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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 and more likely to increase their ownership when their firms become financially constrained. 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 rely on the dynamics of the managerial ownership/firm value relation to mitigate concerns in the literature about the endogeneity of managerial ownership.

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

JEL Classification: G30, G32

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 (more than 2.5 percentage points in absolute value) is substantially more likely to experience a decline in ownership than an increase. High past and concurrent industry-adjusted 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 industry-adjusted stock returns significantly 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 mostly 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.

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'

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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/or 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

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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) suggest 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 ownership changes and changes in q. We focus on large changes to avoid the problems highlighted by Zhou (2001). 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 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, but they show a positive relation between changes in q and large increases in ownership.

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 ones caused by changes in holdings of shares by managers and others caused by increases or decreases in

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[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.

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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.

The paper is organized as follows. In Section 1, we review the literature on managerial ownership and its relation with firm value and draw implications from that literature for our empirical tests. The construction of our database is described in Section 2. In Section 3, we describe 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 review the determinants of managerial ownership emphasized in the literature and how it relates to firm value. We then develop hypotheses for the dynamics of managerial ownership and for how firm value changes as managerial ownership changes.

Section 1.a. The determinants of managerial ownership

Jensen and Meckling (1976) study the tradeoffs that a manager faces when choosing her managerial ownership, which they define as the fraction of the firm's shares held by its manager. A manager chooses her ownership in the firm by maximizing her expected lifetime utility, so managerial ownership is endogenously determined. She derives utility from both direct compensation in the form of cash, options, and shares, and from consuming private benefits in her position. Everything else equal, the value of the firm to outside investors falls as consumption of private benefits increases. Consequently, outside investors will pay less for the firm's securities,

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especially its equity, when managers are expected to consume more private benefits. To raise external financing, managers must therefore find ways to convince outside investors that consumption of private benefits will be limited. By having larger managerial ownership, the manager bonds herself to giving more weight to the interests of outside shareholders in her objectives.

The manager benefits from greater managerial ownership because it increases the price at which the firm can sell equity to outside shareholders. Furthermore, she is less likely to be replaced by shareholders or through hostile acquisitions because she has better incentives to maximize the wealth of outside shareholders. However, greater managerial ownership also gives greater control to managers. Whereas greater ownership of cash flows is associated with higher firm value for outside investors, everything else constant, greater ownership of control rights can, beyond some level, reduce firm value (see Morck, Shleifer and Vishny (1988) and Stulz (1988)).

Managerial ownership has costs for managers. First, it prevents them from holding a diversified portfolio and from using their wealth for consumption. As a result, the benefits from managerial ownership have to be higher for more volatile firms to convince managers to hold a given stake in their firm. Everything else equal, the costs of managerial ownership increase with firm size, because the dollar volatility of managerial ownership increases as firm size increases (Schaefer (1998)). Second, for a given level of managerial ownership, firm size is limited by the wealth of managers (see, for instance, Shleifer and Wolfenzon (2002)). As a result, the firm may be prevented from taking advantage of growth opportunities or may have to use more debt financing. As more debt financing is used, the position of managers becomes riskier as bankruptcy becomes more likely and their discretion may be limited by the providers of debt financing.

The extent to which bonding by managers through their ownership choice increases firm value depends on the extent to which outside investors can monitor managers. In a hypothetical world with perfect information where outside shareholders could costlessly monitor management

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at all times, bonding would be of little use since managers would always maximize shareholder wealth. However, monitoring has limits. Many actions of managers are unobservable. Following Holmstrom (1979), a large literature focuses on contract design to effectively elicit unobservable managerial efforts. Imperfect information about managerial effort leads to the design of contracts that provide incentives for managers to exert effort. Because managers have better information than shareholders and because shareholders cannot always establish whether the managers' actions increase firm value, the optimal contract for managers involves compensation that is sensitive to changes in firm value. However, managers have to be compensated for this sensitivity as it increases the risk they bear. Beyond effort, the manager makes a multitude of decisions which can benefit her at the expense of the outside shareholders. For instance, the manager can make decisions about the risks the firm takes that benefit her but reduce shareholder wealth. As agency problems worsen, optimal managerial ownership increases (see Core, Guay and Larcker (2003) for a review of the literature on empirical predictions).

With higher monitoring costs, managers have more discretion and can extract more rents from their position. Managers may still lose their position, perhaps through a takeover or because of poor performance that leads the firm to financial distress. Even when monitoring costs are high, however, 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. When the firm is financially constrained, managers may be the cheapest providers of external funding to the firm. If shares are issued in exchange for cash or services from managers, the acquisition of the managers' stake and the increase of that stake infuse additional resources into the firm.

Managers may trade in shares of their firm because they have private information that leads them to believe that their firm is misvalued by the market. There is a vast literature that investigates whether trading by management is profitable and whether it is informative for shareholders (see, for instance, Lakonishok and Lee (2001) or Jeng, Metrick and Zeckhauser

(2003)). In an efficient market, the informational advantage of managers would be short-lived since the market would reprice the firm when it learns of trades by managers. However, to the extent that the market cannot completely infer managers' information, it is possible that the firm could be mispriced over longer periods of time and therefore valuation considerations would have a more persistent impact on managerial holdings. The corporate finance literature has also emphasized that firms would rather sell shares when their managers believe that these shares are overvalued by the market. If the market does not discount the share price fully to reflect the beliefs of managers, firms can issue overpriced equity (Myers and Majluf (1984)). If managers make equity issuance and repurchase decisions based on information they have about the fundamental value of their firm, they can also be expected to make decisions about their ownership of firm shares using this information (Jenter (2005)).

