Why Do Firms Become Widely Held? An Analysis of the Dynamics of Corporate Ownership

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ABSTRACT

We examine the evolution of insider ownership of IPO firms from 1970 to 2001 to understand how U.S. firms become widely held. A majority of these firms has insider ownership below 20% after ten years. Stock market performance and liquidity play an extremely important role in ownership dynamics. Firms with stocks that are highly valued, are liquid, and have performed well experience large decreases in insider ownership and become widely held. Ownership also falls for low cash flow and high capital expenditures firms. Surprisingly, variables proxying for agency costs have limited success in explaining the evolution of insider ownership.

Most firms start their life with high insider ownership. Yet, the typical large established U.S. firm has fairly dispersed ownership. How do firms evolve so that many of them end up with dispersed ownership? Why does that evolution take place? A number of recent studies examine the determinants of insider or managerial ownership.[1] While this research focuses on understanding why, at a particular point in time, insiders or managers own a larger fraction of shares in some firms than in others, the evolution of ownership as firms mature has not been the object of much study in the U.S.[2] As a result, we know little about the dynamics of insider ownership following a firm's IPO. In this paper, we attempt to understand these dynamics better.

The stylized fact that large U.S. corporations are much more likely to have dispersed ownership than comparable corporations in most other countries (see La Porta, Lopez-de-Silanes, and Shleifer (1999), hereafter LLS) plays a central role in much of modern corporate finance.[3] In the U.S., concerns that diffuse ownership facilitates entrenchment by managers (see Berle and Means (1932)) have led to a large literature on agency costs and governance, with an intense controversy evolving over whether firms in which managers own more shares perform better and have higher valuations (see Himmelberg, Hubbard, and Palia (1999), Demsetz and Villalonga (2001), and McConnell, Servaes, and Lins (2005)). Cross-country comparisons of corporate ownership raise the question of what it is that makes the U.S. and a few other countries unique in having dispersed ownership. Is it due, for example, to differences in politics, as Roe (2003) argues, to better legal protection of investors, as LLS posit, or to the ease of takeovers and the greater liquidity of markets in the U.S. and the U.K. compared to most countries, as Bolton and von Thadden (1998) suggest? A recent paper by Becht and de Long (2005) concludes, "We wish that we knew." Investigating the dynamics of ownership following a firm's IPO in the U.S. should help us to better understand these issues.

We follow a large sample of firms over time to understand why and how firm ownership becomes more dispersed following an IPO. Our database includes all firms that completed an IPO from 1970 to 2001; we are able to follow the ownership of these firms from 1986 through 2001. LLS consider two definitions of widely held firms. According to their first definition, a firm is widely held if there is no

controlling blockholder who owns more than 20% of the votes. Rather than focusing on the largest blockholder, we consider the combined holdings of the officers and directors of the firm, whom we refer to as insiders as is common practice. Thus, a firm meets the 20% standard when its insiders own less than 20% of the firm's shares. Our approach is similar to the approach of LLS in that we focus on holdings by insiders rather than on blockholdings generally. While blockholdings by non-insiders prevent ownership from being atomistic, they do not prevent it from being diffuse. We find that for our data set, insiders control less than 20% of the cash flow rights in half of the firms 10 years after their IPO. Thus, using this measure, we find that the road to diffuse ownership is quick for the typical firm. LLS' more restrictive definition of diffuse ownership is that no controlling blockholder owns more than 10% of the firm's votes. Strikingly, insiders own less than 10% of the shares in roughly one-quarter of the firms five years after their IPO. However, the typical firm in our sample does not meet the 10% threshold any year within 30 years of its IPO. Because our sample drops in size over time, so that by 30 years, less than 3% of the IPO firms are still in the sample, we cannot reliably evaluate when half the firms eventually meet this stricter standard.

Insider ownership is defined as the ratio of shares held by insiders over the total number of shares outstanding. Note that insider ownership can fall because the numerator falls or the denominator increases. Increases in the denominator take place when the firm issues shares to raise cash, to pay for acquisitions, and to deliver shares upon the exercise of stock options and warrants, or when convertible debt converts. As long as the participation of insiders in equity issues is less than their proportional holdings of shares, their proportional ownership drops when new shares are issued.

In a study of the U.K. stock market, Franks, Mayer, and Rossi (2004) find that increases in the number of shares due to mergers play a central role in ownership dilution in the U.K. We find that the evolution of ownership in our sample is different: On average, sales of shares by insiders are as important in explaining the decrease in insider ownership as the issuance of new shares. Further, shares issued in

1

primary offerings and mergers constitute only a fraction of the increase in shares for our sample firms. This result could be explained at least in part by the importance of option compensation in the U.S.[4]

Insiders reduce their ownership in a firm when the costs of doing so are less than the corresponding benefits. The benefits are that insiders can diversify their portfolio and they can grow the firm faster because firm growth is less dependent on their co-investment. The costs are that the value of the firm's shares falls if insiders control a smaller share of cash flows than the firm value-maximizing ownership share. To the extent that insiders care about control separately from the value of their stake, a reduction in their proportional holdings also decreases their ability to influence the decisions of the firm and resist takeovers. The literature offers several theories to explain why optimal holdings by insiders may fall as firms mature, so that it becomes worthwhile for insiders to reduce their fractional shareholdings. These theories are not mutually exclusive, and thus we would not be surprised to find some support for each. Nonetheless, we seek to investigate whether some of these theories describe the data better than others.

The main ideas found in the literature can be summarized as follows:

1) Moral hazard. Agency theory (Jensen and Meckling (1976)) predicts that ownership will be more concentrated when controlling insiders find it easier to take advantage of outside or minority shareholders. Corporate insiders can benefit from their control of the firm and render the stake of minority shareholders worth less in a number of ways; the literature focuses on shirking, perk consumption, investment choice, and tunneling as the main vehicles for insiders to benefit from their control position.[5] As insiders' ownership stakes increase, their actions become better aligned with the interests of minority shareholders but they also bear more risk. If this agency view is true, we would expect firms to become widely held for two reasons: 1) some types of agency problems become less important, and/or 2) new ways of managing agency problems become cost effective as the firm becomes larger.[6] Similarly, Bolton and von Thadden (1998) build a model in which greater stock market liquidity makes it easier for blocks to be created and takeovers to occur. Their model predicts

that greater liquidity for a firm's stock makes it possible for the firm to realize a more dispersed ownership structure.

2) Adverse selection. Leland and Pyle (1977) model the retention of shares by insiders as a signal of firm quality when information asymmetries are high. As Myers and Majluf (1984) show, if insiders maximize the wealth of existing shareholders, they will choose to sell equity only if they can do so at an advantageous price. This adverse selection makes it expensive to sell shares when information asymmetries are important. Maug (2001) and Subrahmanyam and Titman (1999) point out that it becomes advantageous for firms to have outside shareholders, and hence to have more dispersed ownership, when information from outside the firm becomes more important to managerial decision-making. Thus, in the context of these models, more dispersed ownership becomes more advantageous when the informational advantage of insiders becomes less important. We would therefore expect firms to become widely held when more is known about them and as a result information asymmetries are less important.

3) Timing. Two strands of the literature imply that insiders are concerned about the market for their firm's shares when they choose to increase the supply of shares available for trading, either through sales of their own shares or through the issuance of new shares. First, a number of authors argue that it pays for firms to time the sale of new shares such that the sales occur when the firm's shares are advantageously priced (window of opportunity hypothesis).[7] Since insiders decide when the firm sells shares, they can also time sales for their own account. Clarke, Dunbar, and Kahle's (2004) evidence on secondary equity issues is consistent with the ability of insiders to gain from timing the sale of their shares. Jenter (2005) also find that managers in large firms time their sales and purchases, selling when book-to-market is low and buying when it is high, though he does not find that they gain from doing so. Second, several authors claim that the demand for shares can be downward sloping, in

which case making more shares available for trading leads to a decrease in price.[8] When the market for a firm's shares becomes deeper and more liquid, the demand for shares becomes more elastic, so that it becomes less costly for insiders to sell shares in the market. Empirical evidence shows that the cost of selling a block of shares for a small firm can be large.[9]

We investigate how the influential variables in these theories play a role in the evolution of insider ownership, in particular, and in the process whereby some firms become widely held and others not. We use two different approaches in our analysis. First, we use a probit model to identify the determinants of significant decreases in insider ownership, where we define a significant decrease in insider ownership to be a decrease of at least 5%. Second, we use a hazard model to estimate the probability that a firm will become widely held in the following year. Our two approaches are complementary. The first approach focuses on the determinants of large decreases in insider ownership after an IPO. Because a firm can experience large decreases in insider ownership and still never reach the point where its ownership is dispersed, the second approach attempts to isolate the conditions that have to be met for a firm's ownership to become dispersed.

We find that stock market variables play an extremely important role in the dynamics of insider ownership. First, firms with greater stock market turnover are more likely to see the ownership share of insiders fall, that is, are more likely to become widely held. Second, firms with high book-to-market ratios are less likely to see a large increase in ownership dispersion or to become widely held. Third, the likelihood that insiders will decrease their ownership share significantly increases with the firm's recent stock market performance. Hence, firms move towards dispersed ownership when the market for their shares is liquid in the sense that a large block of shares can be sold without too much of a discount. Strikingly, the moral hazard and information asymmetry variables seem to be largely irrelevant in predicting large changes in insider ownership. This is especially true in a regression in which we use

lagged changes for most of the explanatory variables. In that regression, ownership is expected to decrease significantly when it is high and when the stock has performed well.

Since the hazard model predicts when firms find it optimal to have diffuse ownership rather than the timing of large changes in insider ownership, it is therefore perhaps not surprising that the moral hazard and information asymmetry variables are more significant in the hazard model. The hazard model predicts that firms are more likely to meet the 10% threshold in a given year after not having met it if they have venture capital financing, a low book-to-market ratio, a low ratio of plant, property, and equipment to total assets, low free cash flow, high capital expenditures, low volatility, high contemporaneous stock returns, and high turnover, and further, if they are large and do not pay dividends. While stock return volatility is often used as a proxy for information asymmetries and agency problems, high stock return volatility also makes it costly for insiders to have a large stake. Our evidence suggests that the latter effect is less important than the former. We find no evidence that firms with more hard assets are more likely to become widely held, which seems inconsistent with the moral hazard and information asymmetry theories. These theories would also suggest that dividend payers would be more likely to be widely held, which is not the case. However, we find that firms that have greater financing needs are more likely to become widely held.

The paper proceeds as follows. In Section I, we explain our sample construction and provide summary statistics for cohorts of IPO firms. In Section II, we investigate the evolution of insider ownership and the time it takes for our sample firms to become widely held using the definitions from LLS. In Section III, we analyze the determinants of large changes in ownership. We also show how these changes take place. In Section IV, we provide hazard model estimates of the probability of becoming widely held. Finally, we conclude in Section V.

I. Data

Our analysis involves tracking the evolution of firms' insider ownership as the firms mature. We conduct this exercise using data from the time of an IPO onward, which we believe is a reasonable approach given that it is quite difficult for insiders to sell shares in any significant way while the firm is still private.[10] We identify our initial sample of IPOs from 1970 through 2001 using data provided by Securities Data Corporation (SDC). We include only common stock offerings, eliminating any IPOs in SDC that are flagged as reverse LBOs, spinoffs, rights offerings, or unit offerings. This process yields 9,057 IPOs.

