Why Has IPO Underpricing Changed Over Time?

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Abstract

In the 1980s, the average first-day return on initial public offerings (IPOs) was 7%. The average first-day return doubled to almost 15% during 1990-1998, before jumping to 65% during the internet bubble years of 1999-2000. Part of the increase can be attributed to changes in the risk composition of the companies going public and a realignment of incentives. We attribute much of the higher underpricing during the bubble period to a changing issuer objective function. We argue that in the later periods there was less focus on maximizing IPO proceeds due to both an increased emphasis on research coverage and allocations of hot IPOs to the personal brokerage accounts of issuing firm executives.

JEL classifications: G24; G32

Keywords: Initial public offerings; internet bubble; underwriter reputation; spinning

1. Introduction

What explains the severe underpricing of initial public offerings in 1999-2000, where the average first-day return of 65% is an order of magnitude higher than anything previously seen? In this paper, we address this and the related question of why IPO underpricing doubled from 7% during 1980-1989 to almost 15% during 1990-1998, before exploding during the internet bubble period. Our goal is to explain low-frequency movements in underpricing, changes that are less frequent than hot and cold issue markets.

We examine three hypotheses for the change in underpricing: the changing risk composition hypothesis, the realignment of incentives hypothesis, and the changing issuer objective function hypothesis. Throughout this paper, we use "first-day returns" and "underpricing" as synonyms.

The changing risk composition hypothesis is based on the assumption that riskier IPOs will be underpriced by more than less-risky IPOs. This prediction follows from models where underpricing arises as an equilibrium condition to induce investors to participate in the IPO market. If the proportion of IPOs that represent risky stocks increases, the average underpricing should increase (Ritter (1984a)). Risk can reflect either technological uncertainty or valuation uncertainty. Although there have been some changes in the characteristics of firms going public, we find that these changes have been too minor to explain much of the increase in underpricing. On the other hand, valuations changed dramatically. As valuations increased, so did the uncertainty associated with firm valuation. Campbell, Lettau, Malkiel, and Xu (2001) report that although the market as a whole has not become more volatile, the idiosyncratic volatility of stock returns has dramatically increased during the last three decades. We find that part of the change in underpricing is associated with the increase in valuation uncertainty that occurred.

The realignment of incentives hypothesis and the changing issuer objective function hypothesis both assert that the willingness of issuing firms to accept underpricing has changed over time. The realignment of incentives hypothesis, introduced by Ljungqvist and Wilhelm (2003), argues that the managements of issuing firms have increasingly acquiesced in leaving money on the table, where money on the table is defined as the change between the offer price and the first closing market price, multiplied by the number of shares sold. The hypothesized

reasons for this change are decreases in chief executive officer (CEO) fractional ownership, fewer IPOs containing secondary shares, and increases in the frequency and size of "friends and family" share allocations. These changes lower the incentive of issuing firm decision makers to bargain for a higher offer price. We find relatively little support for the realignment of incentives hypothesis as an explanation for changes in underpricing.

The changing issuer objective function hypothesis argues that, holding constant the level of managerial ownership and other characteristics, issuing firms changed their willingness to accept underpricing. We hypothesize that, during our sample period, there are two reasons why issuers became more willing to leave money on the table. The first reason is the increased importance of analyst coverage. As issuers placed more emphasis on hiring a lead underwriter with a highly ranked analyst to cover the firm, they became less concerned about avoiding underwriters with a reputation for excessive underpricing. We call this desire to hire an underwriter with an influential but bullish analyst the analyst lust hypothesis.

The second reason is the co-opting of decision-makers through side payments. Beginning in the 1990s, underwriters began to co-opt venture capitalists and the executives of issuing firms by setting up personal brokerage accounts and allocating hot IPOs to these accounts. By the late 1990s, this practice, known as spinning, became prevalent. The purpose of this activity is to influence their choice of lead underwriter. These payments create an incentive to seek, rather than avoid, underwriters with a reputation for severe underpricing. We call this the corruption hypothesis. While our evidence is largely indirect, much of the increased underpricing in the bubble period is consistent with the changing issuer objective function hypothesis.

One can view issuers as seeking to maximize a weighted average of IPO proceeds, the proceeds from future sales (both insider sales and follow-on offerings), and side payments from underwriters to the people who will choose the lead underwriter:

$$\alpha_1 \cdot \text{IPO Proceeds} + \alpha_2 \cdot \text{Proceeds from Future Sales} + (1-\alpha_1-\alpha_2) \cdot \text{Side Payments} \qquad (1)$$

The changing issuer objective function hypothesis states that in choosing an underwriter, issuers have put less weight on IPO proceeds and more weight on the proceeds from future sales and side payments. Ljungqvist and Wilhelm's (2003) realignment of incentives hypothesis also argues that issuing firms changed over time to put less weight on maximizing IPO proceeds.

Their hypothesis can be viewed as using a framework where the objective function of issuers was unchanged, with α_1 equal to 1.0 in all periods, but the relative price of underpricing changed from a CEO's viewpoint.

In equation (1), IPO proceeds are a function of the choice of underwriter and underwriting contract (auction or bookbuilding) at the start of the process and, several months later, the bargaining at the pricing meeting for IPOs where bookbuilding is used. Loughran and Ritter (2002) provide a prospect theory analysis of the bargaining at the pricing meeting. In contrast, the focus of this paper is on the choice of underwriter at the start.

The contributions of this paper are two-fold. First, we document many patterns regarding the evolution of the U.S. IPO market during the last two decades. Much of the data has been or will be posted on a website for other researchers to use. Many, although not all, of these patterns have been previously documented, especially for the first two subperiods. Second, we develop the changing issuer objective function hypothesis for the increase in the underpricing of IPOs. We then test the ability of the changing risk composition, realignment of incentives, and changing issuer objective function hypotheses to explain the increase in underpricing from 1980-1989 ("the 1980s") to, respectively, 1990-1998 ("the 1990s") and 1999-2000 ("the internet bubble"). In multiple regression tests, these hypotheses have little success at explaining the increase from the 1980s to the 1990s. Once we include a control for the effect of revisions from the midpoint of the original file price range to the final offer price, however, our empirical specification of these hypotheses is able to explain all of the increase in underpricing from the 1980s to the internet bubble period.