1.b. Empirical predictions

We have identified four motives for managers to hold shares in their firm: (1) bonding, (2), control, (3) financing, and (4) timing. Further, we have identified costs to managerial ownership, namely that managers have to bear firm-specific risk, that they cannot consume out of their wealth as much as they might want to, and that firm size is limited.

We would expect the bonding motive to be more important for firms with greater potential for agency problems. These problems are likely to be more important for firms with more information asymmetries and/or higher monitoring costs between managers and outside investors. 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, with more growth opportunities, with less monitoring by analysts, and with managers who have not built a reputation. However, some of these firm characteristics may measure growth opportunities and the interests of management and shareholders are likely to be better aligned for firms with high growth opportunities (e.g., Stulz (1990)). If R&D investment better proxies for

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growth opportunities than for information asymmetries, we would then expect managerial ownership to be lower for high R&D firms.

More generally, it follows from these motives for managerial ownership that managers own more shares in young firms and that they sell them as their firms become more mature and as they perform 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 financing motive will also 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 to fall over time. 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 (see Stulz (1988)), 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. We would expect the control motive to be less important for firms with valuable growth opportunities, since managerial entrenchment makes access to outside funding to exploit these growth opportunities more expensive.

We would expect large decreases in ownership to 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 the manager's stake and would make it more likely that she will be challenged in her 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

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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 and provide resources to the firm.

With the timing motive, management buys shares when the firm is undervalued and sells them when it is overvalued. With this theory, 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 (Jenter (2005)). The key prediction of this version of the timing theory is that increases (decreases) in managerial ownership should be followed by positive (negative) abnormal returns. In terms of firm valuation, we would therefore expect an increase (decrease) in Tobin's q to follow increases (decreases) in managerial ownership. As discussed in DeAngelo, DeAngelo and Stulz (2008), there are several different theories of market timing for equity issues, some consistent with market efficiency and others not. The same point applies to timing by managers. Managers could sell shares when the firm's market-to-book ratio is high because they expect future depreciation or because of the bonding and financing motives we discussed. In the former case, managers would expect to profit from their trades as the stock price decreases to reflect their information; in the latter case, this need not be true since the bonding or financing motive suggests that managers only sell when selling stock does not have a significant impact on the stock price. Interestingly, Jenter (2005) finds no evidence that managers benefit from their trades. Though financial constraints and the firm's lifecycle play an important role in the agency theory developed in this section, they play no role in the timing theory.

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).[2]

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.[3] 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.[4]

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, Compustat, and I/B/E/S, remove utilities and financial firms, and eliminate observations with missing Compustat and CRSP 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 approximately 28,000 firm-year observations for 4,900 different firms.

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[2] Note that the early literature on the interaction of Tobin's q and ownership sometimes uses slightly different definitions of ownership. 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.

[3] 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.

[4] Compact Disclosure reports the number of shares outstanding, but it 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 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.

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

Table 1 shows time-series summary statistics of our ownership data. The data are 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 than 40% of the firms in our sample would not be widely held according to a 20% threshold.[5] The fraction of firms with more than 20% managerial ownership stays relatively constant over time. We also see that in a typical year 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 1.0% 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

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

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 (21.3%) is almost twice the probability of a large increase (12.3%). 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%.

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:

$$\text{Change in ownership}_{it} = c + \beta \times \text{Change in ownership}_{it} \left| Change < -2.5\% \right.$$
$$+ \gamma \times \text{Change in ownership}_{it} \left| Change > 2.5\% + \varepsilon_{it} \right.$$

The R-squared of the regression 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 remainder 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 decompose large changes in ownership into changes in the number of shares outstanding and changes in the number of shares held by management. We then decompose further the changes in the number of shares held by management into different methods of acquisitions of shares to evaluate whether the financing motive for managerial ownership is economically significant. 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 or even decreases. 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:

$$\Delta\alpha_t = \left(\frac{S_{t+1}}{N_{t+1}}\right) - \left(\frac{S_t}{N_t}\right) = \frac{S_{t+1}}{N_{t+1}} - \frac{S_{t+1} - \Delta S}{N_t} = \frac{\Delta S}{N_t} + \frac{S_{t+1}}{N_{t+1}} - \frac{S_{t+1}}{N_t}$$

$$= \frac{\Delta S}{N_t} + \frac{S_{t+1}N_t}{N_{t+1}N_t} - \frac{S_{t+1}N_{t+1}}{N_t N_{t+1}} = \frac{\Delta S}{N_t} - \frac{S_{t+1}\Delta N}{N_{t+1}N_t} \qquad (1)$$

$$= \frac{\Delta S}{N_t} - \alpha_{t+1}\frac{\Delta N}{N_t}$$

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.

There are only two reasons for decreases in the numerator – either managers sell shares or they stop being insiders. However, increases in the numerator can have a wide number of causes because insiders can acquire shares in a number of different ways. We therefore investigate where large increases in shares held by management come from. Such an inquiry is especially important to assess the economic importance of the financing motive for managerial ownership. 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.

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 cases (22.1%) where officers acquire shares either in the open market or through a private placement. Director share acquisitions represent 84 cases (11.3%). 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 (35.5%) 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.[6]

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 to vesting for directors (officers) is 1.67 years (2.03 years). 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 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%.[7]

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 5,959 large decreases, 3,454 large increases, and 18,560 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

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[6] E.g., Wruck and Wu (2007).
[7] See Jensen and Murphy (1990) for evidence that it is sensible to use a delta of 0.6.

