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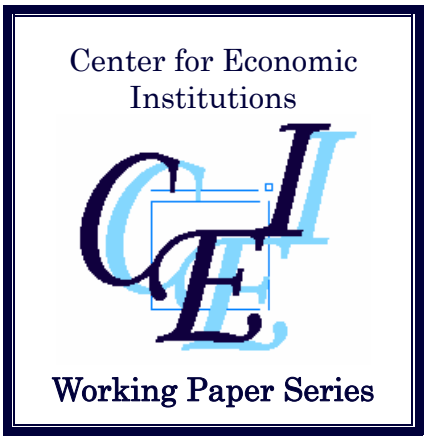

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Managerial ownership dynamics and firm value

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Abstract

From 1988 to 2003, the average change in managerial ownership is significantly negative every year for American firms. We find that managers are more likely to significantly decrease their ownership when their firms are performing well, but not more likely to increase their ownership when their firms have poor performance. Because investors learn about the total change in managerial ownership with a lag, changes in Tobin's *q* in a period can be affected by changes in managerial ownership in the previous period. In an efficient market, it is unlikely that changes in managerial ownership in one period are caused by future changes in q. When controlling for past stock returns, we find that large increases in managerial ownership increase *q*. This result is driven by increases in shares held by officers, while increases in shares held by directors appear unrelated to changes in firm value. There is no evidence that large decreases in ownership have an adverse impact on firm value. We argue that our evidence cannot be wholly explained by existing theories and propose a managerial discretion theory of ownership consistent with our evidence.

Keywords: Firm valuation, director and officer ownership, ownership dynamics

JEL Classification: G30, G32

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We examine the dynamics of managerial ownership for American firms from 1988 through 2003 and their relation to changes in firm value. 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 a large change in ownership is substantially more likely to experience a decline in ownership than an increase. High past and concurrent stock returns make it more likely that a firm will experience a large 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. Strikingly, firm characteristics other than stock returns and stock liquidity, such as proxies for information asymmetry, are unrelated to large decreases in managerial ownership driven by sales of shares by insiders.

The widely held view that higher managerial ownership is valuable for shareholders because it aligns the interests of managers better with those of shareholders would make one concerned about the implications of our finding of decreasing ownership for firm value. However, controlling for the determinants of ownership changes, we find no evidence that large decreases in managerial ownership reduce Tobin's q. In contrast, we show that large increases in managerial ownership can be interpreted, in our experimental design, to cause increases in q. Using insider trading data and a decomposition of changes in managerial ownership, we show further that the positive relation between large increases in managerial ownership and changes in q is driven by increases in shares owned by officers rather than increases in shares owned by directors or changes in the number of shares outstanding.

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. Although existing theoretical models produce a nonlinear relation between levels of q and managerial ownership, they cannot generate a nonlinear relation for changes that holds irrespective of the level of managerial ownership. 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 beyond a certain point. Because of these countervailing forces, the relation between firm value and managerial ownership is not monotonic, and there is an optimal level of ownership. However, an increase in managerial ownership from low levels increases firm value.

The empirical literature typically finds a nonlinear relation between q and managerial ownership in the cross-section. Though this relation is consistent with the agency view, there is considerable controversy whether this nonlinear relation arises (completely or partially) because of the incentive effects of managerial ownership or because of the inherent endogeneity of ownership. If 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, and any relation between ownership and firm value discovered in a cross-section of firms is potentially arising because the firm's environment is inadequately captured. This view was originally proposed by Demsetz (1983) and Demsetz and Lehn (1985), and many authors have since emphasized that the interpretation of an estimated cross-sectional relation between managerial ownership and firm value is difficult.

Recent papers attempting to clarify the interpretation of the relation between q and managerial ownership use fixed-effect models following Himmelberg, Hubbard and Palia (1999)

and instrumental variables (e.g., Demsetz and Villalonga (2001) and Villalonga and Amit (2006)) 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. They also 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. Though Himmelberg, Hubbard and Palia (1999) suggests that focusing on ownership changes would be useful to understand the relation between firm value and ownership, the dynamics of managerial ownership and their relation to changes in firm value have been neglected in the recent literature.[1]

We exploit the dynamic relation between large ownership changes and changes in *q*. Part of the information about changes in managerial ownership that take place in year t only becomes available to investors in year t+1. However, large changes in ownership in year t are unlikely to be caused by changes in *q* in t+1 if markets are efficient. In contrast, the contemporaneous relation between large changes in ownership and changes in *q* is subject to the concern that changes in *q* lead to large changes in ownership. With this perspective, if large decreases in ownership cause decreases in *q*, we should see a positive relation between changes in *q* and past changes in managerial 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. Furthermore, our regression estimates of the contemporaneous relation

[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 5.

between changes in q and large changes in managerial ownership offer no support for the hypothesis that large decreases in ownership lead to decreases in q.

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 changes in holdings of shares by managers and changes caused by increases or decreases in shares outstanding. We show that the positive relation between changes in q and past increases in managerial ownership is driven by increases in shares held by officers rather than by increases in shares held by directors or changes in the number of shares outstanding. In contrast, the increase in q associated with large contemporaneous decreases in managerial ownership appears to be substantially driven by the fact that insiders and the firm sell shares when the firm is doing well.

Our findings seem to require a more comprehensive managerial ownership theory. We present the elements of such a theory, which we call the managerial discretion theory of managerial ownership, and show that this theory can help make sense of our results. The 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 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 for financially constrained firms. Later in the life of the firm, when the firm is doing well and their reputation has increased, managers start to reduce their stake to diversify. They do so in a way that does not endanger their position or reduce the value of their remaining shares. As a result, sales have little impact on firm value. By buying shares, managers bond themselves to pursuing policies that benefit minority shareholders more – at least as long as their ownership does not become so high that they become safe from removal. Managers buy shares when this bonding effect is valuable to them because it enables the firm to raise funds on better terms and reduces threats to their

position. Managers also increase their holdings when the firm is financially constrained and they prevent the firm from becoming more constrained by receiving shares instead of cash.

