory variables

The table reports marginal effects of probit regressions of the decomposition of large decreases (column 1-3) and large increases (column 4-6) in ownership on changes in dependent variables. The decomposition is done as in Helwege, Pirinsky, and Stulz (2007). The dependent variables in columns 1 to 4 are defined as follows. In column 1, it is equal to one if the change in shares held by insiders causes the large decrease of 2.5% or more in ownership. In column 2, it is equal to one if the change in shares outstanding causes the large decrease in ownership. The dependent variables of columns 3 and 4 are defined accordingly for large increases in ownership. The regressions are estimated on the pooled time-series and cross-sectional sample. The independent variables are expressed as changes and are defined as: the percentage of director and officer ownership at the beginning of the year, research and development expenditures over assets; a No R&D dummy, equal to 1 if the firm has missing research and development expenditures for that year; a dividend initiation (termination) indicator variable, equal to 1 if the firm started (ceased) to pay a dividend in that year; the logarithm of book-value-of-assets; capital expenditures over assets; free cash flow, defined as EBITDA over sales; property, plant, and equipment over total assets; leverage, defined as total liabilities over book value of assets; annualized average daily NYSE turnover if traded on NYSE, and zero, otherwise; annualized average daily NASDAQ turnover if traded on NASDAQ, and zero, otherwise; idiosyncratic volatility estimated from a market model and based on daily returns; firm-, industry- and market-returns over the previous fiscal year; firm-, industry- and market-returns over the current fiscal year. All accounting variables are calculated as changes from two fiscal years prior to the end of the previous fiscal year. The regressions include year-fixed effects (not reported). Standard errors (not reported) are corrected for clustering at the firm level. (***), (**), and (*) indicate statistical significance of the underlying coefficient at the 1%, 5%, and 10% level, respectively.

	Large decreases [2.5%]		Large increases [2.5%]	
	Numerator decrease	Denominator increase	Numerator increase	Denominator decrease
Level of D&O ownership	0.343***	0.189***	0.081***	0.038***
Change in D&O ownership	-0.205***	-0.058***	-0.162***	-0.028***
Change R&D / assets	0.087	0.163***	-0.100*	-0.026*
Change in No R&D dummy	-0.017	0.008	-0.003	0.000
Dividend initiation	-0.017	0.008	-0.020	-0.002
Dividend termination	-0.011	-0.013	0.045**	0.004
Change in Log (book value assets)	0.027***	0.045***	-0.040***	-0.009***
Change in Capex / assets	-0.035	-0.033	-0.026	-0.013
Change in Free cash flow	0.017	0.008	0.001	0.010***
Change in PPE / Assets	0.002	0.053*	0.000	-0.005
Change in Leverage	-0.000	0.037**	0.080***	0.002
Change in Turnover NYSE	-0.019**	0.015**	0.001	-0.003
Change in Turnover NASDAQ	0.003	0.005**	-0.008**	-0.001*
Change in Idiosyncratic volatility	0.015	-0.289**	0.316	0.026
Concurrent return	0.004*	0.016***	-0.001	-0.003***
Concurrent industry return	0.039***	0.023***	-0.020**	-0.005**
Concurrent market return	-0.059	-0.001	0.017	0.001
Lagged return	0.006**	0.012***	-0.007	-0.004***
Lagged industry return	0.015*	0.021***	-0.013	-0.004*
Lagged market return	-0.010	-0.013	0.018	0.018*
Concurrent change in COB	0.088***	-0.004	-0.006	-0.004**
Concurrent change in CEO	0.025***	-0.004	-0.002	-0.002
Observed probability	0.130	0.069	0.094	0.017
Predicted probability	0.112	0.050	0.089	0.010
Pseudo-R2	0.080	0.163	0.023	0.121