SDC data on IPOs are matched with CRSP using six-digit CUSIPs. Based on SIC codes reported in CRSP, we also exclude regulated utilities (SIC codes 4900-4949) and financial institutions (SIC codes in the 6000 range), assuming that the relations between fundamental characteristics and firm ownership differ for these firms due to of regulatory constraints.[11] Further, we exclude firms for which trading prices are available on CRSP prior to the IPO date reported by SDC, assuming that the IPO information is incorrect. Because our sample dates back to 1970 and includes many Nasdaq firms, we allow a firm to be in the data set even if its first price in CRSP is substantially after the IPO; otherwise, CRSP coverage of Nasdaq firms, which begins in 1972, would greatly reduce the sample. These procedures leave us with total 6,319 IPO firms. We match SDC data to CRSP daily and monthly returns data and use CRSP to obtain data on prices, returns, share volume, and shares outstanding.

We obtain data on insider ownership from Compact Disclosure, a CD-ROM product that is updated each month. Compact Disclosure attempts to provide information on all firms that file with the SEC and have assets in excess of $5 million. Because the change in the information content between two consecutive CD-ROMs is fairly small and we do not have access to all the CDs, we use the October CDs to produce our data set. Specifically, we use the October CDs available from 1987 to 2002.[12] Compact Disclosure contains text versions of SEC filings and has the ability to create summary reports of many variables. The main variable of interest for our analysis is the ratio of insiders' holdings of common

shares over total shares outstanding (obtained from CRSP). Note that Compact Disclosure defines insiders as officers and directors of the firm. Our insider ownership variable is therefore the same as the one used, for instance, in Himmelberg, Hubbard, and Palia (1999). Obviously, our ownership data are only as good as the proxy data reported to the SEC, that is, the proxy data may lead us to understate insider ownership to the extent that insiders disavow blocks they effectively control.

In a comparison of ownership data from Compact Disclosure to ownership data from other data sources as well as from proxies, Anderson and Lee (1997) find that Corporate Text dominates Compact Disclosure as a data source, and these two data sources are better than Spectrum or Value Line. The disadvantage of Corporate Text for our study is that it covers primarily NYSE and AMEX firms before 1995, whereas most of the firms in our sample are listed on Nasdaq. Anderson and Lee (1997) conclude that the advantage of Corporate Text over Compact Disclosure is due to a significant extent to the presence of firms with dual-class shares. In unreported results, we investigate whether our results are affected by these firms. As Gompers, Ishii, and Metrick (2004) point out, there is no easy way to identify dual-class firms. We follow their method and classify as dual-class firms those firms that have multiple CUSIP numbers that differ in their 7th and 8th digits.[13] Among our sample firm-year observations, 5.94% are from firms that have dual-class shares according to this criterion. We estimate our regressions without these firms and find that our results are not affected by them. Also, while Anderson and Lee (1997) use a panel of firms for 1992, McConnell, Servaes, and Lins (2005) compare ownership from Compact Disclosure to ownership obtained directly from proxies for a sample of 200 randomly selected firms from 1992 through 1997, and find that the correlation coefficient between the two ownership sources is 0.92.

Compact Disclosure reports both the number of shares held by insiders and shares outstanding, but the two often pertain to different dates. When Compact Disclosure reports the proxy date, we obtain the total number of shares from CRSP for the same month as the date of the proxy. If Compact Disclosure reports more than one proxy date, we take the latest date reported.[14] For example, if a CD-ROM dated October 1993 has two proxy filings, one from March 1993 and another from March 1992, as well as a 10-

K from June 1993, we assume that the ownership data are as of March 1993. Since for a typical (October) CD, the latest proxy date is either from the beginning of the corresponding year or from December of the previous year, we assign the ownership information to the previous calendar year. Thus, in the above example we assume that ownership for the 1992 calendar year is given by the data as of March 1993.[15]

Because our sample of insider ownership data spans the years from 1986 to 2001, we are able to track ownership as of 1986. Consequently, the insider ownership of a firm that had an IPO in 1972, for example, would be tracked from 1986 onward. For some firms we can track ownership from the time of the IPO for more than a decade. For other firms, the first year of ownership data may be up to 16 years after the IPO.

We match Compact Disclosure to CRSP using six-digit CUSIPs. We then match the ownership-CRSP data to the IPO data again using CUSIPs. Our final sample contains 5,281 firms for which at least one year of Compustat data and ownership data are available.

Table I provides information on our sample for different IPO years. Not surprisingly, the number of IPOs varies sharply over time. We have a large number of IPOs in the first few years of the sample period, followed by a dramatic lull in the IPO market until the early 1980s. The market then slows down again towards the late 1980s before rebounding again in the early 1990s and finally slowing down sharply at the end of our sample period. For the IPOs before 1986, we lose a large number of observations when we require CRSP data and then many more observations when we merge with Compact Disclosure. The latter is mostly due to the fact that many IPO firms from the 1970s and early 1980s do not survive until 1986, the first year for which information about insider ownership is available. For instance, we lose more than three-quarters of the IPO firms from the 1970s. For the IPOs after 1986, we still lose a substantial number of firms when we merge with CRSP and drop utilities and financial firms, but merging with Compact Disclosure has a minimal impact on our sample size.

<   Insert Table I here   >

We use data from SDC to determine if an IPO is venture-backed and to identify seasoned equity offerings (SEOs) and mergers (especially those involving stock swaps). We rely on daily data in CRSP to obtain estimates of idiosyncratic volatility from market model regressions, to identify the exchange on which the firm is listed, and to calculate the daily turnover of the NYSE and Nasdaq firms. All remaining data are obtained from Compustat.

II. When Do Firms Become Widely Held?

In this section, we investigate the path to dispersed ownership for the firms in our sample. We conduct our investigation using two different samples, namely, the continuous ownership data sample and the whole sample. The continuous sample includes firms with continuous ownership data from the IPO to the year in which they have their first missing observation or the year when they first become widely held.[16] By construction, this sample includes firms with IPOs from 1986 onward. Though many of our results use only the continuous sample, we also report results that use all of our sample firms, including firms that completed their IPO between 1970 and 1985 and for which ownership data are available only after 1985. This sample, the "whole" sample, uses data from any IPO firm that has data on Compustat, CRSP, and Compact Disclosure. The benefit of using the whole sample is that it allows us to track ownership of firms up to 31 years after their IPO. In contrast, a firm in the continuous sample can be tracked no more than 16 years from its IPO.

Because our data is based on proxies, we do not have data on insider ownership at the IPO. At the end of the IPO year, the ownership distribution presumably depends on whether the lock-up for a firm has expired. Typically, it will not have expired for firms with IPOs early in the year, but will have expired for the other firms since Field and Hanka (2001) document that the typical lock-up is 180 days. This makes the distribution of ownership at the end of the IPO year partly dependent on when the IPO took place. Nevertheless, Figure 1 shows the distribution of insider ownership at the end of the IPO year. The mean insider ownership is 38.22%. Roughly, one firm in ten (10.35% of the firms) has insider ownership below

10% at the end of the IPO year and one firm in five (21.53% of the firms) meets the 20% threshold at the end of the IPO year.

<   Insert Figure 1 here   >

Figure 2 shows the distribution of insider ownership changes for firms in the whole sample. It is immediately obvious that many more changes in ownership are negative than positive. The mean (median) change in ownership is -2.07% (-0.30%) per firm-year. Both figures are statistically different from zero. The distribution is only slightly skewed to the left, with a skewness of -0.37, and has high kurtosis at 14.52.

<   Insert Figure 2 here   >

Table II, which uses the whole sample, provides statistics on insider ownership in event time starting with the year of the IPO. For instance, we find that in year 5 after the IPO the median insider ownership is 21.11%. It is interesting to note that the comparable figure for that year in Mikkelson, Partch, and Shah (1997) is 28.6%, which is substantially higher than our estimate, but their median ownership after 10 years is 17.9%, which is very close to our estimate of 18.33%. Our estimate is based on a sample with roughly 15 times as many observations as their sample of IPOs from 1980 through 1983. Another useful benchmark for our ownership data is the work of Holderness, Krozner, and Sheehan (1999), who examine insider ownership across 4,200 exchange-listed firms in 1995. They find that average insider holdings are 21% and median insider holdings are 14%. Consequently, the average and median insider holdings of our IPO firms match the average and median of the population after 25 years. Viewed from this perspective, it takes a long time for the ownership of IPO firms to look like the ownership of the population of firms. Finally, Goergen and Renneboog (2003) find that the average free float five years after an IPO (for IPOs from 1981 through 1988) is only 26.3% in Germany and 36.5% in the U.K. Though our measure of insider ownership is not directly comparable with theirs because it does not include large shareholders who are not directors or officers, the average free float after five years is 72.73% in our sample.

<   Insert Table II here   >

10

Average insider ownership falls steadily over time, dropping nearly in half over 30 years. However, the sample size falls sharply over time; from 3,878 firms in year 1 to only 70 firms in year 30. The second column provides the 25th percentile of the distribution. We see that by year 5, a quarter of the sample's ownership level is below the 10% threshold. The level of ownership for this percentile drops by almost three-quarters over 30 years. The median holdings fall more quickly than the mean holdings, indicating that the distribution of ownership is skewed to the right. The 75th percentile falls less sharply than the 25th percentile, since it drops by less than half over 30 years.

LLS refers to firms as widely held if the controlling shareholder controls less than 10% of the votes using one threshold or less than 20% of the votes using another. Our ownership measure is slightly different since we focus on ownership of cash flow rights by insiders. Following their approach we compute the fraction of firms for which insiders own less than 10% of cash flow rights (WH10) and the fraction of firms for which they hold less than 20% (WH20) and find that only one firm in eight meets the 10% standard and slightly more than one firm in five meets the 20% standard at the end of the year after the IPO. This shows that, using these thresholds, generally a firm is not widely held shortly after its IPO. However, the fraction of firms that are widely held grows steadily. Using the 20% standard, the median firm is widely held shortly before year 10, whereas for the 10% standard, it takes much longer for the median firm to be widely held. In fact, after 30 years, the median firm is still not widely held, but after that the number of firms in our sample becomes quite small and hence not useful for reaching robust conclusions. It therefore follows from Table II that firms become widely held fairly quickly on average using a 20% threshold, but not using a 10% threshold. In light of the results of Holderness, Krozner, and Sheehan (1999), this may not be surprising since median firm ownership is higher than 10% in their sample of 1995 firms. Nevertheless, close to one-third of firms are widely held after the tenth year following their IPO using the 10% threshold.

Figure 3 provides another way to look at how firms become widely held over time. In that figure, we use the whole sample to show how insider ownership evolves from the end of the IPO year. Since we are

interested in how firms become widely held, we exclude all firms that are widely held at the end of the first year following the IPO (insider ownership less than 10%). The figure shows that insider ownership falls faster earlier rather than later following the IPO. When we split the sample period for the continuous sample into two subperiods of similar length, we find similar results for both subperiods.