The rest of this paper is as follows. In Section 2, we present our changing issuer objective function hypothesis. In Section 3, we describe our data. In Section 4, we report year-by-year mean and median first-day returns and valuations. In Section 5, we report average first-day returns for various univariate sorts. In all of our analysis, we report results separately for the 1980-1989, 1990-1998, and 1999-2000 subperiods. In Section 6, we report multiple regression results with first-day returns as the dependent variable. Section 7 discusses alternative explanations for the high underpricing of IPOs during the internet bubble period. Section 8 presents our conclusions. The four appendices provide detailed descriptions of our data on founding dates, post-issue shares outstanding, underwriter rankings, and internet IPO identification.

2. Causes of a changing issuer objective function

Most models of IPO underpricing are based on asymmetric information. Two agency explanations of underpricing exist in the IPO literature. Baron (1982) presents a model of underpricing where issuers delegate the pricing decision to underwriters. Investment bankers find it less costly to market an IPO that is underpriced. Loughran and Ritter (2002) instead emphasize the quid pro quos that underwriters receive from buy-side clients in return for allocating underpriced IPOs to them. The managers of issuing firms do not strongly object to this underpricing if they are simultaneously receiving good news about their personal wealth increasing. This argument, however, does not explain why issuers hire underwriters who will *ex post* exploit issuers' psychology.

In this paper, we introduce a new agency explanation, the corruption hypothesis, based upon a conflict of interest between decision-makers and other pre-IPO shareholders. The decision-makers that we are referring to are the individuals who choose the managing underwriters, especially the lead underwriter, for an IPO. These decision-makers are the general partners of the lead venture capital firm (if a firm is financed with venture capital money) and the top management of the issuing firm. The other pre-issue shareholders are the limited partners of venture capital firms and other minority shareholders. The corruption hypothesis asserts that decision-makers are willing to hire underwriters with a history of underpricing due to the side payments that the decision-makers receive.

2.1 Why underwriters want to underprice IPOs

Underwriters, as intermediaries, advise the issuer on pricing the issue, both at the time of issuing a preliminary prospectus that includes a file price range, and at the pricing meeting where the final offer price is set. If underwriters receive compensation from both the issuer (the gross spread) and investors, the underwriter has an incentive to recommend a lower offer price than if the compensation was merely the gross spread.

With bookbuilding, the mechanism used for pricing and allocating IPOs in over 99.9% of our sample, underwriters have discretion over whom to allocate shares to if there is excess demand. (Auctions were used in 0.1% of the IPOs.) This discretion, as emphasized by Benveniste and Wilhelm (1997), Sherman (2000), and Sherman and Titman (2002), can be to the benefit of issuing firms. Underwriters can reduce the average amount of underpricing, therefore

increasing the expected proceeds of issuing firms, by favoring regular investors who provide information about their demand that is useful in pricing an IPO. Shares can be allocated to those who are likely to be buy-and-hold investors, minimizing any costs associated with price stabilization activities.

Underwriter discretion can completely eliminate the winner's curse problem if underwriters allocate shares in hot issues only to those investors who are willing to buy other IPOs. As Ritter and Welch (2002) note, if underwriters used their discretion to bundle IPOs, problems caused by asymmetric information could be nearly eliminated. The resulting average level of underpricing that would be observed would be no more than several percent. Thus, given the use of bookbuilding, the joint hypothesis that issuers desire to maximize their proceeds and that underwriters act in the best interests of issuers can be rejected whenever average underpricing exceeds several percent.

This discretion can be desirable for issuing firms, but it can also be disadvantageous if conflict of interest problems are not controlled. Benveniste and Wilhelm (1997) and Sherman (2000) emphasize the bright side of discretion, but do not mention the dark side.

Underwriters readily acknowledge that in recent years IPOs were being allocated to investors largely on the basis of past and future commission business on other trades. The willingness of buy-side clients to generate commissions and send trades to integrated securities firms depends upon the amount of money left on the table in IPOs. As an example, Credit Suisse First Boston (CSFB) received commission business equal to as much as 65 percent of the profits that some investors received from certain hot IPOs, such as the December 1999 IPO of VA Linux.[1] The VA Linux IPO was priced at $30 per share, with a 7% gross spread equal to $2.10

[1] See the January 22, 2002 SEC litigation release 17327 and news release that are available on the SEC website at http://www.sec.gov, and the NASD Regulation news release and statement of NASD Regulation President Mary Shapiro that are available at http://www.nasdr.com. The NASD Regulation news release states that "For example, after a CSFB customer obtained an allocation of 13,500 shares in the VA Linux IPO, the customer sold two million shares of Compaq and paid CSFB $.50 a share—or $1 million—as a purported brokerage commission. The customer immediately repurchased the shares through other firms at normal commission rates of $.06 per share at a loss of $1.2 million on the Compaq sale and repurchase because of the $1 million paid to CSFB. On that same day, however, the customer sold the VA Linux IPO shares, making a one-day profit of $3.3 million."

According to paragraphs 48 and 49 of the SEC complaint, for the July 20, 1999 IPO of Gadzoox, which CSFB lead managed, "at least 261,025 shares were allocated to customers that were willing to funnel a portion of their IPO profits to CSFB." CSFB distributed approximately 3.4 million of the 4.025 million offer, which went from an offer price of $21 to a closing price of $74.8125, up 256%. The following day, July 21, 1999, CSFB was the lead manager on MP3, which was priced at $28 and closed at $63.3125, up 126%. "CSFB distributed 7.2 million of the 10.35 million MP3 shares offered through underwriters. Of the 7.2 million MP3 shares distributed by CSFB, at least 520,170 shares were allocated to customers that were willing to funnel a portion of their trading profits to CSFB."

per share. For an investor who was allocated shares at $30, and who then sold at the closing market price of $239.25, the capital gains would have amounted to $209.25 per share. If the investor then traded shares to generate commissions of one-half of this profit, the total underwriter compensation per share was $2.10 plus $104.625, or $106.725.