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 the nature and determinants of ownership changes, focusing on economically significant changes. The contemporaneous and lagged relation between firm value and managerial ownership is analyzed in Section 5. We conclude in Section 6.

Section 1. Managerial ownership and firm value

In this section, we first review the agency theory approach to the relation between managerial ownership and firm value and then introduce the managerial discretion theory. We then briefly review the timing theory of ownership.

1. a. The agency theory approach.

Following Jensen and Meckling (1976), greater managerial ownership aligns the interests of management better with the interests of shareholders. 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 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.

With this interpretation, there exists an optimal level of ownership. Managers choose their ownership in the firm and, if ownership is relatively low, they ought to be encouraged to choose an even higher ownership. However, if there is a cost to managers of holding shares, they would hold more shares only if they were compensated to do so because their portfolio holdings become less diversified as they hold more shares of the firm they manage. Since shareholders would have to compensate managers for holding more shares, overall, shareholders might be worse off even if an increase in managerial ownership increases the incentives of managers to maximize shareholder wealth. We use the term contracting approach to denote models which explicitly take into account these costs – already stressed by Jensen and Meckling (1976) – to solve for an optimal level of managerial ownership in a principal-agent model (see, for instance, the model in Coles, Lemmon, and Meschke (2006)).

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 choose a compensation contract 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 the managers' actions 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. With the contracting approach, shareholders face a tradeoff. As the managers' stake in the firm increases, their incentives become better aligned with those of shareholders but they become more exposed to firm-specific risk. 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 to induce them to bear more risk.

As agency problems worsen, optimal managerial ownership increases (see Core, Guay and Larcker (2003) for references to the literature for empirical predictions). 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, with more capital expenditures, and with more growth opportunities. 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. Because the same fractional ownership of the firm's cash flows implies greater dollar wealth volatility for managers of larger firms, managerial ownership is expected to be lower for larger firms and to fall as a firm grows (Schaefer (1998)). Finally, it is not clear how stock returns affect managerial ownership in the contracting models. 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), optimal managerial ownership would be expected to increase as well.[2]

1. b. The managerial discretion approach.

We follow the existing managerial discretion models (for early models, see Stulz (1990) and Zwiebel (1996)). With these models, managers are in control of the firm. Shareholders can vote with their feet and the stock price reflects the actions the market anticipates managers to take. Shareholders can overcome costs of collective action and fire managers, but costs of collective action are assumed to be high enough that management draws substantial rents from its position (see Kuhnen and Zwiebel (2007) and Lambrecht and Myers (2007) for such formulations). 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 enough, perhaps because the firm requires help from banks to overcome its problems and the banks require a change in management.

With the managerial discretion approach, managers choose their ownership stake to maximize their welfare. This makes ownership endogenous. 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 the firm's cash flows increase – i.e., as the firm performs well – because their fraction of these cash flows increases in value.

Acquiring a stake in the firm that they manage is 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 enables them to preserve their control over the firm. There are three key motives why managers acquire a stake in their firm with this model: (1) financing, (2) bonding, and (3) control. We explore these motives in turn:

[2] See Smith and Watts (1992) for the argument that optimal managerial ownership is positively related to growth opportunities.

(1) The financing motive. When the firm is financially constrained or its investors face serious information asymmetries, managers may be the cheapest providers of external funding 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. The financing motive will be important for young firms and financially constrained firms, but its importance falls with firm size. As firms mature and obtain better access to capital markets, managers will sell the shares acquired because of the financing motive. Hence, we expect high managerial ownership for young firms that falls over time.

(2) The bonding motive. By acquiring shares, managers align their interests better with those of minority shareholders, at least as long as the stake of managers is not too high. This motive for ownership of shares is more important for firms with high information asymmetries, high managerial discretion, and low reputation managers. As information asymmetries and managerial discretion fall because the firm has more assets in place and fewer growth opportunities and as management reputation increases, this motive becomes less important. Again, it follows that ownership falls as firms mature.

(3) The control motive. By increasing their ownership, insiders have more control over the firm. They make it more expensive for outsiders to try to influence firm policies and can prevent hostile takeovers. This motive is important when managers are threatened in their position. Managers are more likely to acquire shares for this motive when they have low reputation and they can be removed cheaply.

It follows from these motives that managers own more shares in young firms and that they sell them as the firm becomes more mature and as it performs well. Should there be doubts about management because of poor performance or should the firm become financially constrained, we would expect managerial ownership to increase as management bonds itself to policies that benefit minority shareholders through greater ownership. With this bonding, management reduces the benefit to outsiders of attempting to displace management. The control motive can lead to an

increase in firm value as higher ownership can make it more expensive for outsiders to take over the firm, but it can also lead insiders to gain the ability to extract more cash flows, in which case firm value falls with increases in ownership.

This approach predicts that large decreases in ownership will take place as the firm matures because high ownership is no longer necessary for minority shareholders to be convinced that their interests will be taken into account. The large decreases will have no impact on firm value because management will avoid sales of ownership that are disruptive to firm value. Such sales would reduce the value of its stake and would make it more likely that management will be challenged in its position. Consequently, we expect sales to take place when a firm has done well and its stock is liquid. Except when their dominant effect is to increase the present value of private benefits consumed by management, large increases will have a positive impact on firm value because they bond management to policies that are better aligned with the interests of minority shareholders.

The managerial discretion theory predicts that there can be an asymmetric relation between changes in ownership and changes in firm value since decreases in managerial ownership do not lead to decreases in firm value but increases in managerial ownership can be associated with increases in firm value. With the contracting theory, there is possibly a non-monotone relation between the level of firm value and the level of managerial ownership, but the theory faces a challenge in predicting a non-monotone relation between changes in firm value and changes in ownership for a wide range of managerial ownership levels.