<   Insert Figure 3 here   >

Another useful way to look at the data is to ask how likely it is for a firm with concentrated ownership entering year n after its IPO to become widely held in that year. Table III provides estimates of such conditional probabilities. The table includes only firms in the continuous sample as the whole sample includes firms that might become widely held in the year or years for which we have no data. Using this sample, we find that the number of firms that could become widely held after year 10 is less than 100 for each threshold.

<   Insert Table III here   >

The probability of becoming widely held at the 10% threshold is 10% or higher in only three years. In contrast, the probability of becoming widely held at the 20% threshold is 10% or higher in most years. This reflects the fact that a firm is much more likely to meet the 20% threshold than the 10% threshold. While we find no evidence that the probability of becoming widely held decreases monotonically over time, the highest probability obtains in year 1 for both thresholds. Also, we see that each year we lose firms from our sample, and except for the early years, we typically lose more firms than there are firms becoming widely held.

III. How Do Large Changes in the Ownership Share of Insiders Take Place?

In this section, we investigate the nature of large insider ownership changes and the determinants of such changes. As Zhou (2001) notes, insider ownership typically does not change much from year to year. In our data, the mode of the distribution of changes is 0%. To understand changes in the ownership share of insiders, we therefore analyze how significant changes in ownership take place and the firm

12

characteristics that are correlated with such changes. We define a significant change in ownership as a reduction in the ownership share of insiders of 5% of the firm's equity or more. We use 5% because it corresponds to the regulatory threshold for the definition of a blockholding (Rule 13d-1(a) of the Securities Exchange Act).[17] Thus, a drop in the ownership share of insiders from 40% to 33% would correspond to a significant reduction in insider ownership but a drop from 40% to 37% would not.

The ownership share of insiders can change because the number of shares they hold falls and/or because the number of shares outstanding for the corporation increases. To account for the changes due to each factor, we use the following decomposition of the change in the ownership share of insiders. Define $\Delta\alpha_t$ to be the change in the ownership share of insiders from t to $t+1$, S_t 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 therefore have

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

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

We use equation (1) to understand better how ownership changes. Table IV shows the distribution of significant changes in the ownership share of insiders. We find that both the average and median changes in insider ownership are large in years in which insider ownership decreases by at least 5%. In particular,

the mean decrease is 15%. Using our decomposition, we find that on average the change in insider ownership due to insider sales is slightly higher than the change in insider ownership due to the increase in the number of shares. The relative importance of insider sales is even greater when we consider medians. The number of shares outstanding can increase because of a variety of reasons. For instance, it increases when the firm issues shares, when it pays for a merger with shares, or when executives exercise stock options. It follows, therefore, that mergers are a less important contributor to the reduction of the insider ownership share than sales of shares by insiders. This result contrasts sharply with the conclusion of Franks, Mayer, and Rossi (2004) for the U.K.

<   Insert Table IV here   >

We also collect information on secondary offerings from SDC. Such offerings are likely to be sales of stock by the insiders in a public offering, although they could be sales by blockholders who do not have a seat on the board of directors. To be conservative, we use secondary offerings for the three-year window centered on the year of a significant insider ownership change. This three-year window ensures that we include all secondary offerings that could possibly be related to the change in insider ownership, and provides an upper bound to the change in ownership that can be accounted for by secondary offerings. We find that secondary offerings account for a small fraction of the change in insider ownership on average.

To consider more directly the role of share issues and the reason for such issues, we investigate the change in shares outstanding brought about by equity issues and mergers around the years in which insider ownership changes by more than 5%. We again use a three-year window. We find that shares issued through SEOs and mergers represent a small fraction of the increase in shares. This result is surprising. An obvious concern is that SDC does not record some of the seasoned issues and mergers of the firms in our sample because these firms are too small for their transactions to be noticed. We therefore investigate whether the results are different if we split our sample into large and small firms. We find that Table IV is very similar if we only include the large firms in our sample.   It seems, therefore,

that a more likely explanation for our results on SEOs and mergers is that options, private equity placements, and convertible conversions play an important role for firms that have recently completed their IPO.

IV. Why Do Firms Have Large Decreases in Ownership?

We now consider why we observe large decreases in insider ownership. Is it because of changes in optimal insider ownership that are consistent with the moral hazard and information asymmetry theories discussed in the introduction or because of windows of opportunity that enable insiders to sell shares and firms to issue shares at advantageous prices? In this section, we estimate probit regressions where the dependent variable takes the value of one if the firm experiences a decrease in insider ownership of at least 5% during a period. Therefore, the coefficient on a variable that makes it more likely that a firm experiences such an insider ownership decrease should be positive. Note that our regressions include lagged insider ownership as an explanatory variable, so that we are examining the relation between the explanatory variables and the probability of a large decrease in insider ownership conditional on a given level of insider ownership. The sample uses any IPO firm with data on Compustat, CRSP, and Compact Disclosure that is not widely-held at the beginning of the year using the 10% threshold.

The variables that the above theories deem important and the proxies we use for these variables are as follows:

1. *Level of insider ownership.* If it is costly for insiders to bear firm risk, they are more likely to decrease their holdings if their holdings are large. We therefore expect a positive coefficient on this variable.

2. *Venture capital.* Venture capital firms (VCs) typically hold a seat on the board of directors (Baker and Gompers (2003)), which means they are classified as insiders according to our data source, Compact Disclosure. Given that VCs aggressively cash out within a few years of

the IPO (Field and Hanka (2001)), IPOs with VC backing should be more likely to experience substantial decreases in insider ownership. We therefore expect a positive coefficient on this variable.

3. *Firm size.* We expect larger firms to have fewer information asymmetries. The relation between size and moral hazard is unclear. On the one hand, larger firms are more monitored by institutional shareholders, analysts, the press, and regulators, whereas on the other hand, they are less likely to be taken over and atomistic shareholders find coordination costs prohibitive. We use two size proxies, the logarithm of total assets and a dummy variable that indicates whether a firm's market value of equity is greater than the 25th percentile of NYSE firms. The dummy variable is used to capture a potential threshold effect whereby firms become more monitored as they stop belonging to the "small-firm" asset class.

4. *Book-to-market ratio.* Lower book-to-market ratio firms tend to have more intangibles. Information asymmetry theories predict that such firms should have higher insider ownership. A low ratio could also indicate that the firm has high growth opportunities. High growth opportunities may suggest more discretion on the part of management, and in turn lead to higher optimal insider holdings, but may also correspond to greater alignment of incentives between insiders and outside shareholders if insiders are empire-builders, and in turn lead to lower optimal insider holdings (see Stulz (1990)). Finally, windows of opportunity theories would predict that firms are more likely to become diffusely held when their valuations are high.

5. *Hard assets.* We use the ratio of property, plant, and equipment to total assets as our measure of hard assets. Because there is less scope for discretionary spending in firms with more hard assets (Gertler and Hubbard (1993)), moral hazard theories therefore predict a positive coefficient on our proxy for hard assets.

16

6. *Funding needs.* Firms with less operating cash flow and more capital expenditures have greater funding needs, in which case insider ownership can be expected to drop. Otherwise, if insider ownership is maintained constant, the firm is restricted in its ability to raise equity by the wealth constraints of the insiders. Further, Jensen (1986) expects higher agency costs for firms with higher free cash flow for a given level of insider ownership. We therefore expect optimal insider ownership to be higher with higher free cash flow, so that the coefficient on free cash flow is expected to be negative both because of moral hazard considerations and because of funding considerations. We use EBITDA as our cash flow measure. For given investment opportunities, an increase in EBITDA corresponds to an increase in free cash flow.

7. *Capital expenditures.* Free cash flow falls with capital expenditures, so that we would expect firms with higher capital expenditures to be more likely to raise equity and see their insider ownership fall. Yet, greater capital expenditures mean more discretion for insiders, so that greater ownership would be required to ensure that this discretion is used to benefit shareholders. This tension makes the sign of the coefficient on capital expenditures undetermined.

8. *R&D spending.* R&D spending differs from other capital expenditures in that it is associated with more managerial discretion and greater information asymmetries. Firms with R&D spending therefore should have higher optimal insider ownership (see Crutchley and Hansen (1989) and Himmelberg, Hubbard, and Palia (1999)). We follow Himmelberg, Hubbard, and Palia (1999) and use a dummy variable for firms that report R&D spending and a level variable that is equal to R&D spending divided by total assets. We therefore expect a negative coefficient on a dummy variable that takes the value of one for firms that report R&D spending and a negative coefficient on the level variable.

9. *Dividends.* Dividends reduce the intensity of agency problems by leaving fewer resources under the discretion of management and reduce information asymmetries through signaling. We therefore expect dividend payers to have lower optimal insider holdings and hence the coefficient on a dummy variable that takes the value of one if a firm pays dividends to be negative.

10. *Leverage.* Leverage mitigates agency problems between outside shareholders and insiders (see Jensen (1986) and Stulz (1990)), thus we expect more highly levered firms to be more diffusely held in equilibrium. Further, because firms with high leverage are more likely to have too much debt, they are more likely to issue equity, which would decrease insider ownership. These considerations suggest a negative coefficient on leverage. However, if insiders are concerned about control, they will choose high leverage precisely so that they can afford a large proportional stake in the firm's cash flow, leading to a positive association between leverage and ownership (see Stulz (1988)).

11. *Volatility.* Volatility reduces the expected utility of insiders for a given stake in their firm, so that it makes them more likely to sell. However, volatility should also make them less likely to sell since information asymmetries are more important with greater volatility. Some authors also use volatility as a proxy for diversity of opinion, which would lead us to expect firms to be less likely to increase their float if diversity of opinion is higher.[18] It follows that the coefficient on volatility is ambiguous. However, if information asymmetries can be neglected, the coefficient on volatility is unambiguously negative. We use the volatility of the residual of a one-year market model regression as our measure of volatility.

12. *Turnover.* Turnover is often used as a proxy for liquidity. Greater turnover means that the market for shares is deeper, in which case sales by insiders have less of a price impact and insiders are more likely to sell shares.[19] Because volume is measured differently on Nasdaq and the NYSE, we use separate turnover variables for Nasdaq firms and NYSE firms.[20] Note

that Nasdaq-listed firms represent 86% of the firm-year observations in our sample. We compute turnover taking into account only the shares that are available for trading since a firm could otherwise appear to have a very thin market for its shares simply because most of its shares are not available for trading. We approximate the shares available for trading by the outstanding shares minus the shares held by insiders at the end of the prior year. In our robustness tests, we use the outstanding shares in the denominator of turnover.

13. *Past and contemporaneous returns.* Greater past returns mean that the firm has performed well. Moral hazard considerations imply lower equilibrium insider holdings when returns are higher because insiders have built a reputation. Further, high past performance is associated with a deeper market for a firm's stock.[21] Because individuals are generally contrarian investors,[22] we expect insiders who do not act on the behalf of institutions to be more likely to sell following high returns.