The receipt of commissions by underwriting firms in return for hot IPO allocations is in violation of NASD Rule 2110 on "Free Riding and Withholding." Because the underwriter has an economic interest (a share of the profits) in the IPO after it has been allocated, there is not a "full distribution" of the security. This is economically equivalent to withholding shares and selling them at a price higher than the offer price, in violation of Rule 2110. But if NASD (a self-regulatory organization) did not enforce its rules, underwriters might find it optimal to violate the rules.

Underwriters have an incentive to underprice IPOs if they receive commission business in return for leaving money on the table. But the incentive to underprice presumably would have been as great in the 1980s as during the internet bubble period, unless there was a "supply" shift in the willingness of firms to hire underwriters with a history of underpricing. We argue that such a shift did indeed occur, resulting in increased underpricing.

2.2 The analyst lust explanation of underpricing

Dunbar (2000) presents evidence that underwriters in 1984-1994 subsequently increased their IPO market share if they had an analyst who was highly ranked in the annual survey of *Institutional Investor*. Providing research coverage is costly to investment bankers, however, with the largest brokerage firms each spending close to $1 billion per year on equity research during the bubble (Rynecki (2002)). Part of the way that these costs are covered is by charging issuers of securities explicit (gross spread) and implicit (underpricing) fees. The more that issuing firms view analyst coverage as important, the more they are willing to pay these costs.

We argue that analyst coverage has become more important over time. There are several reasons for this opinion. First, investment bankers and venture capitalists that we have talked to are unanimous in their agreement with this statement. Supporting this, in the early 1970s Morgan Stanley had "no research business to speak of," even though they were a major IPO underwriter (Schack (2002)). As we will show, the number of managing underwriters in IPO syndicates has increased over time. Investment bankers assert that co-managers are present in the syndicate almost exclusively to provide research coverage. Consistent with this view,

Krigman, Shaw, and Womack (2001) find that one of the most important reasons for switching underwriters in a seasoned offering is to seek additional and influential analyst coverage from the new banker. Indeed, as the number of co-managers has grown, by 2001 they were generally not even invited to participate in road shows and the pricing meeting at which the final offer price is determined.

Second, as valuations increase, changes in growth rates perceived by financial markets represent more dollars. Firm value can be decomposed into the value of existing assets in place plus the net present value of growth opportunities. More importance is placed on analyst coverage when growth opportunities are relatively important. For example, in 1982, when the market price-earnings (PE) ratio was about 8, the difference in valuation for a firm with forecasted growth of 10% and 15% might translate into a difference in PEs of 8 versus 12. In 1999, when the market PE was about 25, the difference in valuation for forecasted growth of 10% versus 15% might translate into a difference in PEs of 25 versus 40. Thus, for a firm with $1.00 in earnings per share, in 1982 the difference in values would be $4 per share, but in 1999 it would be $15 per share.

A third reason for the increased importance of analyst coverage is the rise in the visibility of analyst recommendations because of the internet and cable television stations CNBC and CNN Financial. Consistent with this statement, Busse and Green (2002, Table 5) report that, for Nasdaq stocks during June to October 2000, trading volume increased by an average of 300,000 shares in the four minutes after an analyst mentioned a stock favorably on CNBC's Midday Call segment.

It should be noted that the analyst lust hypothesis does not necessarily involve any conflict of interest between managers and other pre-issue shareholders. To the degree that favorable analyst coverage results in a higher market price, all pre-issue shareholders benefit.

2.3 The corruption explanation of underpricing

In 1999-2000, the average amount of money left on the table of $79 million per IPO adds up to $63 billion. This number appears to be way too high to be justified as equilibrium compensation for purchasing analyst coverage. Two questions are raised. First, if issuing firms wanted to purchase analyst coverage, why did they pay for it by leaving money on the table, rather than paying a higher gross spread? Second, why did they leave so much money on the table?

Our answers are as follows. First, money on the table is state-contingent compensation, since the deals where a lot of money was left on the table were the deals where the managers of issuing firms found themselves facing a substantial increase in their personal wealth (Loughran and Ritter (2002)). Second, with bookbuilding, underwriters have discretion over to whom to allocate the money left on the table. Some of it went to "friends and family" of the issuing firm, as Ljungqvist and Wilhelm (2003) show. But some of it also was paid to the executives of issuing firms and their venture capitalists through personal brokerage accounts.

The aggressive use of allocations of hot IPOs to these individuals, known as spinning, was one of the reasons that CSFB increased its market share to become the leading IPO underwriter in 1999 and 2000 (as measured by the number of IPOs lead-managed). Elkind and Gimein (2001) and Smith and Pulliam (2002b) describe the "Friend of Frank" brokerage accounts set up for decision-makers by CSFB, where Frank Quattrone, head of technology investment banking, worked. "...in the 1990s firms also began offering shares to potential clients... by setting up brokerage accounts specifically for hot IPOs. Under these arrangements, VCs and entrepreneurs made a moderate deposit (perhaps $250,000) and signed over discretionary authority to the brokers whose firms were seeking their favor. Typically, IPO shares would be flipped for a quick—and riskless—windfall. 'The stock would go into the hands of venture capitalists and the managements of companies that were going to go public next,' notes a Silicon Valley fund manager. 'This was the closest thing to free money that there was. It may not be all that much different from a briefcase filled with unmarked tens and 20s.'...Indeed, two Silicon Valley CEOs, who asked that their names not be used, said that because several competing investment banks were offering them cheap IPO shares, they could not have been influenced when choosing between them." Other details about IPO allocations in recent years have recently been revealed. Smith (2002) describes the allocation of IPOs to top executives by Goldman Sachs. Smith, Grimes, Zuckerman, and Scannell (2002) describe the allocations to venture capitalists, and Sherburne (2002) lists the allocations to WorldCom officers and directors by Citigroup's Salomon Smith Barney unit.

This practice, first publicly identified by Siconolfi (1997a), appears to violate the legal doctrine of "corporate opportunity." The individuals receiving the profits receive preferential allocations only because of their position to influence the decisions of their employing organization. Some interpret the IPO allocations as underwriters paying bribes to decision

makers (Siconolfi (1997b)). The damaged parties are the limited partners of the venture capital firms and the other pre-issue shareholders of the issuing firms who suffer excessive dilution when there is severe underpricing.