1. c. The timing theory approach.

This theory is the focus of Jenter (2005). The argument is that management has valuable information which enables it to assess when the firm is over- or undervalued. Management buys shares when the firm is undervalued and sells them when it is overvalued. With this theory, presumably firms that have experienced high (low) returns are more likely to be overvalued

(undervalued) and managers are therefore more likely to sell (buy) shares if their firm has done well. The theory has predictions that are partly consistent with the managerial discretion theory. However, the theory implies that management can beat the market through its trades, whereas the managerial discretion theory has no such implications. Jenter (2005) only finds limited evidence that managers outperform through their trades.

Section 2. Data

We obtain data on insider ownership from Compact Disclosure, which is a CD-Rom produced each month, from January 1988 to August 2005. 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. Our ownership variable is therefore the same as the one used in Himmelberg, Hubbard and Palia (1999), Holderness, Kroszner and Sheehan (1999), and Helwege, Pirinsky and Stulz (2007).[3]

We update our ownership data whenever the proxy date in Compact Disclosure changes from one year to the next. 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.[4] 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. To obtain our measure of managerial ownership, we divide the shares owned by insiders as of the record date by the total number of shares outstanding.[5]

[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.

[4] 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.

[5] Compact Disclosure reports the number of shares outstanding, but the latter is often the fiscal-year end data, and not as of the record date. If, e.g., a stock split or an equity issue occurs between the fiscal year end

Researchers have compared 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.

We match the Compact Disclosure data to CRSP and Compustat, remove utilities and financial firms and eliminate observations with missing Compustat data. We require that a firm is present in at least three adjacent years to calculate the concurrent and past change in insider ownership. Our final sample contains 22,000 firm-year observations for 4,925 different firms.

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 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

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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.

than 40% of the firms in our sample would not be widely held according to a 20% threshold.[6] The fraction of firms with more than 20% managerial ownership stays relatively constant over time. We also see that in a typical year officers and directors have majority control in more than 10% of the firms.

The evidence of Table 1 shows that a firm's managerial 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 change is positive in some years, the overall median ownership change is significantly negative at the 1% level. The difference between the average and the median is not surprising. A large 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, as shown in Table 1, approximately 11% of all firms cannot experience a large decrease because their managerial ownership is already below 2.5%.

[6] 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.

To investigate the extent to which changes in ownership in excess of 2.5% in absolute value explain the variation in changes in managerial ownership, we estimate (but do not report) the following regression for each year of our sample period:

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

The R-squared of the regressions exceeds 98% each year. Therefore, the change in managerial ownership is mostly determined by large changes. Since the 2.5% cut-off is arbitrary, we repeat our analysis by defining a large change as a 1%, 4%, and 5% change, with quantitatively and qualitatively similar results to the results we report in the reminder of the paper for the 2.5% cut-off.

Section 4. The nature and determinants of large changes in managerial ownership

In this Section, we investigate the nature and determinants of changes in ownership in excess of 2.5%. We first examine in detail how large changes in ownership come about. We then study how large increases in managerial ownership take place to assess whether the financing motive posited by the managerial discretion theory is empirically relevant. Finally, we estimate probit regressions for large increases and large decreases in ownership.

4. a. Where do large changes in managerial ownership come from?

There are many ways that managerial ownership can change. To start with, 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. If management's holdings of shares increase, the exposure of management's wealth to changes in firm value increases, which will affect management's incentives even if fractional

ownership is constant. 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 (see, for instance, Lambert, Larcker and Verrecchia (1991)). To allow for such a differential effect, we decompose the change in managerial ownership following Helwege, Pirinsky and Stulz (2007). We 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:

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

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).

Using equation (1), we consider separately the large increases in ownership brought about by an increase in managerial ownership corresponding to 2.5% of outstanding shares and large increases brought about by a decrease in outstanding shares causing an increase in managerial ownership of at least 2.5% (the second term of equation (1) is negative and has an absolute value of 2.5% or higher). We find that an increase of more than 2.5% in the number of shares held by insiders occurs in 83.4% of all large increases in managerial ownership. Turning to the large decreases in managerial ownership, a decrease of more than 2.5% in the number of shares held by

management occurs in 55.60% of all cases and an increase of more than 2.5% in the number of shares outstanding in 26.40% of all large decreases in managerial ownership. For the remaining large decreases, we either observe a large increase in the number of shares outstanding and at the same time a large decrease in the shares held by management (10.7%), or neither the decrease in shares owned nor the increase in shares outstanding is sufficient by itself to cause a drop in managerial ownership of at least 2.5% (7.3%). Dilution of the managers' stake through increases in shares outstanding represents therefore an important cause of decreases in managerial ownership.

Though decreases in the numerator of the ratio defining managerial ownership changes are straightforward because insiders have either to sell shares or stop being insiders and be replaced by insiders who own fewer shares for the numerator to fall, increases in managerial ownership are more complex and can occur for many different reasons. We therefore investigate where large changes in shares held by management come from. Such an inquiry is especially important in light of the prediction of the managerial discretion theory that a motivation for increases in shares held is the funding motive. For this inquiry, we use the Thomson Financial Insider database. It allows us to identify the source of the changes in insider ownership. Unfortunately, this database is only available starting in 1996. There is no reason, however, to suspect that using data from this period instead of data from the whole sample period biases our inferences in any way. We have 740 large increases in ownership in our Compact Disclosure data for the period from 1996 to 2003.