Table 7: Changes in Q and changes in ownership

The table reports coefficients from firm-fixed effects regressions of changes in q on lagged ownership changes and changes in other control variables. The dependent variable is the change from year t-1 to year t of a proxy for Tobin's q, defined as the ratio of the market value of assets to the book value of assets, where the market value is calculated as the sum of the book value of assets and the market value of common stock less the book value of common stock and deferred taxes. The first and third columns include the change in ownership, the second and fourth column decompose the change in ownership into positive and negative changes, and the fifth and sixth column includes two indicator variables equal to one if ownership increases (decreases) by at least 2.5%. The other independent variables are: the logarithm of book-value-of-assets; property, plant, and equipment over total assets; idiosyncratic volatility estimated from a market model and based on daily returns; free cash flow, defined as EBITDA over sales; research and development expenditures over assets; a No R&D dummy, equal to 1 if the firm has missing research and development expenditures for that year; capital expenditures over assets; annualized average daily NYSE turnover if traded on NYSE, and zero, otherwise; annualized average daily NASDAQ turnover if traded on NASDAQ, and zero, otherwise; and lagged firm returns over the two previous fiscal years. All accounting variables represented changes from year t-2 to year t-1. The regressions include year-fixed effects (not reported). Standard errors (in parentheses) are corrected for clustering at the firm level. (***), (**), and (*) indicate statistical significance of the underlying coefficient at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Change in Ownership (from t-2 to t-1)	0.524*** (0.140)		0.270* (0.150)			
Positive Change (from t-2 to t-1)		0.470** (0.215)		0.522** (0.232)		
Negative Change (from t-2 to t-1)		0.555*** (0.212)		0.112 (0.223)		
Large Increase (2.5%) (t-1)					0.062** (0.026)	0.069*** (0.026)
Large drop (2.5%) (t-1)					-0.092*** (0.026)	-0.021 (0.026)
Change in Log (Book value) (from t-2 to t-1)	-0.659*** (0.068)	-0.659*** (0.068)	-0.467*** (0.068)	-0.467*** (0.068)	-0.651*** (0.068)	-0.463*** (0.068)
Change in Log (Book value) squared	0.138** (0.070)	0.139** (0.070)	0.130* (0.077)	0.128* (0.077)	0.136* (0.070)	0.127* (0.077)
Change in PPE / Assets (from t-2 to t-1)	-0.202 (0.211)	-0.203 (0.211)	-0.488** (0.210)	-0.486** (0.211)	-0.220 (0.210)	-0.492** (0.210)
Change in PPE / Assets squared	-0.221 (1.592)	-0.224 (1.593)	-0.270 (1.701)	-0.260 (1.700)	-0.230 (1.583)	-0.271 (1.693)
Change in Idiosyncratic Vol. (from t-2 to t-1)	0.310 (0.820)	0.309 (0.820)	0.619 (0.849)	0.635 (0.850)	0.360 (0.820)	0.651 (0.850)
Change in Free cash flow (from t-2 to t-1)	-0.122 (0.108)	-0.122 (0.108)	0.033 (0.108)	0.033 (0.108)	-0.121 (0.107)	0.033 (0.108)
Change in R&D / Assets (from t-2 to t-1)	-0.478 (0.389)	-0.477 (0.389)	-0.625 (0.405)	-0.624 (0.405)	-0.472 (0.389)	-0.623 (0.405)
No R&D dummy (from t-2 to t-1)	0.027 (0.083)	0.027 (0.083)	0.029 (0.080)	0.029 (0.080)	0.029 (0.083)	0.029 (0.080)
Change in CapEx / Assets (from t-2 to t-1)	-0.598*** (0.182)	-0.598*** (0.182)	-0.191 (0.180)	-0.190 (0.180)	-0.591*** (0.182)	-0.193 (0.180)
Change in Turnover NYSE (from t-2 to t-1)			-0.093*** (0.033)	-0.094*** (0.033)		-0.093*** (0.033)
Change in Turnover NASD (from t-2 to t-1)			-0.115*** (0.019)	-0.115*** (0.019)		-0.115*** (0.019)
Return (from t-2 to t-1)			-0.103*** (0.021)	-0.104*** (0.021)		-0.104*** (0.021)
Return (from t-3 to t-2)			-0.103*** (0.015)	-0.103*** (0.015)		-0.103*** (0.015)
Observations	21389	21389	20403	20403	21389	20403
Number of clusters	4744	4744	4515	4515	4744	4515
R-squared	0.10	0.10	0.12	0.12	0.10	0.12