These payments to individuals result in a situation where the goal of the managers of an issuing firm is to choose an underwriter with a reputation for leaving money on the table. This corruption theory of IPO underpricing provides an explanation for why underwriters and issuing firm managers prefer to forego net proceeds by leaving money on the table, rather than by paying a higher gross spread. Money on the table is the currency with which underwriters can influence other venture capitalists and issuing firm executives, whereas gross spread revenue cannot be redistributed except in a more transparent manner.

3. Data

Our primary datasource for IPOs from 1980-2000 is the Thomson Financial Securities Data (also known as Securities Data Co.) new issues database. We have made hundreds of corrections to their data, and missing information for thousands of observations has been collected from a number of sources, including direct inspection of the prospectuses, Howard and Co.'s *Going Public: The IPO Reporter* for IPOs from 1980-1985, Dealogic (also known as CommScan) for IPOs after 1990, and the SEC's Electronic Data Gathering and Retrieval (EDGAR) system for IPOs after 1996.[2] Final prospectuses are identified on EDGAR as document 424B at http://www.sec.gov. For trading volume on the day of issue, we use information from the University of Chicago's Center for Research in Securities Prices (CRSP).

In all of our analysis, we exclude best efforts offers (typically very small offerings, these are not covered by Thomson Financial Securities Data), ADRs (American Depositary Receipts, issued by foreign firms that list in at least one other market outside of the U.S.), closed-end funds, REITs (real estate investment trusts), banks and savings and loans (S&Ls), partnerships, and firms not covered by CRSP within six months of the offering.[3] CRSP covers stocks listed on

[2] While Thomson Financial's database is missing some sales data, and many founding dates, we find that there is no evidence of any backfilling bias. That is, there is no evidence that subsequent "winners" are more comprehensively or accurately covered than other IPOs, so researchers using this database do not have to worry about introducing a survivorship bias.

[3] Banks, S&Ls, and their holding companies are excluded for several reasons. First, their offer prices are regulated. Second, many of these are conversions from mutuals to stock ownership of institutions that were reorganized in the 1930s, and they would dominate the patterns associated with age. Third, for these conversions, depositors and other affiliated parties are given preference in the share allocations.

the American Stock Exchange, the New York Stock Exchange, and Nasdaq, although foreign firms on Nasdaq are not covered. We also exclude IPOs with an offer price below $5.00 per share. What remains are almost all IPOs of domestic operating companies that are large enough to be of interest to institutional investors. The sample size is 6,169 firms, although in some of our tables we are missing up to 3% of the sample due to incomplete information.

Our main source of information on *venture capital* backing is from Thomson Financial. Supplemental data on venture capital backing has been provided by Chris Barry, Paul Gompers, and Josh Lerner.

Information on the *founding date* of companies has come from a variety of sources, discussed in more detail in Appendix 1. Laura Field, Alexander Ljungqvist, and Li-Anne Woo provided many of the founding dates. We are missing a reliable founding date for 111 firms.

The original *file price ranges* for IPOs from 1980-1982 have been transcribed from Howard and Co.'s *Going Public: The IPO Reporter*. File price ranges for IPOs from 1983 and later have been downloaded from Thomson Financial Securities Data. We are missing the file price range for 11 firms in the early 1980s.

To calculate the market value of the IPO, we use the offer price multiplied by the post-issue number of shares outstanding. For firms with a single class of shares outstanding, our primary source of data on the *post-issue number of shares* is CRSP. For firms with more than one class of shares outstanding (dual-class firms), we use data from a variety of sources, as described in Appendix 2.

Information on *sales* and earnings per share (*EPS*) in the year prior to going public comes mainly from Thomson Financial Securities Data. When available, we use the sales and earnings per share for the most recent twelve months (commonly known as LTM for last twelve months) prior to going public. When unavailable, we use the most recent fiscal year numbers. Additional sources of information include Dealogic for post-1991 IPOs, Howard and Co.'s *Going Public: The IPO Reporter* for 1980-1995 IPOs, and EDGAR. If a firm has zero trailing sales, we assign a sales value of $0.01 million, since in our empirical work we use logarithms, and the logarithm of zero is undefined. If we are unsure whether the sales are zero or are missing, we treat it as missing. We are missing the sales number for 83 firms.

We use Thomson Financial Securities Data as our source for information on the lead underwriter(s) and the number of managing underwriters for each IPO. For *underwriter prestige*

rankings, we have started with the Carter and Manaster (1990) and Carter, Dark, and Singh (1998) rankings. We have created rankings for 1992-2000 in the spirit of their methodology. Appendix 3 contains a detailed description of the procedures. The underwriter prestige rankings are on a 0 to 9 scale, and are based upon the pecking order that is present in "tombstone" advertisements.

Appendix 4 provides a brief description of how we identify *internet* IPOs and also lists the SIC codes that we use to categorize IPOs by whether they are a technology (*tech*) firm or not.

4. The Time-series of First-day Returns and Valuations

Figure 1 plots the annual volume and average first-day return on IPOs from 1980-2000. Table 1 reports the means (Panel A) and medians (Panel B) of the first-day returns, by year of issue and by subperiod. In all of our analysis, we split the sample into three subperiods: January 1980-December 1989 ("the 1980s"), January 1990-December 1998 ("the 1990s"), and January 1999-December 2000 ("the internet bubble").

In the 1980s, the average first-day return was slightly over 7%. In the 1990s, the average first-day return increased to almost 15%, and then jumped to 65% in the internet bubble period. In 2001, after the bubble burst, IPO volume dropped to 73 issues with a mean first-day return of 15.3%. In this paper, we do not include IPO data from 2001 because most of our analysis is based on subperiods, and the 2001 volume is so low that cross-sectional analysis is constrained.

Table 1 also reports the number of managing underwriters, the amount of money left on the table, the valuation of the IPOs computed using the post-issue number of shares outstanding multiplied by, respectively, the offer price and the first closing market price, and the sales in the year prior to issuing. The amount of money left on the table represents the profits made by investors on the first day of trading. All dollar values have been converted to dollars of 2000 purchasing power using the Consumer Price Index.