Table V compares firm characteristics at the end of year *t-1* (except for contemporaneous returns) for the firms that are not widely held (using the 10% criterion) and experience a decrease in insider ownership of more than 5% in year *t* with those that do not. Strikingly, most differences are significant. Since means can be influenced by outliers, we pay more attention to medians. As predicted, we find that firms that experience large decreases in insider ownership in a given year have more insider ownership the previous year, a lower book-to-market ratio, higher turnover, and higher contemporaneous and past returns.[23] The turnover result does not hold for NYSE firms if turnover is estimated using all shares issued by the firm (TONYSE) instead of the shares not held by insiders (TONYSE FLOAT). NYSE firms in our sample tend to become widely held quickly compared to Nasdaq firms. For instance, 43.38% of NYSE firms become widely held in year 1, but only 9.31% of Nasdaq firms became widely held over the same period. Since we start with 355 NYSE firms in year 1, it is not surprising that by year 5 we have only 61 NYSE firms that are not widely held at the 10% threshold, which represents 6.40% of the firms entering

year 5. All the results we report later hold if we estimate our regressions on the subsample of Nasdaq firms. The difference in contemporaneous and past returns is particularly striking since the firms with significant changes outperform those without such changes by more than 10% in the current year and in the previous year. Firms experiencing large decreases in firm ownership are smaller than other firms when size is measured by the book value of assets than other firms. This is most likely due to the fact that larger firms have lower insider ownership to start with. Further, the firms that decrease ownership have a lower ratio of property, plant, and equipment to assets, greater volatility, lower leverage, higher R&D expenses, and are more likely to report R&D expense and less likely to pay dividends. The univariate comparisons show that capital market variables have the predicted effects, but the comparisons for firm fundamentals do not always correspond to the predictions of the moral hazard and adverse selection models. The explanation for the mixed results for the comparisons of the fundamental characteristics could be that correlations among these characteristics obscure their true relationships with the probability of significant changes in ownership. We therefore turn to multiple regressions to examine whether that is the case.

< Insert Table V here   >

Table VI estimates probit regressions to investigate the impact of these variables on the probability of firms experiencing sizeable decreases in insider ownership. When considering whether a drop in insider ownership of 5% or more takes place in the tth year following the IPO, all our explanatory variables are from year *t-1* except for contemporaneous firm, industry, and market returns. While the other explanatory variables could be directly affected in year *t* by the change in ownership, this seems impossible for industry and market returns and the existence of a direct impact on calendar-year firm returns is questionable. It seems reasonable therefore to consider our explanatory variables to be predetermined rather than determined jointly with the change in ownership, in which case the issue of endogeneity is not likely to be as relevant here as it is in papers that regress ownership on contemporaneous firm characteristics. We account for possible autocorrelation in insider ownership changes by adding to the

regression last year's change in insider ownership. The first regression is a pooled regression that uses all firm-years except year 1 since returns and changes in insider ownership in the year of the IPO could differ widely simply because of when in the year the IPO takes place. The next five regressions are regression estimates for each of the first five years following the IPO. The last regression uses all firm years for firms past the fifth year from their IPO. The regressions for the subperiods allow the explanatory variables to affect the probability of large changes in insider ownership differently depending on the level of the firm's maturity.

<   Insert Table VI here   >

We find that firms with larger insider ownership and firms with venture capital investors are more likely to experience a large drop in insider ownership as predicted. The past change in insider ownership is significant in only two regressions, but has opposite signs. Firm size predicts larger drops in insider ownership, but only in the early years. The dummy variable is significant in year 4 only. Book-to-market always has a negative coefficient, which is significant in all years but year 5. The ratio of property, plant, and equipment to total assets is significantly negative in the pooled regression, but is not significant in the other regressions. Our cash flow measure has a negative coefficient in all regressions, so that insiders not pushed by financing needs are less likely to sell shares. It is significant in three regressions including the pooled regressions. Alternatively, it could be that firms with high cash flow have more agency problems as in Jensen (1986); however, it seems that the ability to generate cash plays a more important role than the demand for cash to invest. Capital expenditures do not affect the probability of large decreases in insider ownership. The coefficient on R&D expenditures is positive and significant in four regressions, while the dummy variable for firms that report R&D is significantly negative in four regressions. Leverage is significantly positive in one regression, the regression for years 6 to 32. Volatility is significant and positive in year 1, but in no other year. Turnover for NYSE firms is significantly positive in one regression, whereas turnover for Nasdaq firms is significant in all five regressions including the pooled regression. Finally, turning to returns, the firm's return is always positive and significant and the

lagged return is positive and significant in every regression but one. The lagged industry and market returns are never significant. The contemporaneous industry and market returns generally come in with positive coefficients, but are almost never significant.

The evidence in Table VI indicates that the initial level of insider ownership, venture capital status, book-to-market, funding needs, R&D, turnover, and both contemporaneous and lagged firm returns are the main drivers of large decreases in insider ownership. The other variables, which play a role in the moral hazard and information asymmetry theories, are generally not significant. The message is clearly that insider ownership falls when the shares trade at a high price relative to their book value and relative to their past value, and when the market for their shares is more liquid. The variables emphasized by the moral hazard and information asymmetry theories appear to be of second-order importance. However, in the theory of Bolton and von Thadden (1998), liquidity makes it possible for blocks to emerge cheaply when needed, so that agency problems are less important when a firm's shares trade in a liquid market.

A large literature in finance relates Tobin's q to managerial ownership.[24] Tobin's q is closely related to the inverse of book-to-market. This literature often focuses on the existence of a non-linear relation between q and managerial ownership, where an increase in managerial ownership leads to a higher q at least for low levels of managerial ownership. There is a great deal of debate as to whether q is high because insider ownership is high or whether a high q is associated with higher optimal insider ownership. Because Tobin's q is negatively related to the book-to-market coefficient, in this paper, we add a different consideration, namely, that a high q leads to a subsequent decrease in managerial ownership. At least for firms close to their IPO, this result seems difficult to square with the argument that a high q leads to a high optimal amount of insider ownership.

Table VII examines the sensitivity of the inferences from Table VI to alternative specifications. We only reproduce the estimates of the pooled regressions. The first regression uses a measure of turnover that is not adjusted for float. It is immediately apparent that our inferences are not sensitive to the float measure. The second regression is the pooled regression of Table VI without the past year's change in

insider ownership. The only change in our results is that the book value of assets is now significant; all the other variables that are significant in the regression of Table VI are significant in this regression. In the third regression, we investigate whether the probability of a large decrease in insider ownership is uniformly increasing in insider ownership by adding the square of insider ownership to the regression.[25] We find that the square of insider ownership is significant, and thus firms with very high insider ownership are much less likely to experience a large decrease in insider ownership. Such a result is consistent with the existence of firms in which insiders value control. However, adding the square of insider ownership does not affect the significance of the other variables. We then add the change and the square of the change in insider ownership. Neither variable is significant. The last regression in Table VII omits variables that depend on the stock price and stock returns. This regression examines the possibility that the importance of a firm's fundamental variables is obscured by the stock price and stock return variables. We find that this is not the case.

     <   Insert Table VII   >

  In Table VI, a firm's explanatory variables reflect past cumulative changes in these variables. In Table VIII, we use instead the lagged change in these variables (i.e., the change from *t-2* to *t-1*) with two exceptions. First, because returns are already flow variables, it would make no sense to difference them. Second, we retain the level of insider ownership to investigate whether a high level predicts a decrease in insider ownership and we do the same for the VC variable. By using lagged changes, we lose the regression for year 1 that we were able to estimate in Table VI. The only variables that are consistently significant are the level of insider ownership, firm returns, and lagged firms returns. The higher a firm's insider holdings, the more likely the firm is to experience a large drop in insider holdings. As before, firms are more likely to experience a large drop in insider holdings if their stock performs well. None of the variables that proxy for moral hazard problems or information asymmetries are consistently significant. The results from the pooled regression that uses the whole sample are mixed. Firms are more likely to experience a large drop in ownership as they grow larger. Increases in R&D expenses make it

more likely that a firm will experience a large drop in insider ownership in contrast to agency theory predictions, but an increase in plant, property, and equipment also makes such a drop more likely, which is consistent with these predictions. Finally, an increase in volatility makes a drop in insider ownership more likely. Overall, the regressions are most consistently supportive of the windows of opportunity theories. However, changes in turnover are not significant. This may not be surprising if decreases in insider ownership can only take place if turnover exceeds some threshold level.

<   Insert Table VIII here   >

We explore the robustness of our conclusions by changing the explanatory variables in our regressions. The regressions we report have neither time nor industry dummies. When we add such dummies our conclusions do not change because these dummies are generally not significant. Finally, we estimate the regressions using only one size variable and one R&D variable. Doing so does not affect our conclusions.

V. Estimating the Conditional Probability that a Firm will Become Widely Held

In the previous section, we study the probability that insiders in a firm would decrease their proportional holdings by 5% or more. The evidence is mostly supportive of theories that emphasize capital market considerations: Insiders sell when they get a good price and the market for the stock is good, causing insider ownership to fall over time. It is possible, however, that timing considerations are important determinants of large changes in insider ownership for firms that have high insider ownership but that they have little to do with whether a firm's optimal insider ownership falls below 10% when insider ownership is only slightly above 10%. For instance, it could be the case that variables that proxy for the size of agency problems play a major role in determining whether dispersed ownership is optimal for a firm. We therefore investigate the conditions that make it likely that a firm becomes widely held. We do this by pooling all the observations over the years and estimating the conditional probability of becoming widely held with a proportional hazard function. Our hazard function estimates show how the

24

explanatory variables impact the probability of becoming widely held in a given year, conditional on the firm not having already become widely held in a previous year.

Specifically, we use the hazard function of Cox (1975), which is a semiparametric approach that does not specify all the parameters of the function. Rather, the approach of this proportional hazard model is to estimate the covariates that shift a baseline hazard function up or down. One receives a sense of the baseline hazard function from the data presented in Table III, which reports the fraction of firms that become widely held during the year, conditional on not having been widely held before.

An important aspect of this estimation procedure involves the use of data from firms that do not provide complete data (censored observations). Censored observations can be used in the estimation of this hazard function if their subsequent chances of becoming widely held are neither greater nor less than other firms whose data are not censored. In our sample, firms' data are censored due to bankruptcy, mergers, failure to be included in one of our databases (Compact Disclosure, CRSP, or Compustat), or poor matching of data sets due to identifiers changing over time. Some of these reasons imply firms are unlikely to become widely held after censoring while others imply the opposite; many censored observations are merely observations randomly missing from the sample. We believe the overall impact is a set of censored observations that are randomly missing and thus using them in the hazard estimation is appropriate.

Table IX shows the results of the hazard model estimation. We expect firms with greater insider ownership to be less likely to become widely held; if so, we would like to understand whether firms that have greater insider ownership are less likely to become widely held because they have firm characteristics that make it optimal for them to have high insider ownership or because they simply have not faced circumstances that made it optimal for insiders to reduce their ownership. We cannot answer this question if insider ownership is an independent variable in our regression. Further, having the insider ownership variable in our regression would mean that, effectively, the level of ownership is on both sides of the regression. We therefore reproduce regressions that omit insider ownership as an explanatory

variable. However, the estimates of regressions with insider ownership show that our conclusions are not sensitive to whether insider ownership is included as an independent variable. As before, we use the 10% and 20% thresholds for the definition of a widely held firm. We drop year 1 from the sample (as we do with the pooled regressions in the previous section) since the dependent variables for year 1 would depend on how close to the end of the year the IPO occurs. We report the number of events and the number of censored observations. It is immediately apparent, but not surprising given the results in Table III, that the number of censored observations is large compared to the number of events. For the 10% threshold, 93.57% of the observations are censored observations.