Table 8: Changes in Q and changes in shares held and total shares outstanding

The table reports coefficients from firm-fixed effects regressions of changes in q on lagged ownership changes and changes in other control variables. The dependent variable is the change from year $t-1$ to year t of a proxy for Tobin's q , defined as the ratio of the market value of assets to the book value of assets, where the market value is calculated as the sum of the book value of assets and the market value of common stock less the book value of common stock and deferred taxes; capital expenditures over assets. The large change of at least 2.5% in director and officer ownership is decomposed into changes caused by an increase or decrease in shares held by directors and officers, and changes caused by an increase or decrease in shares outstanding. The decomposition is done as in Helwege, Pirinsky, and Stulz (2007). Columns 1 and 2 include indicator variables that are equal to one if there was a large change in the numerator or denominator, and zero otherwise. Columns 3 and 4 include the actual change in the numerator and denominator, conditional on a large change. The other independent variables are: the logarithm of book-value-of-assets; property, plant, and equipment over total assets; idiosyncratic volatility estimated from a market model and based on daily returns; free cash flow, defined as EBITDA over sales; research and development expenditures over assets; a No R&D dummy, equal to 1 if the firm has missing research and development expenditures for that year; capital expenditures over assets; annualized average daily NYSE turnover if traded on NYSE, and zero, otherwise; annualized average daily NASDAQ turnover if traded on NASDAQ, and zero, otherwise; and lagged firm returns over the two previous fiscal years. All accounting variables represented changes from year $t-2$ to year $t-1$. The regressions include year-fixed effects (not reported). Standard errors (in parentheses) are corrected for clustering at the firm level. (***), (**), and (*) indicate statistical significance of the underlying coefficient at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Large decrease in shares held (t-1)	-0.010 (0.030)	0.007 (0.029)	0.309 (0.222)	-0.030 (0.230)
Large increase in shares outstanding (t-1)	-0.237*** (0.049)	-0.102** (0.049)	-1.087*** (0.293)	-0.474 (0.309)
Large increase shares held (t-1)	0.049* (0.029)	0.055* (0.029)	0.376* (0.216)	0.436* (0.230)
Large decrease in shares outstanding (t-1)	0.072 (0.047)	0.087* (0.047)	-0.540 (0.388)	-0.526 (0.402)
Change in Log (Book value (from t-2 to t-1))	-0.622*** (0.068)	-0.453*** (0.069)	-0.644*** (0.069)	-0.461*** (0.069)
Change in Log (Book value squared)	0.143** (0.070)	0.131* (0.077)	0.156** (0.072)	0.141* (0.079)
Change in PPE / Assets (from t-2 to t-1)	-0.222 (0.210)	-0.490** (0.210)	-0.209 (0.209)	-0.481** (0.210)
Change in PPE / Assets, squared	-0.157 (1.579)	-0.244 (1.690)	-0.253 (1.587)	-0.279 (1.694)
Change in Idiosyncratic Vol. (from t-2 to t-1)	0.357 (0.816)	0.642 (0.849)	0.370 (0.818)	0.680 (0.849)
Change in Free cash flow (from t-2 to t-1)	-0.120 (0.107)	0.032 (0.108)	-0.120 (0.107)	0.030 (0.108)
Change in R&D / Assets (from t-2 to t-1)	-0.444 (0.386)	-0.605 (0.404)	-0.446 (0.387)	-0.603 (0.404)
No R&D dummy (from t-2 to t-1)	0.025 (0.082)	0.029 (0.080)	0.022 (0.081)	0.025 (0.078)
Change in CapEx / Assets (from t-2 to t-1)	-0.584*** (0.181)	-0.193 (0.180)	-0.589*** (0.180)	-0.191 (0.180)
Change in Turnover NYSE (from t-2 to t-1)		-0.091*** (0.033)		-0.093*** (0.033)
Change in Turnover NASD (from t-2 to t-1)		-0.113*** (0.019)		-0.115*** (0.019)
Return (from t-2 to t-1)		-0.101*** (0.021)		-0.100*** (0.021)
Return (from t-3 to t-2)		-0.101*** (0.015)		-0.102*** (0.015)
Observations	21389	20403	21389	20403
Number of clusters	4744	4515	4744	4515
R-squared	0.10	0.12	0.10	0.12