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.

We also investigate whether firms experience changes in CEO or in the chairman of the board that could be associated with large changes in ownership (e.g, Denis and Sarin (1999)). For instance, a retiring CEO who has a large ownership stake could sell shares upon retirement or, if he does not stay on the board, would drop out of the insider data. The data on CEOs and chairmen are 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.[8]

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 discussed 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. Firms which experience large drops in ownership have the highest average Tobin's *q*. These results are puzzling if these variables proxy for information asymmetries. However, as explained earlier, some of these variables might actually be better proxies of growth opportunities, which would explain the results. We follow Whited and Wu (2006) and use their index of financial constraints to measure whether a firm becomes financially constrained or unconstrained.[9] Each year, we

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[8] See Gibbons and Murphy (1992) for a contracting model that takes managerial career concerns into account. Finding that managerial turnover is associated with a large drop in ownership is consistent with their model in which younger managers need fewer explicit incentives due to career concerns.

[9] Whited and Wu (2006) construct an index of financial constraints using six variables (cash flow over total assets, a dividend payer indicator variable, total long-term debt over total assets, log of total assets, sales

group all firms into quartiles based on the Whited-Wu index and define those in the upper quartile as financially constrained and those in the lower quartile as financially unconstrained. The indicator variable 'became financially constrained' ('became financially unconstrained') is equal to one if a firm moves into the top quartile (bottom quartile), and zero otherwise. It is evident from Table 2 that firms that experience large ownership increases have become more often financially constrained and less often financially unconstrained than all other firms. However, each year only a small fraction of firms become less or more financially constrained.

In the next panel, we summarize the Center for Research in Security Prices (CRSP) variables. 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 firms experiencing large increases in ownership have low turnover compared to other 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.

In the last panel, we report the number of analysts that follow a firm's stock and that provide one-year earnings per share estimates. The number of analysts is provided by I/B/E/S. If a firm is not covered by analysts (approximately 20% of our sample), we set the number of analysts to zero. Table 2 shows that firms with no large change in ownership have the most analyst coverage, with on average 6.3 analysts. Firms that experience large decreases in ownership are covered by on average 3.7 analysts. Firms that experience large increases in ownership have the least analyst coverage with, on average, 2.4 analysts.

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growth, and industry sales growth). The index is calculated by multiplying each of these variables with a coefficient that is estimated via GMM from an investment Euler equation (equation (13) on page 543).

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

The hypotheses 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 industry-adjusted stock returns are strongly significant predictors of large decreases in ownership. For example, a one standard deviation increase in concurrent industry-adjusted returns increases the probability of a large decrease in ownership by 3.5 percentage points, which is large compared to the unconditional probability of a large ownership decrease of about 20 percent.[10] In contrast, column 2 of Table 3 shows that the contemporaneous industry-adjusted stock return is not significant in the regression for large increases. Furthermore, the lagged industry-adjusted stock return in column 2 has a coefficient in absolute value roughly a quarter of the coefficient of the large decrease regression (column 1). The regressions demonstrate a lack in symmetry in the relation between industry-adjusted stock returns and large ownership changes when we separate large decreases from large increases. Thus, the results are hard to reconcile with a mispricing timing story for purchases.

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 are 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

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[10] The effects of returns on changes in ownership are quantitatively and qualitatively similar if we use raw returns only or both raw and industry-returns separately.

would predict future decreases, which is what we observe. However, it is puzzling that large increases are more likely following decreases in ownership.[11] Firms with an increase in R&D are more likely to experience a decrease in ownership. Firms that become financially constrained are more likely to experience an increase in managerial ownership, and firms that become financially unconstrained are less likely to experience an increase in managerial ownership. However, there is no association of our measures of financial constraints with a large decrease in ownership.[12] 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. Firms with a COB or CEO change are more likely to experience a decrease in ownership. Firms with an increase in analyst coverage are more likely to experience a large drop and are less likely to experience a large increase in ownership. If information asymmetries become less important as analyst coverage increases (see, for instance, Frankel and Li (2004)), this result is consistent with predictions that managerial ownership falls as information asymmetries decrease.

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 quintiles. However, the contemporaneous industry-adjusted return is positive and significant

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[11] 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.

[12] This result is robust to different specifications of financial constraints. For example, in unreported regressions we show that firms that stop paying dividends or that decrease dividends are more likely to experience an increase in managerial ownership, but that there is no association of these dividend policy changes with large decreases in ownership.

across the five quintiles for large decreases in ownership. The coefficients on chairman of the board, firm size, and the past industry-adjusted return are positive and significant for three quintiles in the probit regressions for large decreases. The other firm characteristics are significant in at most two regressions. These regressions suggest therefore that the coefficients on firm characteristics other than 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 industry-adjusted return is never significant at the ten percent level, and the lagged industry-adjusted return is significant in one regression at the ten percent level. 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 interpreting 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 has a significantly negative coefficient, and contemporaneous firm size and free cash flow have positive and significant coefficients. Both the lagged and contemporaneous changes in turnover for NYSE and NASDAQ stocks are positive and significant. For the regression for large increases in managerial ownership, the change in turnover for the NYSE stocks becomes significant, but concurrent and lagged industry-adjusted stock returns do not change significance. In summary,

our conclusions on the weak effects of firm characteristics proxying for information asymmetries hold for the extended regressions as well. Further, the asymmetry of the effect of returns remains and the effect of stock liquidity grows stronger.