<   Insert Table IX here   >

We first turn to the results that hold irrespective of which definition of a widely held firm we adopt. As expected, firms with VC investments, larger firms, firms with a lower book-to-market ratio, firms with lower cash flow, firms with greater capital expenditures, firms that do not pay dividends, and firms with higher contemporaneous returns are more likely to become widely held. As with our probit regression, turnover is strongly positively related to the probability of becoming widely held, but only for Nasdaq firms; most firms in our sample are Nasdaq firms. However, the threshold size variable is never significant. The coefficient on the book-to-market ratio seems inconsistent with the claims in the literature that a high Tobin's q leads to greater insider ownership. Surprisingly, the ratio of plant, property, and equipment to assets has a significantly negative coefficient. Further, firms that report R&D are more likely to become widely held for the 20% threshold, which appears to be inconsistent with the predictions of the moral hazard and information asymmetry models. The coefficient on R&D expenses is never significant.

The coefficient on leverage is negative, but significant in only one regression. Models that emphasize entrenchment by insiders are consistent with a negative coefficient, since in such models insiders want high leverage so that they can afford a large fraction of the votes (see Stulz (1988)). With moral hazard theories, we would expect that higher leverage decreases ownership concentration since higher leverage

26

keeps managers on a tighter leash (see Jensen (1986) and Stulz (1990)). The evidence does not seem to support these theories. However, if high leverage is the outcome of financial distress, insiders would find it costly to decrease their ownership shares in a way that decreases leverage because doing so would involve issuing equity precisely when the underinvestment problem of Myers (1977) is likely to be severe. From a window of opportunity perspective, insiders might also think that their firm is undervalued when leverage is high, so that they would be reluctant to take actions that decrease their ownership share.

The coefficient on volatility is negative, and is significantly so in three regressions, implying that high volatility firms are less likely to become widely held. Volatility plays a dual role in the theories considered in this paper:[26] High volatility forces insiders to bear more risk, which makes it more valuable for them to decrease their stake, but high volatility also means greater information asymmetry and greater managerial discretion, which makes it costly for insiders to decrease their stake. Our evidence is consistent with Demsetz and Lehn (1985), who state that "noisier environments should give rise to more concentrated ownership structures" (p. 1159). In their empirical work, volatility is positively correlated with ownership concentration. Himmelberg, Hubbard, and Palia (1999) do not find a relation between ownership and volatility when they allow for firm fixed effects, but find a negative relation when they do not.

The contemporaneous return on the firm's stock is positively related to the probability that the firm will become widely held, but the lagged return is not. The insignificant coefficient on lagged return suggests that the windows of opportunity theory may not be an important determinant of the probability of becoming widely held since, according to that theory, firms would issue equity and insiders would sell after the stock has had high returns, but any strong conclusion should be tempered by the fact that contemporaneous returns have a significantly positive coefficient. However, if there is an optimal level of insider ownership that is not trivial, firms that already have low insider ownership are unlikely to dilute the stake of insiders further just because of the existence of a window of opportunity since that might lead them to have too little insider ownership. In contrast, firms that have substantial insider ownership may

have been waiting for the right conditions to dilute the stake of the insiders, but these firms are unlikely to become widely held.

We examine the robustness of our conclusions from the hazard function estimates in a variety of ways. In particular, we extend the sample to include firms for which insider ownership data is missing up to three years. We also use industry dummy variables and only lagged variables. Finally, we use only one size variable and one R&D variable. Our main conclusions are robust to these alternative specifications.

VI. Conclusion

In this paper, we show that insider ownership falls steadily following an IPO. While half of the sample firms have less than 20% insider ownership 10 years after the IPO, there is no post-IPO year in our sample for which more than half of the firms have more than 10% insider ownership. Nevertheless, compared to most countries, the fraction of firms with less than 10% of insider ownership is large as it exceeds 30% 10 years after the IPO.

Surprisingly, in light of the evidence for the U.K., a major factor for the evolution of the ownership structure of U.S. firms is that insiders sell shares in substantial amounts, so that ownership becomes more diffuse about as much because of a reduction in shares held by insiders as because of an increase in shares outstanding. Moreover, the dilution that occurs via SEOs and mergers is only a fraction of the total dilution associated with increased shares outstanding.

We use two different approaches to understand why firms become widely held. With the first approach, we investigate the determinants of large decreases in ownership. A firm experiences a large decrease mostly because its common stock has a good market, that is, the firm is highly valued by the markets, its stock market performance has been good, and its shares have sufficient liquidity that more shares can be sold with limited market pressure. With the second approach, we estimate a hazard model that allows us to understand the determinants of a firm's conditional probability of becoming widely held. Again, we find that highly valued firms and high turnover firms are more likely to become widely held.

Using this approach, we estimate the probability that a firm will end up with diffuse ownership. We find that some variables emphasized by moral hazard and asymmetric information models significantly affect this probability in the predicted direction, but some do not. Importantly, firms with high capital expenditures and low cash flow, that is, firms with financing deficits, are more likely to become widely held.

Our results show that the market for a firm's stock and its stock's market performance are critical determinants of the evolution of its ownership. One might be tempted to conclude this is because these variables better capture the extent to which moral hazard and asymmetric information problems affect a firm. Such a conclusion finds little support in regressions without market variables, but it is possible that the variables we and the literature use to proxy for moral hazard and asymmetric information problems do a poor job of capturing these problems. The evidence is much more supportive of the view that insiders sell shares and reduce their holdings when they can do so without putting too much pressure on the stock price. Further, insiders' proportional holdings of a firm's shares also fall when the firm has low cash flow but high capital expenditures, suggesting that the stake of the insiders gets diluted when financing considerations require equity issues.

Our starting sample has a strikingly large number of IPOs. The conjunction of good performance and stock market liquidity leads to the dilution of insiders, both because firms can issue equity and because insiders sell. The firms that do not experience good performance or stock market liquidity do not experience large decreases in ownership and have a lower probability of becoming widely held. In a typical foreign country, firms such as the typical IPO firm in our sample cannot list on the stock market and hence do not get the chance to evolve in the way U.S. firms typically do. That is, their owners are unlikely to be able to take advantage of stock market liquidity to dilute their ownership. Our paper therefore emphasizes the role of stock market liquidity in making possible diffuse ownership. The fact that other countries typically do not have stock markets that enable firms such as those in our sample to

achieve a liquid market for their stock or even to list may therefore be an important part of the explanation for why diffuse ownership is not widespread in these countries.

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Table I
Description of the IPO Sample

The first column shows the number of IPOs in SDC Platinum that went public between 1970 and 2001, excluding unit offerings, rights offerings, reverse LBOs, and spin-offs. The second column reports the subset of these firms that are in CRSP from 1986 to 2001, excluding utilities and financial firms (based on SIC codes reported in CRSP). The third column reports the number of firms with nonmissing insider ownership information in Compact Disclosure for at least one year over the 1986 to 2001 period.

Year	Sample from SDC Platinum	Sample after merging with CRSP and excluding utilities and financials	Sample after merging with Compact Disclosure requiring one year of ownership data
1970	218	109	27
1971	238	167	58
1972	467	365	104
1973	91	48	16
1974	8	6	3
1975	6	5	3
1976	39	29	10
1977	27	16	5
1978	35	27	13
1979	59	43	21
1980	125	88	47
1981	278	223	124
1982	88	83	46
1983	521	412	331
1984	243	175	132
1985	245	164	143
1986	524	308	280
1987	380	227	209
1988	217	95	90
1989	172	102	101
1990	152	96	86
1991	277	201	198
1992	419	258	253
1993	638	382	376
1994	491	336	331
1995	485	401	396
1996	749	587	570
1997	537	375	367
1998	352	224	211
1999	506	400	384
2000	363	315	301
2001	107	52	45
Total	9,057	6,319	5,281

Table II
Distribution of the Levels of Insider Ownership Following an IPO

Shares held by insiders as a percent of outstanding shares. The WH10 (WH20) column presents the fraction of firms with a percentage insider ownership less than 10% (20%) of the total number of shares outstanding (widely held firms). The initial sample is from SDC Platinum and covers all firms that went public between 1970 and 2001, excluding unit offerings, rights offerings, reverse LBOs, spin-offs, utilities, and financial firms. Insider ownership is sampled annually from Compact Disclosure from 1986 to 2001.

	Mean	Q25	Median	Q75	WH10	WH20	Number of firms
Year1	38.22	20.57	38.13	55.34	12.43	24.27	3878
Year3	30.50	12.76	26.46	46.01	19.68	39.77	3460
Year5	27.27	9.58	21.11	41.48	26.54	48.14	2634
Year10	24.15	7.52	18.33	35.52	31.73	52.71	958
Year15	24.57	8.07	18.26	35.28	33.27	54.16	517
Year20	23.19	6.23	16.59	34.76	37.05	53.57	224
Year25	20.25	5.02	14.68	29.27	42.86	63.27	98
Year30	21.83	5.93	16.48	33.95	37.14	60.00	70
Year32	15.40	4.04	8.88	22.49	50.00	58.33	12

Table III
Probability that a Firm's Ownership will Become Diffuse in a Given Year after its IPO

The random variables T^{10} and T^{20}, are defined as the first down-crossing by the percentage of insider ownership of the threshold barriers of 10% and 20%, respectively. The conditional probability that a firm will become widely held over year k, conditional on not being widely held prior to that year, $\Pr\{T^{10} = k \mid T^{10} \geq k\}$, is obtained by dividing the number of all firms that become widely held over year k by the total number of firms that are "k-years old" and that were never widely held up to this point. The sample includes only firms that went public between 1986 and 2001 with nonmissing insider ownership information from the year of the IPO until they exit the sample. The IPO sample is from SDC Platinum and excludes unit offerings, rights offerings, reverse LBOs, spin-offs, utilities, and financial firms. Insider ownership is sampled annually from Compact Disclosure over the 1986 to 2001 period. The table also reports the total number of firms, the number of firms becoming widely held, and the number of firms leaving the sample each year due to censoring.

Year	$\Pr\{T^{10}\}$	Total number of firms	Number of firms becoming widely held	Number of firms leaving the sample	$\Pr\{T^{20}\}$	Total number of firms	Number of firms becoming widely held	Number of firms leaving the sample
1	0.12	3878	482	530	0.24	3878	941	456
2	0.06	2866	166	635	0.15	2481	362	523
3	0.07	2065	135	541	0.13	1596	201	418
4	0.07	1389	93	344	0.13	977	126	232
5	0.08	952	74	219	0.10	619	64	142
6	0.05	659	35	181	0.09	413	39	101
7	0.07	443	30	104	0.10	273	27	64
8	0.08	309	24	86	0.06	182	11	55
9	0.05	199	9	72	0.05	116	6	44
10	0.05	118	6	39	0.06	66	4	25
11	0.14	73	10	19	0.03	37	1	8
12	0.07	44	3	7	0.11	28	3	5
13	0.00	34	0	4	0.10	20	2	3
14	0.10	30	3	6	0.07	15	1	3
15	0.05	21	1	6	0.18	11	2	2

Table IV
How Do Large Drops in Insider Ownership Take Place?