Table 9: Changes in Tobin's Q and changes in shares held and total shares outstanding by ownership quintile

The table reports coefficients from firm-fixed effects regressions of changes in q on lagged ownership changes and changes in other control variables by ownership quintile. The large change of at least 2.5% in director and officer ownership is decomposed into changes caused by an increase or decrease in shares held by directors and officers, and changes caused by an increase or decrease in shares outstanding. The decomposition is done as in Helwege, Pirinsky, and Stulz (2007). Columns 1 through 5 include indicator variables that are equal to one if there was a large change in the numerator or denominator of inside ownership, and zero otherwise. The dependent variable is the change from year t-1 to year t of a proxy for Tobin's q, defined as the ratio of the market value of assets to the book value of assets, where the market value is calculated as the sum of the book value of assets and the market value of common stock less the book value of common stock and deferred taxes. The other independent variables are the same as in table 8, column 2. The regressions include year-fixed effects (not reported). Standard errors (in parentheses) are corrected for clustering at the firm level. (***), (**), and (*) indicate statistical significance of the underlying coefficient at the 1%, 5%, and 10% level, respectively.

	quint 1	quint 2	quint 3	quint 4	quint 5
Large decrease in shares held (t-1)	-0.041 (0.112)	-0.012 (0.094)	0.108 (0.080)	-0.004 (0.062)	-0.011 (0.059)
Large increase in shares outstanding (t-1)	0.014 (0.345)	-0.368** (0.186)	0.006 (0.118)	-0.167* (0.097)	-0.185** (0.093)
Large increase shares held (t-1)	-0.113 (0.220)	0.085 (0.113)	0.096 (0.074)	0.074 (0.061)	-0.029 (0.048)
Large decrease in shares outstanding (t-1)	-0.295 (0.361)	1.242 (0.757)	-0.058 (0.132)	0.109 (0.108)	0.038 (0.069)
Change in Log (Book value) (from t-2 to t-1)	-0.293 (0.189)	-0.786*** (0.201)	-0.547** (0.269)	-0.384*** (0.131)	-0.272** (0.123)
Change in Log (Book value) squared	0.334 (0.281)	0.400** (0.161)	0.139 (0.300)	0.121 (0.135)	0.212 (0.140)
Change in PPE / Assets (from t-2 to t-1)	-0.532 (0.449)	-1.518* (0.827)	-0.603 (0.573)	0.308 (0.580)	0.048 (0.366)
Change in PPE / Assets squared	-2.991 (3.285)	4.032 (9.095)	0.724 (2.200)	-1.186 (2.704)	-1.596 (2.412)
Change in Idiosyncratic Vol. (from t-2 to t-1)	0.360 (3.235)	-1.395 (3.191)	5.806** (2.670)	0.034 (1.916)	0.552 (1.288)
Change in Free cash flow (from t-2 to t-1)	0.020 (0.325)	0.252 (0.314)	-0.163 (0.259)	-0.119 (0.262)	0.038 (0.209)
Change in R&D / Assets (from t-2 to t-1)	0.817 (0.918)	0.459 (0.730)	-1.859* (1.127)	-1.250 (1.072)	0.583 (1.611)
No R&D dummy (from t-2 to t-1)	0.011 (0.157)	0.194 (0.212)	0.034 (0.287)	0.076 (0.168)	-0.091 (0.149)
Change in CapEx / Assets (from t-2 to t-1)	-0.220 (0.535)	0.230 (0.601)	-0.686 (0.526)	-0.538 (0.403)	-0.097 (0.275)
Change in Turnover NYSE (from t-2 to t-1)	-0.124** (0.054)	-0.036 (0.079)	-0.128* (0.074)	-0.008 (0.170)	-0.070 (0.119)
Change in Turnover NASD (from t-2 to t-1)	-0.171*** (0.057)	-0.069 (0.046)	-0.110** (0.044)	-0.134*** (0.041)	-0.102 (0.072)
Return (from t-2 to t-1)	-0.210*** (0.056)	-0.150** (0.059)	-0.123*** (0.045)	-0.070 (0.059)	-0.050 (0.048)
Return (from t-3 to t-2)	-0.116** (0.047)	-0.148*** (0.049)	-0.097*** (0.035)	-0.094*** (0.036)	-0.081*** (0.031)
Observations	4374	4186	4057	3982	3804
Number of clusters	1098	1498	1548	1497	1285
R-squared	0.14	0.14	0.15	0.16	0.10