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 industry-adjusted 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 contemporaneous industry-adjusted stock market performance is poor and only evidence at the 10% level that they do so when lagged industry-adjusted stock market performance is poor. 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 drop in turnover (for NASDAQ firms only), and becoming financially constrained make it more likely that insiders will buy shares. On the other hand, becoming financially unconstrained makes it less likely that insiders will buy 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. An increase in analyst coverage makes it more likely that managers sell shares and firms issue equity, but less likely that firms repurchase shares.

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 industry-adjusted 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 becomes financially constrained according to the Whited-Wu (2006) measure 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.

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 briefly review the existing evidence on the relation between managerial ownership and q. 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, their view is that it is unlikely that firms are not optimizing their ownership structure. Then, the interpretation of a positive cross-sectional 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 endogenous choice of ownership, it cannot be interpreted as showing that an increase in managerial ownership

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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. After controlling for an extensive set of firm characteristics, 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 demonstrate 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.[13] 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

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[13] Cumulating insider trades during a firm's fiscal year does not provide the change in insider ownership recorded from the proxy statements for a number of reasons. During our sample period, all open market insider trades needed to be reported at the latest 10 days after the end of the month in which trading took place. While violations of this rule had to be reported in the annual report, insiders could remedy a missed filing through filing of an annual change in ownership. More importantly, several types of insider trades such as bona fide gifts and transactions between an issuer and its officers could be reported with a delay of up to 365 days. For example, Kenneth Lay sold shortly before the fall of Enron $66 million worth of stock without immediately reporting the transaction while he immediately reported a $2 million stock purchase thereby leading investors to believe that he was increasing his holdings of Enron stock. Cheng, Nagar, and Rajan (2007) estimate that at least 24% of all firm years have insider trades (both purchases and sales) that are reported with a long delay.

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. Therefore the contemporaneous relation between changes in q and changes in managerial ownership is 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 change in q follows 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

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ownership. In the next regression, we distinguish between lagged positive changes in ownership and lagged negative changes. Note that a positive coefficient on lagged negative changes means that a decrease in ownership leads to a decrease in Tobin's *q*. The regression coefficients are significantly positive for the lagged positive changes as well as the lagged negative changes 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 5% level and its value is cut by 40%.

In column 4, we re-estimate the regression where we allow for different slopes for lagged positive changes in ownership and lagged negative changes. Now, the coefficient on lagged negative changes in ownership is no longer significant but the coefficient on lagged positive changes 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 in column 6, 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%, with a median value of 5.2%, is associated with an increase in Tobin's *q* of 0.061. 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

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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 greater impact on the coefficient for ownership decreases than on the coefficient for ownership increases. A change in the CEO is associated with a decrease in *q.* Finally, an increase in analyst coverage is also associated with an increase in *q.*

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 control for past stock returns, this relation is cut by more than 50% compared to the specification without stock returns. 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 least at the 10% level in each specification. The relation between decreases in shares outstanding and Tobin's *q* is insignificant in two specifications out of four. This evidence is not supportive of a non-monotone relation between changes in managerial ownership and changes in Tobin's *q.*

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 some theories predict that firm value can fall as ownership increases when the level of ownership is high enough. For instance, Morck, Shleifer and Vishny (1988) and Stulz (1988) predict that firm value increases with share

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ownership up to a point and falls beyond that point. 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 two quintiles (quintiles 2 and 4) in which large increases in shares held by management are positively associated with changes in Tobin's q. Our evidence does not mean that the widely documented non-monotonic relation between firm value and managerial ownership does not hold in the cross-section (e.g., McConnell and Servaes (1990) and Morck, Schleifer, and Vishny (1988)), but it does mean that our analysis cannot find supportive evidence

for that non-linear relation using the dynamics of the relation between q and managerial ownership.

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 increase q and increases in shares outstanding decrease q. In column 2 of Table 7, we separate the increases in director and officer ownership into different components. The results are striking. We find that increases in director ownership are not associated with increases in q. In contrast, for the officer ownership changes, the coefficients are positive and significant except for the coefficient on new stock grants. The coefficient for ownership increases due to option vesting is 2.602 (significant at the 1% level) and the coefficient for open market and private placement purchases is 1.14 (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 concurrent change in q should be related to both the concurrent 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 (2008)). There is no evidence that a decrease in shares held by management is associated with a change in q. It follows from this that it is important to decompose the change in ownership to understand the relation between changes in q and changes in ownership. The positive coefficient for large increases in managerial ownership is explained by large purchases by management; the positive coefficient for large decreases in managerial ownership is explained by the fact that share issues are correlated with large stock returns.

In column 3, we add the lagged variables to regression (1). In that regression, three ownership variables are significant: the contemporaneous large decrease variable and the contemporaneous and lagged large increase variable. The last regression uses the decomposition of the change in ownership for the current 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. 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 both the lagged and contemporaneous increase in shares held by insiders and the 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 that they 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

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managerial ownership increases. Strikingly, however, managerial ownership increases for firms that have become financially constrained.

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 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 is due to increases in shares held by officers rather than to increases in shares held by directors or to decreases in shares outstanding. We find similar evidence for the contemporaneous relation between ownership and Tobin's *q* when we decompose the changes in ownership into changes in shares held by managers and shares outstanding. As a result, all our evidence is consistent with the view that increases in shares held by managers are beneficial for firm value. However, we find no evidence that is supportive of the view that decreases in managerial ownership are associated with decreases in firm value.

Our findings suggest the following interpretation. Managers own shares to maximize their welfare subject to constraints and 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.