A large drop in insider ownership is defined as a drop of at least five percentage points of insider ownership, which is defined as the percent of shares owned by insiders. The change in insider ownership is decomposed into two parts, the change in number of shares held by insiders (changes in the numerator of fractional ownership) and the change in total number of shares outstanding (changes in the denominator of fractional ownership). The fraction of shares sold in secondary offerings, as well as the fraction of shares issued in SEOs and issued to pay for mergers, is obtained from SDC. We compute these fractions over a three-year window centered in the year for which the firm experiences a drop in insider ownership that exceeds 5%.

	Change in ownership share	Changes in numerator		Changes in denominator	
		Due to change in shares held by insiders	Due to secondary share sales in SEOs	Due to change in the number of shares	Due to SEOs and mergers
Mean	-0.15	-0.08	-0.02	-0.07	-0.01
1%	-0.63	-0.60	-0.28	-0.64	-0.15
Q1	-0.19	-0.14	0.00	-0.09	-0.00
Median	-0.11	-0.07	0.00	-0.02	0.00
Q3	-0.08	-0.02	0.00	-0.00	0.00
99%	-0.05	0.46	0.00	0.04	0.00

Table V
Firm Characteristics of Firms Experiencing a Large Ownership Drop and of Other Sample Firms

The initial sample is from SDC Platinum and covers all firms that went public between 1970 and 2001, excluding unit offerings, rights offerings, reverse LBOs, spin-offs, utilities, and financial firms. All variables except contemporaneous returns are measured at the end of the year preceding the large drop in ownership. The firm characteristics are: The percentage of insider ownership at the beginning of the year (INSD); a venture capital dummy (VC) that is equal to one if the IPO is backed by venture capital; the logarithm of the book value of assets (LBVA) in 1970 dollars; an indicator variable for the bottom size quartile based on NYSE breakpoints (SZIND); book-to-market equity ratio (BME); property, plant, and equipment over total assets (PPEA); free cash flow (FCF), defined as EBITDA over sales; capital expenditures over assets (CEXPA); research and development expenditures over assets (RDA); an R&D dummy (RDIND) that is equal to one if the firm has positive Research and Development expenditures for that year; a dividend dummy (DIVIND) that is equal to one if the firm has paid a dividend in that year; leverage (LVRG), defined as total liabilities over book value of assets; idiosyncratic volatility for year t is the residual from a market model regression estimated using daily data for year t (VOLATILITY); average daily turnover for NYSE-traded stocks (TONYSE); average daily turnover for Nasdaq-traded stocks (TONASD); FLOAT, which denotes that turnover is computed using the shares not held by insiders; firm, industry, and market returns over the previous fiscal year (LAGRET, LAGIRET, and LAGMRET); and firm, industry, and market returns over the current fiscal year (RET, IRET, and MRET). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Mean (>5% drop)	Mean (<5% drop)	Median (>5% drop)	Median (<5% drop)	Diff.Mean	Diff.Median
INSD	0.396	0.346	0.361	0.305	0.050***	0.055***
DINSD	-0.149	0.014	-0.107	0.000	-0.163***	-0.107***
VC	0.412	0.344	0.000	0.000	0.068***	---
LBVA	2.810	2.875	2.735	2.847	-0.065**	-0.112***
SZIND	0.879	0.880	1.000	1.000	-0.001	---
BME	0.562	0.707	0.417	0.541	-0.145***	-0.123***
PPEA	0.248	0.265	0.177	0.200	-0.017***	-0.023***
FCF	-0.058	0.010	0.084	0.087	-0.067***	-0.003***
CEXPA	0.077	0.077	0.050	0.050	0.000	0.001
RDA	0.090	0.062	0.002	0.000	0.028***	0.002***
RDIND	0.506	0.464	1.000	0.000	0.041***	---
DIVIND	0.157	0.187	0.000	0.000	-0.030***	---
LVRG	0.447	0.444	0.418	0.425	0.003***	-0.007***
VOLATILITY	0.048	0.046	0.043	0.041	0.003***	0.002***
TONYSE FLOAT	0.635	0.533	0.425	0.375	0.102**	0.050**
TONASD FLOAT	1.241	0.852	0.756	0.602	0.389***	0.154***
TONYSE	0.326	0.327	0.239	0.250	-0.001	-0.011
TONASD	0.644	0.555	0.436	0.369	0.089***	0.067***
LAGRET	0.230	0.102	0.040	-0.044	0.128***	0.084***
LAGIRET	0.156	0.142	0.118	0.101	0.014***	0.017***
LAGMRET	0.162	0.159	0.213	0.213	0.003**	0.000
RET	0.354	0.093	0.148	-0.042	0.262***	0.190***
IRET	0.177	0.136	0.145	0.101	0.041***	0.044***
MRET	0.147	0.134	0.213	0.213	0.013***	0.000

Table VI
Determinants of the Probability of a 5% or Greater Annual Drop in Insider Ownership

Probit model parameter estimates of the probability of a 5% or greater drop in insider ownership in a year conditional on the insider ownership at the beginning of the year being greater than 10%. The pooled estimates use all firm-year observations, whereas "Yr. 6-32" pools data in years 6 though 32. The sample includes all firms in SDC Platinum that went public between 1970 and 2001, except unit offerings, rights offerings, reverse LBOs, spin-offs, utilities, and financial firms. The independent variables are: the percentage of insider ownership at the beginning of the year (INSD); the change in insider ownership in the previous year (INSD CHANGE); a venture capital dummy (VC) that is equal to one if the IPO is backed by venture capital; the logarithm of the book value of assets in 1970 dollars (LBVA); an indicator variable for the bottom size quartile based on NYSE breakpoints (SZIND); book-to-market equity ratio (BME); property, plant, and equipment over total assets (PPEA); free cash flow (FCF), defined as EBITDA over sales; capital expenditures over assets (CEXPA); research and development expenditures over assets (RDA); an R&D dummy (RDIND) that is equal to one if the firm has positive Research and Development expenditures for that year; a dividend dummy (DIVIND) that is equal to one if the firm has paid a dividend in that year; leverage (LVRG), defined as total liabilities over book value of assets; idiosyncratic volatility estimated from a market model and based on daily returns (VOLATILITY); average daily turnover for NYSE-traded stocks and zero, otherwise (TONYSE FLOAT); average daily turnover for Nasdaq-traded stocks and zero otherwise (TONASD FLOAT); FLOAT, which denotes the fact that the number of shares is computed using the shares not held by insiders; firm, industry and market returns over the previous fiscal year (LAGRET, LAGIRET, and LAGMRET); and firm, industry and market returns over the current fiscal year (RET, IRET, and MRET). All accounting variables are sampled at the end of the previous fiscal year. The last two rows report the number of firms experiencing a 5% or greater drop (NOBS = 1) and the number of firms that did not experience a 5% or greater drop in insider ownership (NOBS = 0). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Pooled	Yr.1	Yr.2	Yr.3	Yr.4	Yr.5	Yr.6-32
Intercept	-1.237***	-1.266***	-1.097***	-1.064***	-0.497	-1.416***	-1.378***
INSD	1.090***	0.961***	1.429***	0.402*	0.981***	1.193***	0.938***
INSD CHANGE	-0.102		-0.616*	0.372	-0.070	0.670	0.343*
VC	0.191***	0.349***	0.323***	-0.089	0.176*	0.188*	0.176***
LBVA	0.023	0.142***	0.038	0.043	-0.113**	-0.043	0.017
SZIND	-0.046	0.081	-0.155	0.148	-0.426**	-0.011	-0.027
BME	-0.216***	-0.771***	-0.169*	-0.143*	-0.272***	-0.078	-0.203***
PPEA	-0.166*	-0.070	-0.300	-0.213	-0.240	0.034	-0.039
FCF	-0.138***	-0.047	-0.116**	-0.131**	-0.079	-0.052	-0.065
CEXPA	0.081	-0.199	0.212	-0.004	0.309	-0.215	-0.084
RDA	0.541***	0.783*	0.680*	1.144***	0.474	0.046	0.496*
RDIND	-0.101***	-0.082	-0.057	-0.203**	-0.373***	-0.246*	0.020
DIVIND	-0.046	-0.004	-0.299**	0.106	0.199	-0.068	-0.002
LVRG	0.059	-0.107	-0.332	-0.070	0.118	0.077	0.393***
VOLATILITY	0.227	5.273**	-0.413	1.571	1.469	-0.357	-0.870
TONYSE FLOAT	0.024	0.026	-0.046	0.181	0.355**	0.032	0.010
TONASD FLOAT	0.089***	0.013	0.057*	0.053	0.135***	0.220***	0.067**
LAGRET	0.109***	0.122**	0.057	0.170***	0.204***	0.126***	0.113***
LAGIRET	0.003	0.164	0.154	0.095	0.148	0.091	-0.031
LAGMRET	-0.070	-0.055	0.173	-0.158	-0.100	0.062	-0.235
RET	0.269***	0.333***	0.389***	0.200***	0.376***	0.230***	0.244***
IRET	0.083	0.086	-0.139	0.202	0.251	0.394*	0.066
MRET	0.152	0.332	0.092	0.475*	-0.077	0.303	-0.050
NOBS = 1	2,206	849	496	378	278	204	850

| NOBS = 0 | 7,299 | 1,147 | 1,119 | 964 | 826 | 802 | 3,588 |

Table VII
Determinants of the Probability of a 5% or Greater Annual Drop in Insider Ownership:
Alternative Specifications

Probit model parameter estimates of the probability of a 5% or greater annual drop in insider ownership conditional on insider ownership at the beginning of the year greater than 10%. Model (1) uses turnover not adjusted for the free float. Models (2) through (4) use turnover adjusted for the free float. Model (2) is the pooled regression of Table VI with the change in insider ownership omitted. Model (3) adds the square of insider ownership ($INSD^2$) to Model (2). Model (4) adds to Model (3) the change in insider ownership (DINSD) and its square ($DINSD^2$).