Managerial ownership can increase either due to increases in shares owned by insiders who were already insiders at the beginning of the fiscal year or due to the holdings of new insiders. Out of 740 large increases, we have 90 cases (12.2%) where new officers report ownership greater than 2.5% and 98 (13.2%) cases where new directors report ownership greater than 2.5%. There are 164 or 22.1% (84 or 11.3%) cases where officers (directors) acquire shares either in the open market or through a private placement. New stock grants yield 33 (4.5%) cases of increases

in ownership of more than 2.5% for officers and 13 (1.8%) cases for directors. Vesting of options accounts for a substantial number of cases: 183 for officers (24.7%) and 17 for directors (2.3%). Finally, there are 172 (23.2%) cases where none of the sources of increases in managerial ownership accounts for a 2.5% increase in shares held, but all sources together account for such an increase.

Several observations follow from these statistics. First, the most likely reason for an increase in shares held of more than 2.5% is by far an increase in shares held by officers who were already in place at the end of the prior fiscal year. Second, we have at most 98 large increases in managerial ownership due to new board seats given to large blockholders who demanded such board seats (some of these increases could be due to purchases after the director became a board member or because of inheritances or other reasons unrelated to activism). Third, at least 263 cases correspond to situations where the firm granted options or shares and hence saved cash compared to the case where it would have had to pay cash for services from insiders (vested shares and stock grants). Share purchases of insiders through private placements are common, so that some and perhaps many of the large increases through purchases of shares correspond to acquisitions of shares issued by the corporation.[7]

A difficulty with the Compact Disclosure data is that options that vest correspond to an increase in ownership. One might argue, therefore, that part of the large increases in ownership corresponds to cases where the incentives of management change little as management already owned the options. However, it is useful to note that Thomson collects data on the time to vesting of options granted. We find that the median time for directors is 1.67 years and 2.03 years for officers. Consequently, if the options vest at the end of the fiscal year, roughly half of the life of the non-vested options took place during that fiscal year. Further, changes in new option grants are small compared to the changes in managerial ownership whether we look at the mean or the

[7] E.g., Wruck and Wu (2007)

median. For instance, in 1999, the mean change in managerial ownership is -0.42%; the mean new option grants expressed as a fraction of outstanding shares using a delta of 0.6 is 0.024%.[8]

4. b. Characteristics of firms experiencing large increases and large decreases in managerial ownership.

We now show how firm characteristics differ for firms that experience large increases, large decreases, and no large changes in managerial ownership. Table 2 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 in managerial ownership 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, even 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 approach. 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 approach. Firms which experience large drops in ownership have the highest average Tobin's *q*. Such a result is puzzling given the predictions of the contracting approach discussed in Section 1.

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

[8] See Jensen and Murphy (1990) for evidence that it is sensible to use a delta of 0.6.

instance, a retiring CEO who has a large ownership stake could sell shares upon retirement. The data on CEOs and chairmen is derived from the director and officer text lists provided by Compact Disclosure. 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 models 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 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.

4. c. Regressions relating the likelihood of large increases or decreases in managerial ownership to changes in firm characteristics.

The ownership theories discussed in Section 1 predict that changes in firm characteristics lead to changes in ownership. To investigate the relation between changes in firm characteristics and large changes in ownership, 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 3.

Column 1 of Table 3 shows that a firm's contemporaneous and lagged stock returns are significant predictors of large decreases in ownership. In contrast, column 2 of Table 3 shows that the contemporaneous stock return is not significant in the regression for large increases and that 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 from large increases. 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.[9] 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 but not more likely to experience an increase in 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 3. It is not surprising, therefore, that the level of significance drops. Most variables are not consistently significant across the five

[9] 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.

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.

A concern with the regressions of Table 3 discussed so far is that we look at how large changes in ownership are related to lagged changes in firm characteristics. It could be that managerial ownership changes in period t because of changes in firm characteristics in period t. The difficulty with a regression that uses contemporaneous changes in firm characteristics is that these changes could result from the change in ownership rather than causing such a change. Nevertheless, we estimate the regressions, but do not reproduce them in a table, using both contemporaneous and lagged changes in firm characteristics. Generally, the firm characteristics with significant coefficients in columns 1 and 2 of Table 3 also have significant coefficients for contemporaneous changes. Few other firm characteristics are significant. In the regression for large decreases in managerial ownership, contemporaneous leverage and idiosyncratic volatility changes have negative significant coefficients. The change in turnover for the NYSE stocks becomes significant for the lagged change and is significant for the contemporaneous change. For the regression for large increases in managerial ownership, the change in turnover for the NYSE

stocks becomes significant, but concurrent and lagged stock returns are not significant. In summary, our conclusions on the weak effects of firm characteristics emphasized by the contracting models hold for the extended regressions as well. In fact, the asymmetry of the effect of returns grows stronger for the extended regressions, as does the effect of stock liquidity.

Table 4 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 4 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 sales or purchases are negatively related to idiosyncratic volatility changes.

There is a striking asymmetry between the determinants of the decomposed large decreases in managerial ownership and those of the decomposed large increases in managerial ownership. Firm characteristics besides returns seem more important in explaining large increases in the number of shares outstanding, and they appear less important in explaining 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 seem in explaining large decreases in shares outstanding. Existing contracting models do not predict such an asymmetry.

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 first review briefly the existing evidence. We then present our estimation approach. We discuss in turn estimates of the relation between changes in *q* and lagged changes in ownership and estimates which also include the contemporaneous change in ownership.

5. a. The existing literature.

The empirical literature provides support for the non-monotonic relation between *q* and managerial ownership predicted by agency theory. Morck, Shleifer and Vishny (1988) estimate a piecewise linear regression of *q* on insider ownership, which they define as ownership by the company's directors. In their sample of 460 large firms in 1980, they find that *q* significantly increases for director ownership levels between 0 and 5 percent, decreases between 5 and 25 percent, and again increases for levels of ownership above 25 percent. McConnell and Servaes (1990) examine a large sample of firms and find in cross-sectional regressions that *q* increases with ownership up to 50% for their 1976 sample and 40% for their 1986 sample, and decreases

for larger ownership levels. Hermalin and Weisbach (1991) also estimate a piecewise linear regression of *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.