Inspection of Table 1 shows that from 1980 through 1994, the underpricing of IPOs was typically quite modest, as was the amount of money left on the table. Every year from 1995-1998, the average first-day return was higher than in any year between 1981 and 1994. Underpricing took a discrete jump in 1999-2000, as did the amount of money left on the table. The number of managing underwriters has steadily increased over time, with a rapid acceleration in the late 1990s.

Focusing on Panel B, one observes that for IPOs in the 1980s, the median valuation of $68 million using the offer price was less than twice the annual sales of $36 million. In the 1990s, this market-to-sales ratio increased to 2.6 (the median valuation of $113 million relative to median sales of $43 million). During the internet bubble period, the median valuation using the offer price jumped to $361 million while the median sales fell to $14 million, giving a market-to-sales ratio of 26. Using the valuation implied by the first closing market price, the market-to-sales ratio is even higher, at 38. This rapid escalation in market-to-sales ratios suggests that valuation uncertainty played a role in the increase in underpricing over time.

5. Univariate Sorts

Can the changing characteristics of IPOs and a realignment of incentives explain the increase in underpricing over time? Some of the characteristics of IPOs have changed over time. In Table 2, we report the mean first-day returns on IPOs after several simple sorts: small vs. large, young vs. old, low sales vs. high sales, tech vs. nontech, venture capital (VC) backed vs. nonVC backed, whether all of the shares in the offering are being sold by the issuing firm or not, low and high share overhang, and non-prestigious underwriter vs. prestigious underwriter. Overhang is defined as the shares retained by pre-issue shareholders divided by the shares issued. We report the average underpricing for three subperiods: the 1980s, the 1990s, and the internet bubble. The table shows that some of the cross-sectional patterns that existed in the 1980s have been reversed in the 1990s. In the 1990s, larger offers have been underpriced more than smaller IPOs, and IPOs with a prestigious lead underwriter have been underpriced more than those without prestigious underwriters.[4] Several other patterns have increased in magnitude. Going across each row in Table 2, underpricing has increased over time.

In Table 2, during the 1980s, tech stock IPOs had an average first-day return of 10.4%. This is the highest average first-day return of any category during the 1980s except for the set of IPOs whose offer price was revised upwards from the file price maximum. If the changing characteristics of IPOs explained all of the changes in underpricing across time, it would be hard to imagine that the average first-day return in the 1990s would have increased to much more than

[4] The difference in underpricing of 7.4% for small firms and 7.3% for large firms in the 1980s is smaller than found in other studies because we have screened out IPOs with an offer price below $5.00 per share. These low price IPOs had an average first-day return of 20.5%, and their inclusion would boost the average return on small IPOs during the 1980s to 8.8%.

10.4% if the first-day returns were drawn from a stationary distribution. Thus, Table 2 suggests that very little of the increase in underpricing over time can be attributed to a change in the composition of the types of firms going public if the modest risk-return tradeoff that existed in the 1980s had continued to hold.

Ljungqvist and Wilhelm (2003) argue that, because the dilution effect hurts selling shareholders more than if they retain their shares, there will be more severe underpricing of pure primary offerings than of IPOs with secondary shares. Table 2 reports that pure primary offerings were associated with greater underpricing during the internet bubble period, but that this pattern was not present in any quantitatively important manner in the 1980s and 1990s. We now look at some of the patterns documented in the univariate sorts of Table 2 in more detail.

5.1 Sales

In Figure 2, we categorize issuing firms on the basis of their sales in the 12 months prior to issuing. Inspection of Figure 2 shows that, holding sales constant, underpricing roughly doubled from the 1980s to the 1990s, and then exploded during the internet bubble period. Within each subperiod, there is less underpricing the larger the sales are, although firms in the lowest sales category sometimes have slightly lower average first-day returns than those with sales of just above $10 million. Prior to the internet bubble, there was no secular trend in the median sales of firms going public.

5.2 Technology Stocks

In Table 3, we report the mean first-day returns, the mean percentage of the firm sold, and the ratio of the median market value-to-median sales on IPOs for our three subperiods after categorizing firms on the basis of industry. We use a very broad industry classification: technology and internet-related stocks versus all others. In Appendix 4 we list the detailed criteria for how firms are classified into these two categories. For simplicity, we will refer to these two categories as "tech" and "nontech." We also report results for two very homogenous subsets of the nontech category, that of startup biotechnology firms and that of mature "old economy" firms.

Specifically, startup biotechnology firms are defined as biotechnology firms that are no older than seven years old at the time of going public with trailing annual revenue of less than $10 million (measured in terms of 2000 purchasing power) and with negative trailing earnings. All of these firms are subject to substantial technological uncertainty. At the other end of the

spectrum, all of our mature "old economy" firms are at least 20 years old, have trailing annual sales of $100 million or more, positive trailing earnings, and are not in the technology or biotech industries. These mature old economy firms, many of which are "reverse LBOs" or spinoffs, have substantial assets in place.

In Table 3, we document that in each subperiod, tech stocks have been underpriced by more than nontech stocks. This difference has increased over time. The proportion of IPOs that are tech stocks has increased, from roughly 25% in the 1980s to roughly 70% during the internet bubble period. For the homogeneous industry classifications, we report that the startup biotech firms on average were underpriced by, respectively, 8%, 7%, and 39% during the eighties, nineties, and internet bubble periods. The mature old economy firms were underpriced by, respectively, 4%, 9%, and 17%. Thus, whether industries are defined very broadly or very narrowly, underpricing was substantially higher during the internet bubble period than before.

The Table 3 results show that the changing underpricing of IPOs cannot be attributable merely to an increased proportion of tech stocks in the mix of companies going public. Of note is that mature nontech, nonbiotech stocks had higher first-day returns during the internet bubble period than in prior periods. Thus, the high average returns on IPOs during the internet bubble period affected the whole IPO market, not just internet and technology stocks.

We also report the mean percentage of the firm sold in the IPO and the ratio of the median market value (post-issue shares outstanding multiplied by the offer price) to the median annual sales in the year prior to going public for each subperiod. While the percentage of the firm sold did not change dramatically over time, the median market value/median annual sales ratio increased substantially. Inspection of the patterns across industry categories shows that higher first-day returns are generally associated with higher market-to-sales ratios.