Table 10: Changes in Tobin's Q and concurrent changes in ownership

The table reports coefficients from firm-fixed effects regressions of changes in q on *concurrent* ownership changes and *concurrent* changes in other control variables. The dependent variable is the change from year $t-1$ to year t of a proxy for Tobin's q , defined as the ratio of the market value of assets to the book value of assets, where the market value is calculated as the sum of the book value of assets and the market value of common stock less the book value of common stock and deferred taxes; capital expenditures over assets. The first column includes indicator variables for large increases and decreases in director and officer ownership. The second and third columns decompose the large change in director and officer ownership into changes caused by a large increase or decrease in shares held by directors and officers, and changes caused by a large increase or decrease in shares outstanding. The decomposition is done as in Helwege, Pirinsky, and Stulz (2007). Column 2 includes an indicator variable equal to one if the respective condition is met, and zero otherwise. Column 3 includes the magnitude of the change in the numerator or denominator, conditional on a large change occurring. The other independent variables are: the logarithm of book-value-of-assets; property, plant, and equipment over total assets; idiosyncratic volatility estimated from a market model and based on daily returns; free cash flow, defined as EBITDA over sales; research and development expenditures over assets; a No R&D dummy, equal to 1 if the firm has missing research and development expenditures for that year; capital expenditures over assets; annualized average daily NYSE turnover if traded on NYSE, and zero, otherwise; annualized average daily NASDAQ turnover if traded on NASDAQ, and zero, otherwise; and lagged firm returns from year $t-2$ to $t-1$. All accounting variables represented changes from year $t-1$ to year t . The regressions include year-fixed effects (not reported). Standard errors (in parentheses) are corrected for clustering at the firm level. (***), (**), and (*) indicate statistical significance of the underlying coefficient at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
Large increase in ownership (t)	0.047* (0.027)		
Large decrease in ownership (t)	0.163*** (0.027)		
Large decrease shares held (t)		-0.009 (0.028)	-0.508** (0.214)
Large increase in shares outstanding (t)		0.457*** (0.050)	2.345*** (0.302)
Large increase in shares held (t)		0.071** (0.031)	0.392 (0.238)
Large decrease in shares outstanding (t)		-0.087** (0.042)	0.594 (0.370)
Change in Log (Book value (from t-1 to t))	-0.696*** (0.069)	-0.746*** (0.069)	-0.719*** (0.068)
Change in Log (Book value squared	-0.210** (0.083)	-0.221*** (0.083)	-0.256*** (0.079)
Change in PPE / Assets (from t-1 to t)	-1.125*** (0.204)	-1.126*** (0.203)	-1.136*** (0.203)
Change in PPE / Assets, squared	-0.486 (1.295)	-0.632 (1.273)	-0.467 (1.282)
Change in Idiosyncratic Vol. (from t-1 to t)	-10.352*** (0.928)	-10.293*** (0.925)	-10.420*** (0.924)
Change in Free cash flow (from t-1 to t)	0.672*** (0.111)	0.668*** (0.110)	0.674*** (0.110)
Change in R&D / Assets (from t-1 to t)	0.818** (0.363)	0.748** (0.358)	0.758** (0.361)
No R&D dummy (from t-1 to t)	-0.121 (0.086)	-0.114 (0.084)	-0.106 (0.087)
Change in CapEx / Assets (from t-1 to t)	0.696*** (0.205)	0.703*** (0.203)	0.699*** (0.203)
Change in Turnover NYSE (from t-1 to t)	0.282*** (0.039)	0.270*** (0.039)	0.276*** (0.039)
Change in Turnover NASD (from t-1 to t)	0.259*** (0.022)	0.250*** (0.022)	0.253*** (0.021)

Return (from t-2 to t-1)	-0.106*** (0.021)	-0.110*** (0.021)	-0.107*** (0.021)
Observations	20453	20453	20453
Number of clusters	4518	4518	4518
R-squared	0.15	0.16	0.16