The evidence of a positive relation between firm value and managerial ownership over some range of ownership is often viewed 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. However, this view has been criticized as early as Demsetz (1983) and Demsetz and Lehn (1985). If firm value can be increased through changes in ownership, why do firms deviate from optimal ownership? If adjustment costs for changes in the ownership structure are small, it is unlikely that firms are not optimizing their ownership structure. Then, the interpretation of a cross-sectionally observed positive relation between firm value and managerial ownership is that different firms have different optimal levels of managerial ownership, depending on the severity of agency problems, but that each firm is at or close to its optimum. Demsetz (1983), Demsetz and Lehn (1985), and Himmelberg, Hubbard and Palia (1999) find that the determinants of ownership emphasized by the contracting approach affect managerial ownership. Variables proxying for asymmetric information are positively and significantly related to the level of managerial 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 *q* and managerial ownership can hold in equilibrium across firms, but if it is the result of endogeneous choice of ownership, it cannot be interpreted as showing that an increase in managerial ownership would increase firm value. Himmelberg, Hubbard and Palia (1999) show that the contracting model predicts a positive relation between *q* and managerial ownership if firms with more intangible assets have a higher *q* and optimally also have higher managerial ownership. They find no relation between *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 they study. Coles, Lemmon and Meschke (2006) present a formal model in which a non-monotonic relation between *q* and managerial ownership emerges in equilibrium. They show through calibrated simulations that their model can replicate a concave cross-sectional relation between managerial ownership and *q*.

5. b. Econometric specification.

In an efficient market, changes in ownership should affect *q* when investors learn about them. Investors typically do not have a complete picture of changes in managerial ownership until well after the end of the fiscal year when the proxy statement is published. Consequently, changes in managerial ownership that take place in year t impact *q* in year t as well as in year t+1. In the extreme case where all of the information about changes in ownership is revealed to investors through the proxy statement, investors would receive all their information about changes in managerial ownership in year t during year t+1. We exploit this delayed receipt of information by investors to obtain estimates of the relation between changes in managerial ownership and changes in *q* which are not seriously affected by the dependence of ownership on *q*. These estimates are obtained by relating the change in *q* in year t+1 to the change in ownership in year t. In an efficient market, we would expect the change in managerial ownership in year t to be related to the change in *q* in year t, but not to the change in *q* in year t+1, so that the

contemporaneous relation between changes in *q* and changes in managerial ownership is heavily affected by the endogeneity of managerial ownership. In contrast, the change in *q* in year t+1 should reflect the investors' assessment of the information in the change in managerial ownership that took place in year t but became known in year t+1.

Since in our approach the changes in *q* follow the actual change in managerial ownership we measure, it is reasonable to treat the change in managerial ownership as exogenous relative to the change in *q*. Nevertheless, it could be that the change in ownership proxies for other variables. To address this issue, we use control variables that have been considered important in the literature and, conservatively, we use firm and year fixed-effects. We find that both firm and year fixed-effects are significantly different from zero. We resolve the issues raised by Zhou (2001) in his criticism of the firm-fixed effects regression approach by focusing on large changes in ownership.

5. c. Estimates of the relation between changes in *q* and lagged changes in managerial ownership.

Table 5 reports the results of the regressions of changes in *q* on lagged changes in ownership. 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. Note that a positive coefficient on lagged decreases means that a decrease in ownership leads to a decrease in Tobin's *q*. The regression coefficients are significant positive for the lagged increases as well as the lagged decreases and are roughly of the same size.

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 and its value is cut in half.

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. This relation is economically significant: An increase in managerial ownership of at least 2.5% of shares outstanding, with a median value of 5.1%, is associated with an increase in Tobin's q of 0.069. The median Tobin's q for firms experiencing such an increase is 1.18, so that the increase is roughly 6% of that value and the elasticity of q with respected to managerial ownership is roughly 1.

Table 5 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 3 and 4, 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 stock returns concurrent and lagged with the large

change in ownership has a much greater impact on the coefficient for ownership decreases than for ownership increases.

To better understand 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. These results are reported in Table 6. The results strengthen the asymmetry highlighted in Table 5. 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 5 and 6 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.

We address the possible non-monotonicity of the relation between firm value and lagged ownership in two different ways. First, in regressions not reproduced in a table, we add to the regressions of Table 5 the level of ownership and interactions between our ownership change variables and the level of ownership. The interactions are never significant. Second, we estimate our regressions separately for firms that have different levels of ownership but again do not report the results in a table. We form quintiles yearly, but the breakpoints remain stable over time. Using firm fixed effects, 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 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 with industry-fixed effects. 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*.

After controlling for past stock returns, we find that there is evidence of a relation between past ownership increases and changes in Tobin's *q*. We saw in Section 4 that, for part of our sample period, we can identify the origin of the change in ownership. This makes it possible for us to re-estimate our change in *q* regressions allowing for separate coefficients on changes in ownership attributable to different causes. We estimate industry-fixed effects regressions because the time-series of Thomson Financial data is too short to estimate firm-fixed effects regression, but we show in column 1 of Table 7 that the inferences we drew earlier are also valid in the smaller sample: Increases in shares held by insiders and increases in shares outstanding have the most explanatory power. In column 2 of Table 7, we separate the increases in director and officer ownership into different components. The results are striking. For the director ownership

changes, we find the coefficients to be insignificant. In contrast, for the officer ownership changes, the coefficients are positive and significant except for the coefficient on new stock grants, which is positive and insignificant. The coefficient for ownership increases due to option vesting is 2.309 (significant at the 1% level) and the coefficient for open market and private placement purchases is 0.672 (significant at the 5% level). The coefficients for the changes in the ownership of directors are much smaller than the significant coefficients for the changes in ownership of officers. These results differ from the results of Morck, Shleifer, and Vishny (1988) who find similar coefficients in their regression of *q* on ownership for ownership by internal and external board members.