How do we interpret these numbers? For biotech stocks, it is arguably true that there was just as much valuation uncertainty as for internet stocks, and yet the level of underpricing was quite modest in the eighties and nineties before increasing substantially in the bubble period. For mature old economy stocks, underpricing also increased, but not by a substantial amount. Since the two groups have very homogeneous firms, if there was a stationary risk-return relation that determined underpricing, there should be no change in underpricing within a group over time, unless it is caused by the increased valuations of the same physical assets. This later possibility cannot be dismissed.

Arguably, with the much higher levels of valuation prevailing in 1999-2000 across almost all industries, equilibrium underpricing should have increased even if there were no agency problems between either managers and minority shareholders or between issuing firms and underwriters. An increased fear of future lawsuits, for instance, is certainly plausible as a reason for not attempting to price issues to get "top dollar" (Lowry and Shu (2002)). It is not obvious, however, how much of the increase in underpricing can be attributed to greater valuation uncertainty, especially for mature old economy firms. After all, one of the major purposes of the bookbuilding process is to collect information about the market's willingness to pay prior to pricing an issue. If there is a lot of uncertainty about demand prior to the start of building the book, much of the uncertainty should be resolved by the time of the pricing meeting.

5.3 Overhang

Bradley and Jordan (2002) document that the ratio of retained shares to the public float, which they refer to as share overhang, predicts first-day returns during 1990-1999. There are a number of explanations for why share overhang predicts first-day returns. First, the "scarcity value" hypothesis argues that if the float (the number of shares issued in the IPO) is small relative to the shares retained by pre-issue shareholders, the market price will be higher if there is a negatively sloped demand for shares. This translates into higher first-day returns if the offer price has not incorporated this scarcity value (Ofek and Richardson (2003)). Second, Leland and Pyle's (1977) asymmetric information model views the relative float as a signal of firm value. Managers with positive private information about firm value will signal this value by selling only a small fraction of the firm in the IPO. The Leland and Pyle model has no role for underpricing, but Grinblatt and Hwang (1989) extend it to incorporate underpricing.

A third explanation for a relation between underpricing and overhang is offered by Barry (1989), Habib and Ljungqvist (2001), and Ljungqvist and Wilhelm (2003). They argue that the opportunity cost of underpricing to issuers is less if the relative float is small, and that this cost is greater for pre-issue shareholders who sell shares in the IPO than for those who retain their shares. Fourth, Ritter (1984b) argues that the relative float may be small (and the overhang large) if the firm and its underwriter have a fixed proceeds in mind, but the market is willing to place a high value on the firm. In other words, the higher the valuation, the higher will be the overhang for a given amount of proceeds. If high valuations are correlated with greater valuation uncertainty, this would result in more underpricing when the overhang is large.

In Table 4, we document the patterns after categorizing IPOs on the basis of their share overhang. Firms that sell 30% or more of the post-issue shares in the IPO are deemed to have a low overhang. The table shows that as valuations have increased over time, both first-day returns and the share overhang also have increased. Causality is unclear, however. Firms could be selling less of themselves because underpricing has increased. Underpricing could have increased because the overhang has gotten bigger. Or both the overhang and underpricing could have increased because valuations and the attendant agency problems and valuation uncertainty have increased. Note that, in the 1980s, when valuations were lower, underpricing was virtually identical whether the share overhang was large or small. This is most consistent with the valuation uncertainty explanation.

Inspection of Table 4 shows that, in the 1990s and internet bubble period, the median proceeds of low overhang and high overhang firms were virtually identical. Not identical, however, are the valuations. High overhang firms have a much higher valuation, so they are able to sell a smaller fraction of the firm to raise the same proceeds.

5.4 Turnover

In Table 5, we report the average turnover on the first day of trading. Turnover is defined as volume, as reported by CRSP, divided by the global number of shares offered, exclusive of overallotment options. Because of the different conventions for reporting volume on Nasdaq versus the American or New York Stock Exchanges, we double the reported volume numbers for Amex and NYSE IPOs. Of our sample of IPOs, 87% are initially listed on Nasdaq.

Panel A of Table 5 reports that the proportion of IPOs with first-day turnover greater than 100% increased from less than 2% of IPOs in the 1980s to 24% of IPOs during the 1990s and 75% during the bubble period. In other words, what was once a rare event became commonplace.

In Panel B, we report the average turnover after classifying IPOs on the basis of their first-day return. In general, turnover is larger the higher is the first-day return. Our numbers are consistent with those reported by Krigman, Shaw, and Womack (1999), Ellis, Michaely, and O'Hara (2000), and Aggarwal (2003). This correlation of volume and returns may be partly due to the implementation of penalty bids by investment bankers on IPOs that do not jump in price. A penalty bid exists when a stockbroker loses his or her commission on an IPO if the buyer then sells the shares within a short period of time. If a broker expects that a penalty bid will be

implemented, the broker has an incentive to allocate shares to a buy-and-hold investor. More controversially, a penalty bid also creates incentives for the broker to dissuade a client from selling the shares after the stock has started trading.

Because underpricing has increased over time, we attempt to disentangle these effects by reporting the relation between returns and turnover for each subperiod. Panel C shows that for each subperiod, a positive relation between turnover and first-day returns exists. Panel C also shows that, for each first-day return category, turnover has increased over time, and by a much larger percentage than for stocks in general. According to the New York Stock Exchange *Fact Book* (2001), NYSE turnover per year averaged 51% for 1980-1989, 57% for 1990-1998, and 83% for 1999-2000. Looking across each row, turnover roughly doubled between the 1980s and 1990s, and then roughly doubled again during the internet bubble period. This suggests that selling IPO shares immediately after the offering, a practice known as "flipping," has become much more common over time. This is consistent with the hypothesis that underwriters have increasingly used IPOs as a reward for buy-side clients who generate profitable commission business. These clients frequently flip their IPO allocations, unlike buy-and-hold investors.