	Pooled Regular TO	Pooled	Pooled	Pooled	Pooled
Intercept	-1.291***	-1.269***	-1.810***	-1.824***	-1.223***
INSD	1.237***	1.102***	4.007***	4.266***	1.098***
$INSD^2$			-3.357***	-3.748***	-0.180
DINSD(*t-1*)	-0.053			0.041	
$DINSD^2$(*t-1*)				1.264	
VC	0.191***	0.193***	0.212***	0.207***	0.217***
LBVA	0.021	0.032*	0.037*	0.031	0.023
SZIND	-0.037	-0.025	-0.035	-0.052	-0.071
BME	-0.219***	-0.238***	-0.230***	-0.211***	
PPEA	-0.169	-0.158	-0.142	-0.145	-0.270***
FCF	-0.138***	-0.145***	-0.144***	-0.133***	-0.093***
CEXPA	0.074	0.075	0.016	0.017	0.297
RDA	0.542***	0.453***	0.515***	0.619***	0.711***
RDIND	-0.104***	-0.088**	-0.089**	-0.100***	-0.030
DIVIND	-0.042	-0.067	-0.060	-0.044	-0.042
LVRG	0.060	0.048	0.055	0.050	0.067
VOLATILITY	0.270	0.383	0.234	0.182	0.167
TONYSE	0.109	0.034	0.082	0.063	
TONASD	0.140***	0.080***	0.108***	0.106***	
LAGRET	0.110***	0.108***	0.106***	0.106***	
LAGIRET	-0.003	0.011	0.013	0.010	
LAGMRET	-0.068	-0.055	-0.052	-0.081	
RET	0.269***	0.280***	0.278***	0.268***	
IRET	0.08	0.082	0.094	0.099	
MRET	0.154	0.157	0.151	0.142	
NOBS = 1	2,206	2,378	2,483	2,206	2,378
NOBS = 0	7,299	7,658	8,102	7,299	7,658

Table VIII
Determinant of the Probability of a 5% or Greater Annual Drop in Insider Ownership Using
Lagged Changes in the Explanatory Variables

Probit model parameter estimates of the probability of a 5% or greater annual drop in insider ownership conditional on insider ownership at the beginning of the year greater than 10%. The pooled estimates use all firm-year observations, whereas "Yr. 6-32" pools data in years 6 though 32. The sample includes all IPOs in SDC Platinum that occurred between 1970 and 2001, except unit offerings, rights offerings, reverse LBOs, spin-offs, utilities and financial firms. The independent variables include the percentage of insider ownership at the beginning of the year (INSD); firm, industry, and market returns over the previous fiscal year (LAGRET, LAGIRET, and LAGMRET); firm, industry, and market returns over the current fiscal year (RET, IRET, and MRET); and lagged changes in the following variables: the logarithm of the book value of assets in 1970 dollars (DLBVA(t-1)); an indicator variable for the bottom size quartile based on NYSE-breakpoints (DSZIND(t-1)); the book-to-market equity ratio (DBME(t-1)); property, plant, and equipment over total assets (DPPEA(t-1)); free cash flow (DFCF(t-1)), defined as EBITDA over sales; capital expenditures over assets (DCEXPA(t-1)); research and development expenditures over assets (DRDA(t-1)); an R&D dummy (DRDIND(t-1)), which is equal to one if the firm has positive R&D expenditures for that year; a dividend dummy (DDIVIND(t-1)), which is equal to one if the firm has paid a dividend in that year; leverage (DLVRG(t-1)), defined as total liabilities over book value of assets; idiosyncratic volatility, which is estimated with daily returns (DVOLATILITY(t-1)); average daily turnover for NYSE-traded stocks and zero, otherwise (DTONYSE(t-1)); average daily turnover for Nasdaq-traded stocks and zero, otherwise (DTONASD(t-1)). All accounting variables are sampled at the end of the previous fiscal year. The last two rows report the number of firms that experience a 5% drop (NOBS = 1) and the number that do not (NOBS = 0). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

(Table VIII)

	Pooled	Yr.2	Yr.3	Yr.4	Yr.5	Yr.6-32
Intercept	-1.374***	-1.488***	-0.862***	-1.307***	-1.548***	-1.302***
INSD	1.027***	1.486***	0.348***	0.948***	1.292***	0.815***
DINSD(t-1)	-0.037	-0.687*	0.252	-0.079	0.936*	0.424*
VC	0.255***	0.446***	-0.002	0.150	0.171*	0.213***
DLBVA(t-1)	0.244***	0.170	0.238*	0.153	-0.086	0.170*
DSZIND(t-1)	-0.039	-0.077	0.290	-0.425**	-0.023	-0.037
DBME(t-1)	-0.062	-0.162	-0.192	-0.128	0.095	-0.080
DPPEA(t-1)	0.571**	0.129	-1.012	0.949	0.143	0.751*
DFCF(t-1)	-0.044	0.048	-0.020	0.108	-0.242	-0.298***
DCEXPA(t-1)	-0.365	-0.673	0.086	0.617	0.291	-0.180
DRDA(t-1)	0.764***	1.044*	1.721***	-0.501	1.168	-0.460
DRDIND(t-1)	0.000	-0.372	0.037	0.472*	-0.323	0.095
DDIVIND(t-1)	0.049	0.237***	0.090	0.303*	-0.027	-0.097
DLVRG(t-1)	0.030	0.063	-0.242	0.460	-0.434	0.029
DVOLATILITY(t-1)	1.491*	-1.829	3.648	4.297*	-0.281	0.705
DTONYSE(t-1)	0.010	0.051	0.323*	0.032	0.322	-0.016
DTONASD(t-1)	-0.002	-0.006	0.016	0.034	-0.063	0.012
LAGRET	0.150***	0.046	0.123*	0.213***	0.255***	0.152***
LAGIRET	0.035	0.298*	0.093	0.079	0.029	-0.057
LAGMRET	-0.035	0.072	-0.152	-0.004	0.143	-0.197
RET	0.258***	0.392***	0.198***	0.364***	0.179***	0.242***
IRET	0.102	-0.004	0.255*	0.114	0.359*	0.043
MRET	0.159	0.052	0.433	0.009	0.215	0.013
NOBS = 1	2,062	407	366	262	199	828
NOBS = 0	7,029	969	939	809	787	3,525

Table IX
Hazard Rate Model for the Event of Becoming Widely Held

Estimates of a hazard rate model for the event of becoming widely held, where a firm is defined to be widely held if its insider ownership is less than 10% (the first three columns of the table) or less than 20% (the last three columns of the table). The sample includes only firms that went public between 1986 and 2001 with nonmissing insider ownership information from the year of the IPO until they exit the sample (continuous sample). The explanatory variables are the variables listed in Table VI. Model (1) uses regular turnover, Model (2) uses float-adjusted turnover, and Model (3) is a reduced form of the model excluding all market information.