5. d. Estimates of the relation between changes in *q* and changes in managerial ownership using both contemporaneous and lagged changes in ownership.

The current change in *q* should be related to both the current change in ownership and the lagged change in ownership. This is because some information about the change in ownership will be partly reflected in the current change in *q* and partly in next year's change in *q*. In Table 8, we report estimates of regressions which include the contemporaneous change in ownership. As a benchmark, we estimate in column 1 a regression with only contemporaneous variables. In that regression, the dummy variables for large changes in ownership are both positive and significant, so that we have a u-shaped relation between changes in ownership and changes in *q*. Though such a relation provides no support for the hypothesis that a decrease in managerial ownership reduces Tobin's *q*, it would not make sense to interpret the regression as suggesting that *q* increases irrespective of how managerial ownership changes as long as it changes. When we estimate the regression decomposing the large changes in ownership (column 2), we see that the positive coefficient on the large decrease in managerial ownership is due to the increase in shares outstanding, so that the coefficient reflects the fact that firms issue shares when they have a high market-to-book ratio (see DeAngelo, DeAngelo and Stulz (2007)).

In column 3, we add the lagged variables to regression (1). In that regression, only two ownership variables are significant: the contemporaneous large decrease variable and the lagged large increase variable. The last regression uses the decomposition of the change in ownership for the current year and the past year. These regressions confirm our interpretation of the coefficient on the large drop in ownership indicator variable since the contemporaneous increase in the denominator – the increase in shares outstanding – is highly significant. Surprisingly, the lagged denominator increase is significant as well, but the coefficient is smaller. We find no evidence of an adverse impact on q of decreases in shares held by insiders, but we find evidence that there is a significant positive relation between the lagged increase in shares held by insiders and the contemporaneous change in q.

The analysis of McConnell, Servaes and Lins (2006) is closely related to our analysis of the contemporaneous relation between changes in q and contemporaneous changes in ownership, except for the fact that they use the event study method, which attenuates the concerns about changes in firm value driving changes in managerial ownership in a contemporaneous relation, and include only open-market purchases. They find a nonlinear relation: the announcement return first increases in pre-purchase insider ownership and then falls. Though we find a positive contemporaneous relation between firm value changes and changes in managerial ownership, in further investigation not reported in a table, we fail to find evidence of a relation that is nonlinear in the level of managerial ownership. The difference in the results may be due to the difference in the samples. 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 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. However, as we have seen, our approach is powerful enough to obtain

significant coefficients on large ownership increases and decreases (which they do not consider) when we do not control for past returns and on large ownership increases when we do.

Section 6. Conclusion

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 managerial ownership and changes in Tobin's *q*. We argue that, if models that predict a relation between changes in firm value and changes in managerial ownership are correct, we should see that relation when we estimate a regression of changes in *q* on lagged changes in ownership because the full extent of the changes in ownership becomes known only after the end of a fiscal year. This lagged relation is much less subject to endogeneity concerns than the contemporaneous relation. We find that there is an asymmetry in the relation between changes in *q* and changes in lagged ownership: a large increase in ownership leads to an increase in *q*, but a large decrease in ownership does not lead to a decrease in *q*. We find further that the significant effect of large increases we document is due to increases in shares held by officers rather than to increases in shares held by directors or to decreases in shares outstanding. In contrast to the lagged relation, we find that the contemporaneous relation between changes in ownership and changes in Tobin's *q* is seriously affected by the fact that increases in firm value lead firms to issue equity and insiders to sell

equity. As a result, we find that both large decreases and large increases in managerial ownership are associated with a concurrent increase in Tobin's *q*. After controlling for past stock returns, none of our evidence is supportive of the hypothesis that decreases in managerial ownership decrease firm value. The asymmetry in the relation between changes in ownership and changes in firm value we document is hard to reconcile with existing models of the relation between the level of firm value and the level of managerial ownership.

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, or 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. We call this the managerial discretion theory of managerial ownership. With this theory, managers choose their ownership, so that our results on the relation between changes in *q* and changes in managerial ownership reflect the firm-value consequences of decisions by managers to alter their 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 it being positive, and negative change is the change in D & O ownership conditional on it being negative. 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 five columns show the percentage of firms that have an ownership level of at most 2.5 percent, and at least 20, 30, 40, or 50 percent, respectively.

										% of firms with						
Fiscal	Number	D&O ownership		Change ownership		Positive change		Negative change		Large	Large	% of firms with ownership level				
Year	of Firms	Mean	Median	Mean	Median	Mean	Median	Mean	Median	drop	increase	<2.5%	> 20 %	> 30%	>40%	> 50
1988	845	23.1%	17.4%									14.3%	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%	12.5%	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%	12.7%	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%	11.3%	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%	12.2%	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%	12.6%	41.3%	28.6%	17.3%	10.6
1994	1812	21.1%	14.9%	-1.1%	-0.1%	1.0%	0.0%	-2.1%	-0.1%	19.9%	9.1%	11.4%	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%	11.0%	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%	11.8%	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%	10.8%	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%	10.6%	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%	10.2%	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%	9.3%	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%	9.0%	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%	8.9%	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%	10.1%	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%	11.0%	43.3%	29.9%	19.7%	12.1