Two further comments are relevant. First, one reason that stock market turnover increased in general is because hedge funds and other investors were churning their portfolios to generate commissions, for which they would be rewarded with underpriced IPOs. Ritter and Welch (2002) suggest that this may have resulted in a ten percent increase in aggregate trading volume during 1999-2000. Second, and more importantly, underwriters have complete discretion in their allocation of IPO shares, and if they wanted to allocate shares only to buy-and hold investors, first-day turnover could be close to zero. In other words, first-day turnover is endogenous. By choosing their allocation policy, underwriters can make the first-day turnover as low or as high as they want it to be. The fact that it increased substantially is therefore proof that underwriters changed their policy, with fewer shares being allocated to buy-and-hold investors and more to flippers. The dramatic increase in first-day turnover, especially for cold issues, is perhaps the single piece of evidence that is most problematic for the changing risk composition hypothesis, where the level of underpricing is just enough to induce investors to purchase IPOs.

5.5 Age

In Figure 3, we report the average first-day return in each subperiod after classifying firms by their age at the time of going public. Inspection of the figure shows that in each subperiod there is more underpricing of young firms than of old firms, although the relation is not strictly monotonic. Our results for the 1980s are consistent with those reported by Muscarella and Vetsuypens (1990).

Even more noteworthy is the increase in underpricing, holding age constant, as one moves from the 1980s to the 1990s to the internet bubble period.[5] Thus, Figure 3 shows that the increase in underpricing over time is not due merely to a shift towards younger firms in the age distribution of firms going public. Instead, the relation between age and first-day returns is nonstationary.

In Figure 4, we report the 25th, 50th, and 75th percentiles of the age distribution for the IPOs in each cohort year, from 1980-2000. Three patterns stand out. First, in the early 1990s, the proportion of young firms dropped. This drop is associated with an increase in the number of "reverse LBOs," firms going public after having previously been involved in a leveraged buyout. Second, in 1999, more young firms went public. This increase in the proportion of young firms is associated with the internet bubble. Third, there is no strong secular trend in the age distribution of firms going public. With only temporary aberrations, the median age has stayed remarkably constant at about 7 years.[6] The median age of an issuing firm was 7 years old in the 1980s and 8 years old in the 1990s, before falling to 5 years old during 1999-2000 ("the internet bubble").

5.6 CEO Ownership

The realignment of incentives hypothesis argues that issuing firm executives will not bargain as hard for a higher offer price if the CEO owns less of the firm. This prediction is also consistent with the changing issuer objective function hypothesis, in that an executive receiving

[5] The greater variation of average first-day returns during the internet bubble period is due to two features of the data. First, the internet bubble period has a smaller sample size, so each age group has fewer firms in it. Second, within each age group, the standard deviation of first-day returns is higher.

[6] It should be noted that we have screened out best efforts offers, unit offers, and IPOs with an offer price of below $5.00. This segment of the IPO market historically has been intensive in fraud and has been avoided by institutional investors. There has been a decrease in these issues over time, and most of these offers are from fairly young firms. The decrease in these offers is partly attributable to tighter listing requirements on Nasdaq, and partly due to greater regulatory pressures on this part of the IPO market.

side payments bears less of the cost of underpricing, the smaller is his or her ownership. Ljungqvist and Wilhelm (2003) present regression evidence consistent with this prediction, using the percentage of shares owned by the CEO as the measure of ownership.

It is not obvious, however, that CEO percentage ownership is as important as the number of shares owned or the market value of these shares if one is trying to measure the managerial benefits of a higher offer price. In Table 6, we list the median pre-issue CEO percentage ownership reported by Ljungqvist and Wilhelm (2003, Table III) for each year in 1996-2000. We also report the median number of pre-issue shares outstanding, and the product of the CEO fractional ownership times the shares outstanding, which gives an estimate of the pre-issue number of shares owned by the CEO for the median company going public in a year. We also report the median offer price in each year, and an approximation to the median market value of shares owned by CEOs, valued at the offer price.[7]

Inspection of Table 6 shows that, while CEO percentage ownership decreased during 1996-2000, the number of shares owned more than doubled, due to the quadrupling of the number of shares outstanding. This dramatic increase in pre-issue shares outstanding is attributable to the substantial increase in valuations along with a relatively constant offer price. If one were to focus on the number of shares owned by the CEO or the market value of the shares owned when his or her firm went public, one might expect a decrease in underpricing during the bubble period due to the incentive effect. Wealth effects associated with the higher market value of the shares might dominate substitution effects, however, making predictions hazardous, as Ljungqvist and Wilhelm (2003) acknowledge in their conclusion. In any case, the substantial increase during 1996-2000 in CEO holdings when ownership is measured by shares owned or by the market value of the shares owned is in sharp contrast to the decrease in CEO holdings when ownership is measured as a percentage of shares outstanding.

5.7 Prestigious Underwriters

In general, underwriters with a Carter and Manaster rank of 8.0 to 9.0 (on a scale of 0 to 9) are considered to be prestigious national underwriters. Those with a rank of 5.0 to 7.9 are

[7] Alexander Ljungqvist has computed the value of the median CEO's pre-issue market value of equity, using the Ljungqvist and Wilhelm sample, which is virtually identical to ours. His numbers for the median market value each year show the same trend that we report in Table 6, where we multiply the product of several medians. Ljungqvist's pre-issue market value of equity for the median CEO increases from $6.76 million in 1996 to $20.64 million in 1999 before declining to $16.86 million in 2000, whereas our Table 6 medians increase from $8.68 million in 1996 to $21.76 million in 2000.

considered to be quality regional or niche underwriters. Underwriters with a rank of 0 to 4.9 are generally associated with penny stocks; many of those with ranks of below 3.0 have been charged with market manipulation by the SEC. In Table 7, we categorize IPOs on the basis of the prestige of their lead underwriter. Inspection of the sample sizes shows that prestigious lead underwriters have increased their market share from under 50% in the 1980s to over 60% in the 1990s and to over 80% during the internet bubble period.[8]

Beatty and Welch (1996), Cooney, Singh, Carter, and Dark (2001), and others have documented that the negative relation between underwriter prestige and underpricing that existed in the 1980s reversed itself in the 1990s. Our Table 7 findings confirm this reversal. To rationalize the pattern of the 1980s that prestigious underwriters are associated with less underpricing, Carter and Manaster (1990) and Carter, Dark, and Singh (1998) argue that IPOs taken public by prestigious underwriters benefit from superior certification. Because of the greater reputation capital that is committed, investors do not demand as large a discount on these offers. The higher underpricing associated with prestigious underwriters in the 1990s and internet bubble period is inconsistent with the joint hypothesis that underwriters are attempting to maximize issuer proceeds and that certification is an important determinant of the required amount of money to be left on the table. Instead, it is consistent with the changing issuer objective function hypothesis.