|	10%			20%		
	(1)	(2)	(3)	(1)	(2)	(3)
VC	0.788***	0.828***	0.869***	0.834***	0.852***	0.924***
LBVA	0.188***	0.252***	0.208***	0.132**	0.178***	0.115**
SZIND	0.237	0.238	0.242	-0.113	-0.128	-0.087
BME	-0.642***	-0.706***		-0.477***	-0.538***	
PPEA	-0.940**	-1.095***	-1.288***	-1.665***	-1.784***	-1.858***
FCF	-0.198**	-0.183**	-0.121	-0.242***	-0.243***	-0.184***
CEXPA	2.024***	2.285***	2.684***	2.532***	2.728***	3.002***
RDA	0.489	0.499	0.886**	0.801**	0.765**	1.003***
RDIND	-0.129	-0.104	0.165	-0.230*	-0.209	0.003
DIVIND	-0.596***	-0.612***	-0.608***	-0.334*	-0.355*	-0.248**
LVRG	-0.334	-0.439	-0.223	-0.418*	-0.482	-0.351
VOLATILITY	-8.438*	-5.204	-10.377***	-3.959	-1.944	-5.268*
TONYSE FLOAT	-0.505	-0.757**		-0.876*	-0.897*	
TONASD FLOAT	0.262***	0.054*		0.243***	0.049**	
LAGRET	0.004	0.022		0.003	0.019	
LAGIRET	-0.174	-0.138		0.269	0.275	
LAGMRET	0.064	0.078		0.352	0.343	
RET	0.244***	0.239***		0.306***	0.292***	
IRET	0.142	0.152		0.022	0.061	
MRET	0.399	0.436		1.036***	1.017***	
Number of events	345	345	369	408	408	433
Number of censored obs.	5,018	5,018	5,274	3,595	3,595	3,765
Likelihood ratio	230.79	221.33	173.10	314.17	304.16	219.58
Chi-square test for likelihood ratio p-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
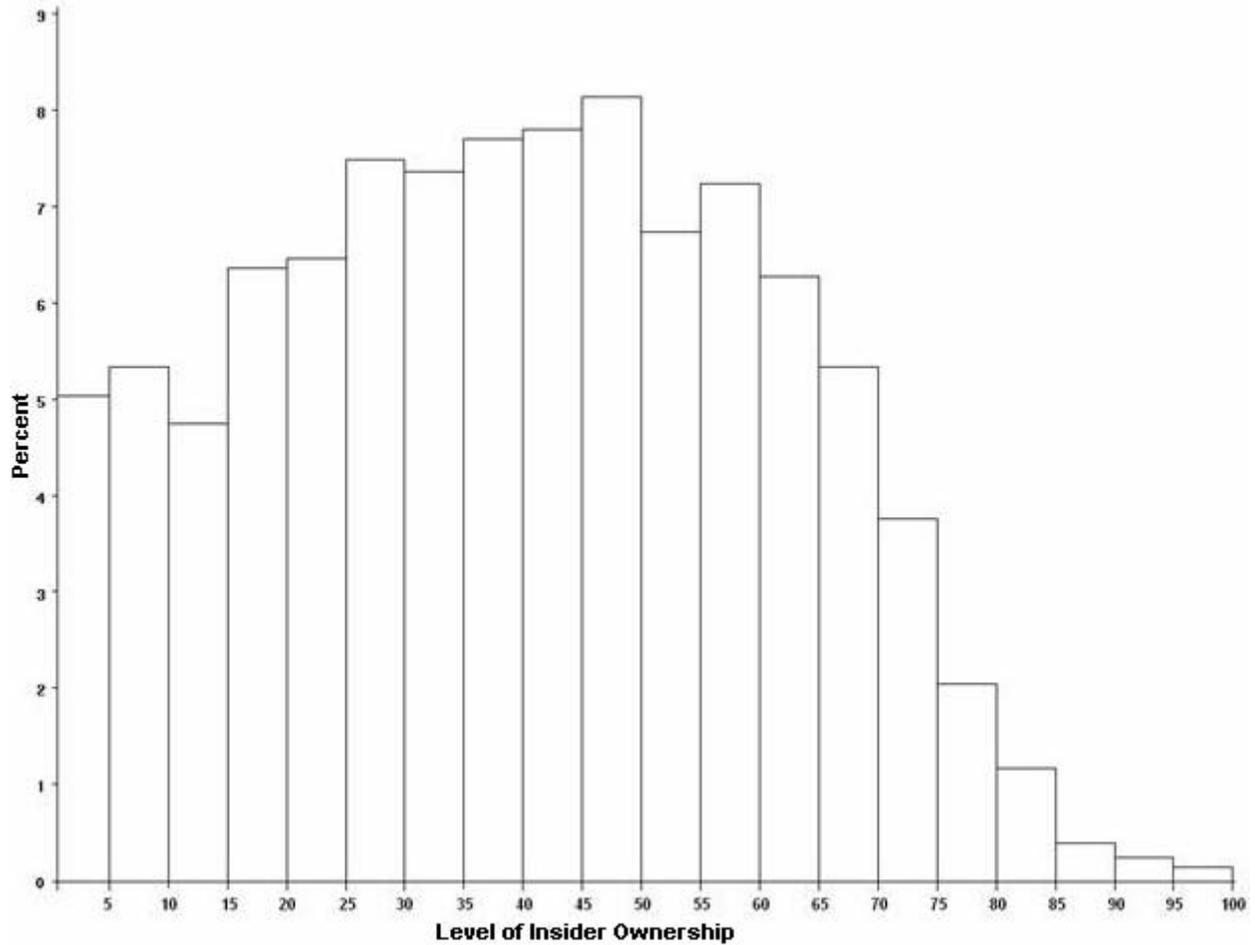
Figure 1. Distribution of the level of insider ownership at the end of the IPO year. The initial sample is from SDC Platinum and covers all firms that went public between 1970 and 2001, excluding unit offerings, rights offerings, reverse LBOs, spin-offs, utilities, and financial firms. Insider ownership is sampled annually from Compact Disclosure over the 1986 to 2001 period. The data used here are from the first proxy following the IPO.
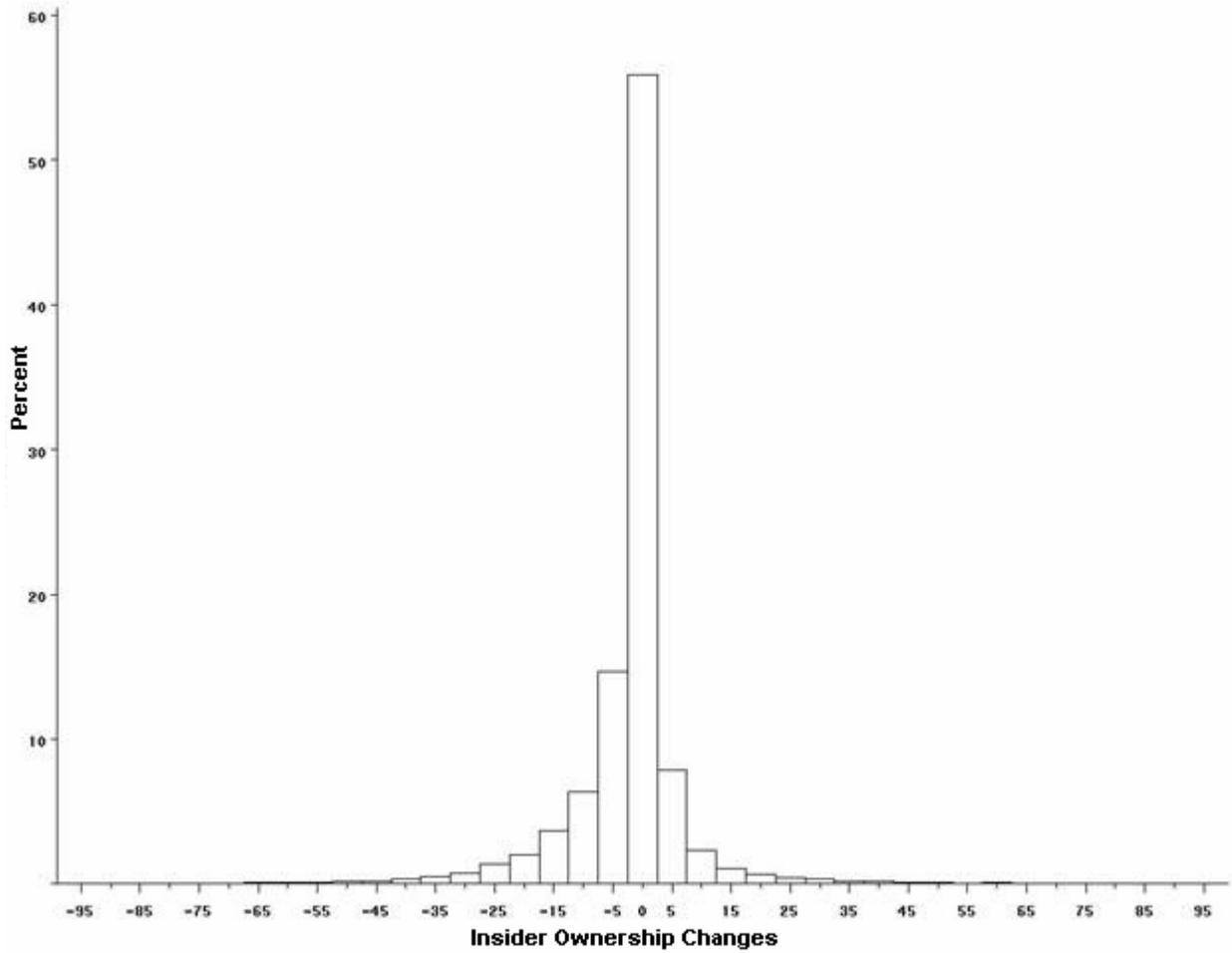
Figure 2. **Distribution of the percentage annual insider ownership changes**. The initial sample is from SDC Platinum and covers all firms that went public between 1970 and 2001, excluding unit offerings, rights offerings, reverse LBOs, spin-offs, utilities, and financial firms. Insider ownership is sampled annually from Compact Disclosure over the 1986 to 2001 period.
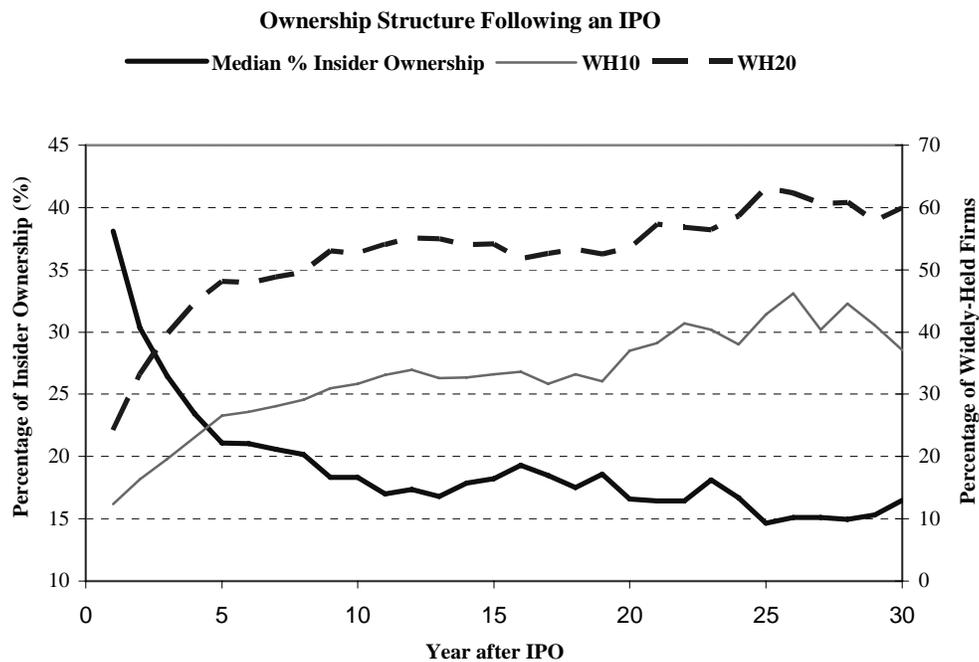
Ownership Structure Following an IPO

———Median % Insider Ownership ——— WH10 ▬ ▬ WH20

Figure 3. **Distribution of insider ownership levels following an IPO**. Distribution of insider ownership changes (current fraction minus initial fraction of insider ownership) in event time following an IPO. We exclude all firms that were widely held at the end of the first year following the IPO (insider ownership less than 10%). The initial sample is from SDC Platinum and covers all firms that went public between 1986 and 2001, excluding unit offerings, rights offerings, reverse LBOs, spin-offs, utilities, and financial firms. Insider ownership is sampled annually from Compact Disclosure over 1986 to 2001 period.

[1] See, for instance, Coles, Lemmon, and Meschke (2003), Demsetz and Villalonga (2001), and Himmelberg, Hubbard, and Palia (1999) for recent papers that make ownership structure endogenous.

[2] One paper that follows ownership beyond the years immediately following the IPO is Mikkelson, Partch, and Shah (1997). Their focus differs from ours. Though they document the evolution of insider ownership for firms with IPOs from 1980 through 1983 for the 10 years following the IPO, they are mostly concerned about how ownership explains performance. Denis and Sarin (1999) follow a similar approach, but instead study a random sample of firms in existence in 1983 for 10 years. Their focus is mostly on the interaction of changes in ownership with changes in the board.

[3] For a contrary view, however, see Holderness (2005).

[4] See Fama and French (2005) for evidence that option exercises can substantially increase the number of shares outstanding.

[5] See, for instance, Shleifer and Vishny (1997).

[6] See Fama and Jensen (1983).

[7] See Baker and Wurgler (2002). Schultz (2003), Pastor and Veronesi (2005), and Benninga, Helmantel, and Sarig (2005) review the evidence for IPOs and provide models of timing that rely on the efficient market hypothesis. Baker and Stein (2004) review evidence for SEOs and propose a model of timing that does not rely on the efficient market hypothesis.

[8] Bagwell (1991) reviews the literature and discusses the implications of downward-sloping demand curves for corporate finance. The more recent literature combines diversity of opinion with limits of arbitrage. See, for instance, Baker, Coval, and Stein (2005) for a model and a review of the evidence.

[9] See Keim and Madhavan (1996), for instance.

[10] This is particularly true if we count venture capitalists as insiders, which is highly likely given that they often hold a seat on the board of directors.

[11] See Demsetz and Lehn (1985) for evidence of the importance of regulation for corporate ownership.

[12] For 1988 and 1995, we sample ownership in November instead of in October, and for 1987 we use the CD from January 1988.

[13] They use two additional criteria. One uses new issues from SDC and the other uses information from the Investor Responsibility Research Center (IRRC).

[14] This matching procedure results in insiders owning more than 100% of the shares for 549 firm-years out of 27,512 firm-years. We eliminate these cases in our analysis.

[15] If Compact Disclosure doesn't report a proxy date for a particular firm but it reports insider ownership for that firm, we compute the insider ownership share as the ratio of the number of shares held by insiders over the number of shares outstanding at the end of the previous year. For instance, if the October 1993 CR-ROM reports insider ownership without a proxy date, we divide insider ownership by shares outstanding at the end of 1992 and use that ratio as our insider ownership measure for 1992.

[16] We also use a sample in which we add firms to the continuous sample if the firms have gaps in their data not exceeding two years. Our results also hold for this sample.

[17] In their study of the relation between ownership and board structures, Denis and Sarin (1999) also describe changes in insider ownership of more than 5% as large changes. They argue that the literature implies that such changes are economically meaningful.

[18] See Moeller, Schlingemann, and Stulz (2005) and Baker, Coval, and Stein (2005).

[19] Turnover is sometimes used as a proxy for differences of opinion or information asymmetries (see, for instance, Dierkens (1991) and Chen, Hong, and Stein (2001)). These considerations would predict a negative coefficient on turnover.

[20] See Atkins and Dyl (1997).

[21] See Chordia, Huh, and Subrahmanyam (2004).

[22] See, for instance, Kaniel, Saar, and Titman (2004) and the references therein.

[23] Note that while the raw sample has firms with negative book-to-market, these firms drop out as we impose our various data requirements and hence they are not in the sample used to estimate our regressions.

[24] See Demsetz and Villalonga (2001) for a review of this literature.

[25] The literature on the relation between q and insider ownership emphasizes the nonlinear nature of that relation (see Morck, Shleifer, and Vishny (1988) and Stulz (1988) for possible explanations). The nonlinearity addressed here is different.

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[26] Prendergast (2002) shows that the empirical evidence on the relation between volatility and optimal managerial ownership is ambiguous and that on theoretical grounds the relation is complex.