Table 2: 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 nor a large 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 Mann-Whitney-Wilcoxon rank-sum tests for equality of distributions across the three groups. From the main Compact Disclosure database, we derive all variables for D&O ownership. From the Compact Disclosure 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.		Mann-Whitney-Wilcoxon rank-sum tests of equality of distributions (p-values)		
	Mean	Median	Mean	Median	Mean	Median	No chg. vs. Large drop	No chg. vs. Lg. increase	Lg. drop vs. Lg. increase
Compact Disclosure 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%	---	51.1%	---	73.5%	---	0.000	0.000	0.000
Ownership > 30%	23.9%	---	32.4%	---	54.8%	---	0.000	0.000	0.000
Ownership > 40%	16.1%	---	18.6%	---	38.8%	---	0.000	0.000	0.000
Ownership > 50%	9.9%	---	10.0%	---	26.1%	---	0.890	0.000	0.000

Table 2, continued

	No change 18609 observations		Large Drop 6015 observations		Large Increase 3488 observations		Mann-Whitney-Wilcoxon tests (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
Tobin's *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
Compact Disclosure – Directors									
Concurrent change in CEO	10.6%	---	12.7%	---	11.1%	---	0.000	0.386	0.031
Concurrent change in COB	8.7%	---	12.3%	---	8.7%	---	0.000	0.969	0.000
Change in CEO over next year	9.1%	---	10.2%	---	8.6%	---	0.010	0.367	0.011
Change in COB over next year	10.0%	---	9.1%	---	9.8%	---	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 3: 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 in ownership (column 2) on changes in independent 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 first independent variable is the level of D&O ownership at the beginning of the year. The other independent variables are expressed as changes and are defined as: the change in D&O ownership from t-2 to t-1; 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 4: Decomposition of ownership changes and changes in explanatory variables

The table reports marginal effects of probit regressions of the decomposition of large decreases (columns 1 and 2) and large increases (columns 3 and 4) in ownership on changes in independent 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 first independent variable is the level of D&O ownership at the beginning of the year. The other independent variables are expressed as changes and are defined as: the change in director and officer ownership from t-2 to t-1; 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 drop [2.5%]		Large increase [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 5: 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 include 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	0.524***		0.270*			
(from t-2 to t-1)	(0.140)		(0.150)			
Positive Change		0.470**		0.522**		
(from t-2 to t-1)		(0.215)		(0.232)		
Negative Change		0.555***		0.112		
(from t-2 to t-1)		(0.212)		(0.223)		
Large Increase (2.5%) (t-1)					0.062**	0.069***
					(0.026)	(0.026)
Large drop (2.5%) (t-1)					-0.092***	-0.021
					(0.026)	(0.026)
Change in Log (Book value)	-0.659***	-0.659***	-0.467***	-0.467***	-0.651***	-0.463***
(from t-2 to t-1)	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)
Change in Log (Book value)	0.138**	0.139**	0.130*	0.128*	0.136*	0.127*
Squared	(0.070)	(0.070)	(0.077)	(0.077)	(0.070)	(0.077)
Change in PPE / Assets	-0.202	-0.203	-0.488**	-0.486**	-0.220	-0.492**
(from t-2 to t-1)	(0.211)	(0.211)	(0.210)	(0.211)	(0.210)	(0.210)
Change in PPE / Assets	-0.221	-0.224	-0.270	-0.260	-0.230	-0.271
Squared	(1.592)	(1.593)	(1.701)	(1.700)	(1.583)	(1.693)
Change in Idiosyncratic Vol.	0.310	0.309	0.619	0.635	0.360	0.651
(from t-2 to t-1)	(0.820)	(0.820)	(0.849)	(0.850)	(0.820)	(0.850)
Change in Free cash flow	-0.122	-0.122	0.033	0.033	-0.121	0.033
(from t-2 to t-1)	(0.108)	(0.108)	(0.108)	(0.108)	(0.107)	(0.108)
Change in R&D / Assets	-0.478	-0.477	-0.625	-0.624	-0.472	-0.623
(from t-2 to t-1)	(0.389)	(0.389)	(0.405)	(0.405)	(0.389)	(0.405)
No R&D dummy	0.027	0.027	0.029	0.029	0.029	0.029
(from t-2 to t-1)	(0.083)	(0.083)	(0.080)	(0.080)	(0.083)	(0.080)
Change in CapEx / Assets	-0.598***	-0.598***	-0.191	-0.190	-0.591***	-0.193
(from t-2 to t-1)	(0.182)	(0.182)	(0.180)	(0.180)	(0.182)	(0.180)
Change in Turnover NYSE			-0.093***	-0.094***		-0.093***
(from t-2 to t-1)			(0.033)	(0.033)		(0.033)
Change in Turnover NASD			-0.115***	-0.115***		-0.115***
(from t-2 to t-1)			(0.019)	(0.019)		(0.019)
Return (from t-2 to t-1)			-0.103***	-0.104***		-0.104***
			(0.021)	(0.021)		(0.021)
Return (from t-3 to t-2)			-0.103***	-0.103***		-0.103***
			(0.015)	(0.015)		(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 6: 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. 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 represent 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	0.007	0.309	-0.030
	(0.030)	(0.029)	(0.222)	(0.230)
Large increase in shares outstanding (t-1)	-0.237***	-0.102**	-1.087***	-0.474
	(0.049)	(0.049)	(0.293)	(0.309)
Large increase shares held (t-1)	0.049*	0.055*	0.376*	0.436*
	(0.029)	(0.029)	(0.216)	(0.230)
Large decrease in shares outstanding (t-1)	0.072	0.087*	-0.540	-0.526
	(0.047)	(0.047)	(0.388)	(0.402)
Change in Log (Book value (from t-2 to t-1))	-0.622***	-0.453***	-0.644***	-0.461***
	(0.068)	(0.069)	(0.069)	(0.069)
Change in Log (Book value squared	0.143**	0.131*	0.156**	0.141*
	(0.070)	(0.077)	(0.072)	(0.079)
Change in PPE / Assets (from t-2 to t-1)	-0.222	-0.490**	-0.209	-0.481**
	(0.210)	(0.210)	(0.209)	(0.210)
Change in PPE / Assets, squared	-0.157	-0.244	-0.253	-0.279
	(1.579)	(1.690)	(1.587)	(1.694)
Change in Idiosyncratic Vol. (from t-2 to t-1)	0.357	0.642	0.370	0.680
	(0.816)	(0.849)	(0.818)	(0.849)
Change in Free cash flow (from t-2 to t-1)	-0.120	0.032	-0.120	0.030
	(0.107)	(0.108)	(0.107)	(0.108)
Change in R&D / Assets (from t-2 to t-1)	-0.444	-0.605	-0.446	-0.603
	(0.386)	(0.404)	(0.387)	(0.404)
No R&D dummy (from t-2 to t-1)	0.025	0.029	0.022	0.025
	(0.082)	(0.080)	(0.081)	(0.078)
Change in CapEx / Assets (from t-2 to t-1)	-0.584***	-0.193	-0.589***	-0.191
	(0.181)	(0.180)	(0.180)	(0.180)
Change in Turnover NYSE (from t-2 to t-1)		-0.091***		-0.093***
		(0.033)		(0.033)
Change in Turnover NASD (from t-2 to t-1)		-0.113***		-0.115***
		(0.019)		(0.019)
Return (from t-2 to t-1)		-0.101***		-0.100***
		(0.021)		(0.021)
Return (from t-3 to t-2)		-0.101***		-0.102***
		(0.015)		(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 7: Changes in *q* and decomposition of increases in shares held