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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. The director and officer (D&O) ownership data come from Compact Disclosure. D&O ownership is the average level of director and officer ownership as of the record date. Change in ownership is the 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. If data for adjacent years are missing, ownership changes are not calculated. 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.

Fiscal Year	Number of Firms	D&O ownership Mean	Median	Change ownership Mean	Median	Positive change Mean	Median	Negative change Mean	Median	% of firms with large drop	large increase	% of firms with ownership level < 2.5%	> 20 %	> 30%	>40%	> 50%
1988	870	23.1%	17.6%	-0.5%	0.0%	1.4%	0.0%	-1.9%	0.0%	16.0%	15.5%	16.1%	45.7%	31.6%	21.4%	13.0%
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	1392	24.9%	20.0%	-0.5%	0.0%	1.6%	0.0%	-2.0%	0.0%	19.1%	13.6%	12.6%	50.0%	35.8%	23.6%	15.0%
1991	1519	24.3%	19.1%	-1.2%	-0.2%	1.4%	0.0%	-2.6%	-0.2%	22.9%	12.8%	11.4%	48.6%	34.7%	23.0%	13.5%
1992	1580	23.3%	17.6%	-1.0%	-0.2%	1.4%	0.0%	-2.3%	-0.2%	22.0%	11.1%	12.2%	45.8%	32.5%	21.1%	13.0%
1993	1661	21.2%	15.2%	-1.6%	-0.3%	1.0%	0.0%	-2.6%	-0.3%	23.5%	8.2%	12.5%	41.2%	28.5%	17.1%	9.8%
1994	1814	21.2%	14.9%	-1.1%	-0.1%	1.0%	0.0%	-2.1%	-0.1%	19.8%	9.0%	11.4%	42.1%	27.7%	17.4%	10.3%
1995	1753	21.8%	15.9%	-1.3%	-0.2%	1.2%	0.0%	-2.5%	-0.2%	23.2%	10.3%	10.8%	42.6%	28.4%	17.7%	10.7%
1996	1560	21.6%	14.7%	-1.3%	-0.2%	1.2%	0.0%	-2.6%	-0.2%	24.4%	10.5%	11.7%	41.1%	28.5%	18.6%	11.4%
1997	1722	21.4%	14.9%	-1.6%	-0.2%	1.1%	0.0%	-2.8%	-0.2%	24.3%	10.2%	10.7%	40.4%	28.0%	17.5%	11.3%
1998	2100	22.5%	15.9%	-0.3%	0.0%	1.6%	0.0%	-1.9%	0.0%	18.7%	14.6%	10.4%	42.5%	29.8%	19.5%	12.0%
1999	2304	22.9%	16.4%	-0.5%	0.1%	1.6%	0.1%	-2.1%	0.0%	20.6%	16.4%	10.2%	44.1%	30.1%	19.7%	12.5%
2000	2268	23.0%	15.6%	-0.7%	0.0%	1.5%	0.0%	-2.2%	0.0%	21.1%	16.3%	9.3%	43.5%	30.2%	21.4%	13.9%
2001	2063	22.3%	15.0%	-0.7%	0.0%	1.5%	0.0%	-2.3%	0.0%	20.6%	13.3%	9.0%	41.5%	28.9%	19.6%	12.8%
2002	1735	21.5%	14.5%	-0.6%	0.1%	1.3%	0.1%	-1.9%	0.0%	17.5%	13.9%	8.9%	40.3%	27.2%	19.3%	11.6%
2003	1765	19.1%	11.8%	-1.7%	-0.2%	1.2%	0.0%	-2.9%	-0.2%	25.0%	8.3%	10.1%	34.7%	22.4%	15.4%	8.6%
Overall	27502	22.3%	15.8%	-1.0%	-0.1%	1.4%	0.0%	-2.3%	-0.1%	21.3%	12.3%	10.9%	42.9%	29.5%	19.4%	11.9%

Table 2: Summary statistics of data by data source

The first two columns of the table 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 related to D&O ownership. From the Compact Disclosure director text files, we derive changes in the chief executive officer and chairman of the board position. From the Compustat database, we derive research and development expenditures over assets; a dividend payer indicator variable, equal to 1 if the firm has paid a dividend in that year; a dividend termination (initiation) indicator variable, equal to 1 if the firm has ceased (started) to pay 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; leverage, defined as long-term debt plus short-term debt over book value of assets; a financially constrained (financially unconstrained) indicator variable, equal to 1 if the firm becomes financially constrained (financially unconstrained) according to the definition of Whited and Wu (2006). 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 I/B/E/S summary database, we calculate the average number of analysts that follow a firm during the fiscal year. All variables are winsorized at the 1% and 99% level, respectively.

| | No change 18560 obs. | | Large drop 5959 obs. | | Large increase 3454 obs. | | Mann-Whitney-Wilcoxon rank-sum tests of equality of distributions (p-values) | | |
| | | | | | | | No chg. vs. Large drop | No chg. vs. Lg. increase | Lg. drop vs. Lg. increase |
	Mean	Median	Mean	Median	Mean	Median			
Compact Disclosure Variables									
Percentage ownership	19.0%	11.1%	24.5%	20.7%	36.3%	32.8%	0.000	0.000	0.000
Percentage ownership (t-1)	18.9%	11.1%	34.1%	30.7%	27.5%	23.4%	0.000	0.000	0.000
Percentage ownership (t-2)	19.7%	12.1%	35.1%	32.2%	28.8%	25.4%	0.000	0.000	0.000
Change in percentage ownership	0.0%	0.0%	-9.6%	-6.4%	8.8%	5.2%	0.000	0.000	0.000
Ownership < 2.5%	15.8%	---	0.0%	---	3.5%	---			
Ownership > 20%	34.5%	---	51.2%	---	73.5%	---	0.000	0.000	0.000
Ownership > 30%	23.9%	---	32.4%	---	54.7%	---	0.000	0.000	0.000
Ownership > 40%	16.1%	---	18.6%	---	38.7%	---	0.000	0.000	0.000
Ownership > 50%	9.9%	---	10.0%	---	26.0%	---	0.862	0.000	0.000
Concurrent change in CEO	10.6%	---	12.7%	---	11.2%	---	0.000	0.309	0.043
Concurrent change in COB	8.7%	---	12.3%	---	8.8%	---	0.000	0.861	0.000