The table reports coefficients from industry-fixed effects regressions of changes in *q* on lagged ownership changes and changes in other control variables. Sample period is 1997 to 2003. The dependent variable is the change from year t-1 to year t of a proxy for Tobin's *q*, defined as before. Column 1 repeats the regression of Table 5, column 6. Column 2 decomposes the change in managerial ownership 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 increases in shares held by officers and directors are further decomposed, using the Thomson Financial Insider trading database. We use the description of the role of the insider provided by Thomson Financial to separate all insiders into officers and directors. We group the changes in insider's holdings into the following subcategories. When insiders first obtain their insider status, they are required to file an initial statement of ownership (form 3). Form 3 reports both the number of options an insider holds as well as the initial number of shares owned by the insider. The first category consists of all shares and fully vested options reported on form 3. Thomson Financial reports vesting schedules of individual option grants, and we build the portfolio of each insider's option holdings. Whenever options vest, they become part of the director and officer ownership, and we aggregate by insider type and fiscal year all vesting options for the third category. The third category consists of all open market and private placement purchases minus all open market and private placement sales of existing insiders by insider type and fiscal year (if positive). The last category sums all new grants of restricted stock given to existing insiders. For all categories, we aggregate the number of shares or options held by insider type and fiscal year and divide the aggregate holding by shares outstanding at the end of the fiscal year. The other independent variables are identical to those in Table 5, column 6, but are not reported below for brevity. 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.

	Base-case	Decomposition
Large numerator increase	0.082**	
	(0.036)	
Large denominator decrease	0.031	
	(0.049)	
Large numerator drop	-0.013	
	(0.038)	
Large denominator increase	-0.191***	
	(0.067)	
Denominator decrease (in %)		-0.047
		(0.665)
Numerator decrease (in %)		-0.126
		(0.340)
Denominator increase (in %)		-0.507**
		(0.248)
Previously granted options vest (directors)		-0.621
		(4.144)
Previously granted options vest (officers)		2.309***
		(0.809)
Initial ownership of new directors		0.244
		(0.768)
Initial ownership of new officers		0.672**
		(0.316)
Net open market purchases or private placements by directors		0.159
		(0.724)
Net open market purchases or private placement by officers		1.252***
		(0.381)
New stock grants to directors		1.167
		(3.879)
New stock grants to officers		1.118
		(2.108)
Other control variables	Yes	Yes
Industry-fixed effects	Yes	Yes
Year-fixed effects	Yes	Yes
Observations	8535	8535
R-squared	0.15	0.15

Table 8: 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. Columns 1 and 2 include concurrent changes only, and columns 3 and 4 include both concurrent and lagged changes in ownership and control variables. The dependent variable is the change from year t-1 to year t of a proxy for Tobin's *q*, defined as before. The first column includes indicator variables for large increases and decreases in director and officer ownership. The second column decomposes 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. 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 concurrent accounting variables represent changes from year t-1 to year t, and all lagged accounting variables represent changes from year t-2 to year t-1. 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.

	Concurrent changes only		Concurrent and lagged changes	
	Model 1	Model 2	Model 1	Model 2
Large increase in ownership (t)	0.047*		0.050	
	(0.027)		(0.031)	
Large decrease in ownership (t)	0.163***		0.207***	
	(0.027)		(0.030)	
Large increase in ownership (t-1)			0.055*	
			(0.029)	
Large decrease in ownership (t-1)			0.027	
			(0.030)	
Large decrease in shares held (t)		-0.009		0.034
		(0.028)		(0.029)
Large increase in shares outstanding (t)		0.457***		0.386***
		(0.050)		(0.052)
Large increase in shares held (t)		0.071**		0.062*
		(0.031)		(0.032)
Large decrease in shares outstanding (t)		-0.087**		-0.094**
		(0.042)		(0.045)
Large decrease in shares held (t-1)				-0.032
				(0.061)
Large increase in shares outstanding (t-1)				0.273***
				(0.074)
Large increase in shares held (t-1)				0.101*
				(0.059)
Large decrease in shares outstanding (t-1)				0.022
				(0.069)
Changes in control variables (concurrent)	Yes	Yes	Yes	Yes
Changes in control variables (lagged)	No	No	Yes	Yes
Firm-fixed effects	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes
Observations	20453	20453	18518	18518
Number of firms	4518	4518	4024	4024
R-squared	0.15	0.16	0.17	0.17