Table 2, continued

	No change 18560 observations		Large drop 5959 observations		Large increase 3454 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	4.4%	0.4%	6.2%	0.4%	4.5%	0.0%	0.000	0.000	0.000
No R&D dummy	52.0%	---	52.0%	---	47.0%	---	0.450	0.000	0.000
Dividend payer	38.2%	---	16.3%	---	19.3%	---	0.000	0.000	0.000
Dividend termination	1.4%	---	1.1%	---	2.0%	---	0.178	0.004	0.001
Dividend initiation	1.6%	---	1.7%	---	1.5%	---	0.674	0.645	0.491
Log (book value of assets)	5.38	5.21	4.36	4.28	4.15	4.07	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	2.24	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	0.21	0.19	0.21	0.16	0.23	0.20	0.165	0.000	0.000
Became financially constrained	2.2%	---	3.7%	---	4.8%	---	0.000	0.000	0.015
Became financially unconstrained	1.6%	---	1.9%	---	0.9%	---	0.176	0.002	0.000
CRSP Variables									
Concurrent return	15.3%	4.3%	40.0%	13.0%	13.9%	-3.1%	0.000	0.000	0.000
Concurrent industry return	18.5%	12.1%	25.7%	16.1%	15.8%	9.6%	0.000	0.000	0.000
Concurrent market return	12.8%	13.7%	14.4%	15.2%	11.2%	13.7%	0.000	0.001	0.000
Lagged return	14.2%	2.2%	29.2%	7.1%	7.3%	-6.7%	0.000	0.000	0.000
Lagged industry return	13.6%	9.2%	14.0%	8.8%	12.9%	8.4%	0.393	0.001	0.205
Lagged market return	11.0%	13.3%	10.7%	12.8%	12.4%	13.7%	0.550	0.000	0.001
Turnover NYSE	0.83	0.66	0.74	0.56	0.64	0.46	0.000	0.000	0.000
Turnover NASDAQ	1.60	0.98	1.56	1.07	1.26	0.77	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
I/B/E/S Variable									
Number of analysts	6.3	3.3	3.7	2.2	2.4	1.0	0.000	0.000	0.000

Table 3: Large changes in ownership and 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 D&O ownership decreases (increases) by more than 2.5%, and zero otherwise. The regressions are estimated on the pooled time-series and cross-sectional sample. The 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 (not reported); 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 long-term and short-term debt over book value of assets; a financially constrained (financially unconstrained) indicator variable, equal to 1 if the firm becomes financially constrained (financially unconstrained) according to the definition of Whited and Wu (2006); 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; industry-adjusted and market-returns over the previous fiscal year; industry-adjusted and market returns over the current fiscal year; and the average number of analysts that follow a firm during the 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	0.524***	0.146***
Change in D&O ownership	-0.244***	-0.150***
Change R&D / assets	0.319***	-0.073
Change in log (book value assets)	0.091***	-0.053***
Change in capex / assets	-0.085	-0.025
Change in free cash flow	0.005	0.028*
Change in PPE / assets	0.150***	-0.033
Change in leverage	-0.053*	0.079***
Became financially constrained	0.004	0.040**
Became financially unconstrained	0.028	-0.036**
Change in turnover NYSE	-0.011	-0.006
Change in turnover NASDAQ	0.002	-0.009***
Change in idiosyncratic volatility	0.142	0.242
Concurrent industry-adjusted return	0.053***	-0.005
Concurrent market return	0.071	0.014
Lagged industry-adjusted return	0.049***	-0.012***
Lagged market return	0.092**	0.023
Concurrent change in COB	0.106***	-0.016**
Concurrent change in CEO	0.051***	-0.002
Change in analyst coverage	0.011***	-0.004***
Number of observations	18810	18810
Observed probability	0.199	0.119
Predicted probability	0.174	0.110
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 D&O 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 (not reported); 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 long-term and short-term debt over book value of assets; a financially constrained (financially unconstrained) indicator variable, equal to 1 if the firm becomes financially constrained (financially unconstrained) according to the definition of Whited and Wu (2006); 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; industry-adjusted and market-returns over the previous fiscal year; industry-adjusted and market returns over the current fiscal year; and the average number of analysts that follow a firm during the 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	0.341***	0.176***	0.082***	0.039***
Change in D&O ownership	-0.182***	-0.045***	-0.132***	-0.018**
Change R&D / assets	0.097*	0.159***	-0.038	-0.028**
Change in log (book value assets)	0.029***	0.043***	-0.039***	-0.011***
Change in capex / assets	-0.048	-0.017	-0.009	-0.013
Change in free cash flow	0.018	0.003	0.010	0.009***
Change in PPE / assets	0.038	0.063**	-0.028	-0.008
Change in leverage	-0.051*	-0.008	0.078***	0.007
Became financially constrained	0.004	-0.005	0.036**	0.003
Became financially unconstrained	0.008	0.005	-0.038***	0.006
Change in turnover NYSE	-0.018**	0.007	-0.005	-0.001
Change in turnover NASDAQ	0.004	-0.000	-0.008***	-0.001*
Change in idiosyncratic volatility	0.030	0.048	0.304	-0.020
Concurrent industry-adj. return	0.009***	0.032***	-0.005	-0.002**
Concurrent market return	0.003	0.049**	0.007	-0.001
Lagged industry-adj. return	0.008*	0.031***	-0.007*	-0.004***
Lagged market return	0.026	0.026	-0.006	0.007
Concurrent change in COB	0.095***	-0.000	-0.007	-0.005***
Concurrent change in CEO	0.052***	-0.003	0.005	-0.004**
Change in analyst coverage	0.005***	0.007***	-0.001	-0.001***
Number of observations	18810	18810	18810	18810
Observed probability	0.134	0.069	0.098	0.017
Predicted probability	0.116	0.050	0.093	0.010
Pseudo-R2	0.078	0.175	0.024	0.115

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 (not reported); capital expenditures over assets; change in CEO, an indicator variable equal to one if the chief executive officer changed in the previous year; the average number of analysts that follow a firm during a fiscal year; a financially constrained (financially unconstrained) indicator variable, equal to 1 if the firm becomes financially constrained (financially unconstrained) according to the definition of Whited and Wu (2006); 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 industry-adjusted returns over the two previous fiscal years. All accounting and I/B/E/S variables are calculated as 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	0.527***		0.291**			
(from t-2 to t-1)	(0.120)		(0.127)			
Positive change		0.460***		0.494***		
(from t-2 to t-1)		(0.172)		(0.184)		
Negative change		0.572***		0.147		
(from t-2 to t-1)		(0.192)		(0.202)		
Large increase (2.5%) (t-1)					0.055**	0.061***
					(0.023)	(0.023)
Large drop (2.5%) (t-1)					-0.085***	-0.015
					(0.023)	(0.023)
Change in log (book value)	-0.601***	-0.600***	-0.430***	-0.431***	-0.595***	-0.428***
(from t-2 to t-1)	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)
Change in log (book value)	0.134**	0.135**	0.143**	0.141**	0.133**	0.141**
squared	(0.062)	(0.062)	(0.064)	(0.064)	(0.061)	(0.064)
Change in PPE / assets	-0.142	-0.142	-0.417***	-0.416***	-0.156	-0.423***
(from t-2 to t-1)	(0.161)	(0.161)	(0.158)	(0.158)	(0.161)	(0.158)
Change in PPE / Assets	-0.510	-0.513	-0.453	-0.446	-0.507	-0.451
squared	(0.981)	(0.981)	(0.987)	(0.985)	(0.978)	(0.984)
Change in idiosync. vol.	-0.235	-0.238	0.455	0.473	-0.179	0.497
(from t-2 to t-1)	(0.733)	(0.733)	(0.777)	(0.778)	(0.732)	(0.778)
Change in free cash flow	-0.044	-0.044	0.089	0.089	-0.044	0.088
(from t-2 to t-1)	(0.097)	(0.097)	(0.098)	(0.098)	(0.097)	(0.098)
Change in R&D / assets	-0.534	-0.533	-0.702**	-0.702**	-0.526	-0.701**
(from t-2 to t-1)	(0.326)	(0.326)	(0.346)	(0.346)	(0.326)	(0.346)
Change in Capex / assets	-0.550***	-0.549***	-0.141	-0.140	-0.545***	-0.142
(from t-2 to t-1)	(0.161)	(0.161)	(0.162)	(0.162)	(0.161)	(0.162)
Change in CEO	-0.046*	-0.046*	-0.048*	-0.048*	-0.047*	-0.048*
	(0.026)	(0.026)	(0.025)	(0.025)	(0.026)	(0.025)
Change in analyst	-0.034***	-0.034***	-0.012**	-0.012**	-0.034***	-0.012**
coverage	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)

Became financially constrained	0.086 (0.065)	0.086 (0.065)	0.004 (0.062)	0.003 (0.062)	0.085 (0.065)	0.002 (0.062)
Became financially unconstrained	-0.021 (0.068)	-0.021 (0.068)	-0.015 (0.070)	-0.015 (0.070)	-0.022 (0.068)	-0.016 (0.070)
Change in turnover NYSE (from t-2 to t-1)			-0.084*** (0.027)	-0.085*** (0.027)		-0.085*** (0.027)
Change in turnover NASD (from t-2 to t-1)			-0.114*** (0.017)	-0.114*** (0.017)		-0.114*** (0.017)
Return (from t-2 to t-1)			-0.106*** (0.020)	-0.107*** (0.020)		-0.107*** (0.020)
Return (from t-3 to t-2)			-0.106*** (0.014)	-0.106*** (0.014)		-0.106*** (0.014)
Observations	21530	21530	20541	20541	21530	20541
Number of clusters	4782	4782	4558	4558	4782	4558
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 (not reported); capital expenditures over assets; change in CEO, an indicator variable equal to one if the chief executive officer changed in the previous year; the average number of analysts that follow a firm during a fiscal year; a financially constrained (financially unconstrained) indicator variable, equal to 1 if the firm becomes financially constrained (financially unconstrained) according to the definition of Whited and Wu (2006); 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 industry-adjusted returns over the two previous fiscal years. All accounting and I/B/E/S variables are calculated as 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)	-0.008	0.007	0.143	-0.015
	(0.026)	(0.025)	(0.221)	(0.234)
Large increase in shares outstanding (t-1)	-0.227***	-0.096**	-1.403***	-0.601**
	(0.044)	(0.044)	(0.246)	(0.247)
Large increase in shares held (t-1)	0.048*	0.050**	0.771***	0.498**
	(0.025)	(0.025)	(0.187)	(0.193)
Large decrease in shares outstanding (t-1)	0.065	0.081*	-0.868**	-0.678
	(0.042)	(0.042)	(0.412)	(0.414)
Change in log (book value)	-0.570***	-0.419***	-0.576***	-0.418***
(from t-2 to t-1)	(0.058)	(0.058)	(0.058)	(0.058)
Change in log (book value) squared	0.139**	0.144**	0.149**	0.150**
	(0.061)	(0.064)	(0.062)	(0.064)
Change in PPE / assets	-0.163	-0.422***	-0.159	-0.416***
(from t-2 to t-1)	(0.160)	(0.158)	(0.160)	(0.158)
Change in PPE / Assets squared	-0.421	-0.411	-0.512	-0.426
	(0.982)	(0.986)	(0.988)	(0.988)
Change in idiosync. vol.	-0.195	0.475	-0.153	0.527
(from t-2 to t-1)	(0.729)	(0.777)	(0.730)	(0.775)
Change in free cash flow	-0.043	0.087	-0.045	0.085
(from t-2 to t-1)	(0.096)	(0.097)	(0.096)	(0.098)
Change in R&D / assets	-0.495	-0.683**	-0.503	-0.684**
(from t-2 to t-1)	(0.324)	(0.346)	(0.323)	(0.345)
Change in Capex / assets	-0.537***	-0.142	-0.531***	-0.138
(from t-2 to t-1)	(0.160)	(0.162)	(0.160)	(0.161)
Change in CEO	-0.047*	-0.048*	-0.049*	-0.049*
	(0.026)	(0.025)	(0.026)	(0.025)
Change in analyst coverage	-0.033***	-0.012**	-0.032***	-0.011**
	(0.006)	(0.005)	(0.006)	(0.005)

Became financially constrained	0.084	0.002	0.083	0.002
	(0.065)	(0.062)	(0.065)	(0.062)
Became financially unconstrained	-0.020	-0.015	-0.018	-0.012
	(0.068)	(0.070)	(0.068)	(0.070)
Change in turnover NYSE		-0.082***		-0.084***
(from t-2 to t-1)		(0.027)		(0.027)
Change in turnover NASD		-0.113***		-0.113***
(from t-2 to t-1)		(0.017)		(0.017)
Return (from t-2 to t-1)		-0.104***		-0.102***
		(0.020)		(0.020)
Return (from t-3 to t-2)		-0.105***		-0.103***
		(0.014)		(0.014)
Observations	21530	20541	21530	20541
Number of clusters	4782	4558	4782	4558
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 6, column 2. 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 second 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 6, column 2, 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	0.098**	
	(0.044)	
Large denominator decrease	0.032	
	(0.069)	
Large numerator drop	-0.025	
	(0.041)	
Large denominator increase	-0.140*	
	(0.073)	
Denominator decrease (in %)		-0.144
		(0.380)
Numerator decrease (in %)		0.811
		(0.772)
Denominator increase (in %)		-0.520*
		(0.293)
Initial ownership of new directors		1.102
		(1.019)
Previously granted options vest (directors)		-2.597
		(6.211)
Net open market purchases or private placements by directors		0.171
		(0.862)
New stock grants to directors		-2.831
		(4.094)
Initial ownership of new officers		0.974**
		(0.476)
Previously granted options vest (officers)		2.602***
		(0.950)
Net open market purchases or private placement by officers		1.140**
		(0.476)
New stock grants to officers		-0.658
		(2.510)
Other control variables	Yes	Yes
Industry-and year-fixed effects	Yes	Yes
Number of firms	2737	2737
Observations	8000	8000
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* D&O 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 D&O ownership and concurrent and lagged changes in 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 (not reported); capital expenditures over assets; change in CEO, an indicator variable equal to one if the chief executive officer changed; the average number of analysts that follow a firm during the fiscal year; a financially constrained (financially unconstrained) indicator variable, equal to 1 if the firm becomes financially constrained (financially unconstrained) according to the definition of Whited and Wu (2006); 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 industry-adjusted returns over the two previous fiscal years. 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 3	Model 4
Large increase in ownership (t)	0.061**		0.067**	
	(0.027)		(0.029)	
Large decrease in ownership (t)	0.218***		0.226***	
	(0.028)		(0.029)	
Large increase in ownership (t-1)			0.070***	
			(0.027)	
Large decrease in ownership (t-1)			0.030	
			(0.028)	
Large decrease in shares held (t)		0.041		0.052*
		(0.030)		(0.029)
Large increase in shares outstanding (t)		0.520***		0.489***
		(0.052)		(0.053)
Large increase in shares held (t)		0.093***		0.103***
		(0.031)		(0.032)
Large decrease in shares outstanding (t)		-0.110***		-0.126***
		(0.042)		(0.047)
Large decrease in shares held (t-1)				0.001
				(0.032)
Large increase in shares outstanding (t-1)				-0.012
				(0.052)
Large increase in shares held (t-1)				0.056**
				(0.028)
Large decrease in shares outstanding (t-1)				0.003
				(0.047)
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	15971	15971	14164	14164
Number of firms	3876	3876	3478	3478
R-squared	0.17	0.18	0.18	0.19