According to Elkind and Gimein (2001), "The internet craze had led analysts at every investment bank to issue glowing reports on internet companies that were little more than an idea and some PowerPoint slides—a process that Bill Burnham, a former CSFB internet analyst, calls 'the competitive devaluation of underwriting standards.'" In the 1980s and earlier, prestigious underwriters refused to take public young, unproven companies. For example, Goldman Sachs was lead underwriter on only one technology IPO with inflation-adjusted annual sales of less than $20 million in the entire decade of the 1980s. For comparison, Goldman Sachs was the lead underwriter on 15 such companies in the 1990s and 37 more during the internet bubble period.

Table 7 shows that over time, especially in the internet bubble period, prestigious underwriters relaxed their underwriting standards and took public an increasing number of very

[8] Since in all subperiods the biggest deals are more commonly managed by prestigious underwriters, if market share is computed using gross proceeds, rather than the number of IPOs, the market share of prestigious underwriters would be uniformly higher.

young, unprofitable companies. The median sales of firms taken public by prestigious underwriters dropped from $75 million in the 1980s to just $16 million during the internet bubble period. Table 7 also shows that prestigious underwriters were more likely to increase the offer price to above the maximum of the file price range. How much of this pattern is due to success at creating demand versus intentional low-balling of the file price range is an open question.[9]

In the early 1980s, many underwriters were thinly capitalized firms where risk-sharing was important. On a $50 million deal with a 7% gross spread, the underwriters shared $3.5 million in fees. The lead underwriter might get 20% of this, or $0.7 million. As underwriters got bigger, the lead manager was able to keep 60% of the fees, or $2.1 million. Furthermore, with more money left on the table, the lead underwriter could get quid pro quos that might be worth another $2.1 million. So it became a lot more lucrative to be the lead underwriter. To get this business, it was important to have an analyst who would be bullish. According to Lise Buyer, Director of Internet/New Media Research at CSFB during the internet bubble, "Some of the bigger stars were cheerleaders, not analysts…".[10] Cheerleading is the term that describes the bullish tilt to analyst recommendations, with "buy" and "strong buy" recommendations becoming more common, much as grade inflation by professors became common.

We are arguing that IPO underwriting became more lucrative over time as valuations increased. The higher valuations made issuing firms more willing to leave money on the table, and underwriters encouraged this by establishing "Friend of Frank" accounts and "friends and family" allocations. Underwriters found that they could recoup some of the money left on the table in the form of commissions from rent-seeking buyers. Issuers were willing to pay the higher indirect fees due to both the analyst lust hypothesis and the corruption hypothesis. The time series evidence is consistent with this story, but what about cross-sectional implications?

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[9] Cooney, Singh, Carter, and Dark (2001) and Logue, Rogalski, Seward, and Foster-Johnson (2002) also document that during the 1990s prestigious underwriters were more likely to revise the offer price upwards. Lowry and Schwert (2002b) report similar results for the 1985-1997 time period. Logue *et al.* interprets this as success in creating demand, rather than low-balling the file price range.

[10] As quoted on the PBS Frontline episode "dotcon" on January 24, 2002. A transcript is available at http://www.pbs.org.

6. Multiple regression results

6.1 Cross-sectional patterns

One explanation for the cross-sectional pattern between age and first-day returns is that younger firms are riskier firms, and investors need to be compensated for this risk. The negative relationship between sales and first-day returns shown in Figure 2 also can be interpreted as demonstrating a relation between the risk of an IPO and underpricing. The univariate sorts in Tables 2-7, however, are not independent. Tech firms are much more likely to be young firms, for instance. Thus, to examine marginal effects, we report multiple regression results with the first-day return as the dependent variable. Our explanatory variables are chosen on the basis either of their association with first-day returns in our univariate sorts, or to test the changing risk composition, realignment of incentives, and changing objective function hypotheses. We do not report regression results including several additional variables that are generally insignificant, both economically and statistically.

In the first row of Table 8, we use ten explanatory variables: a tech stock dummy, the logarithm of (1 + age), a pure primary offering dummy, share overhang, the logarithm of market-to-sales, a prestigious underwriter dummy variable, a dummy variable for IPOs from 1990-1998, a dummy variable for IPOs from 1999-2000, and interactions between the prestigious underwriter dummy and the time period dummies.[11, 12] In row 5, we add negative offer price revision and positive offer price revision variables, which take on the value of 100%x(offer price – midpoint of the original file price range)/midpoint or zero when the offer price is above or below, respectively, the midpoint of the original file price range; the lagged 15-trading day return on the Nasdaq Composite index; and interaction terms.

[11] Firms with trailing sales of zero are assigned a sales value of $10,000. Market value of equity is computed using the offer price multiplied by the post-issue number of shares outstanding, as reported by CRSP for IPOs with a single class of stock. For IPOs with multiple classes of stock outstanding (where typically only one class is covered by CRSP), we include all classes of stock, as described in Appendix 2, and use the price per share of the traded class. Age is expressed in years, and represents the number of years between founding and the IPO. Tech stocks include both technology stocks and internet stocks.

[12] Our regression specification ignores the endogeneity of several variables. For example, firms anticipating a high first-day return may choose to sell only a small fraction of the firm in the IPO, resulting in a high share overhang. See Habib and Ljungqvist (2001) and Lowry and Shu (2002) for a discussion of endogeneity issues in the context of IPO underpricing regressions. Furthermore, the t-statistics in our regressions are undoubtedly overstated because of the violation of the independence assumption for the residuals caused by high-frequency commonalities in first-day returns ("hot issue" markets).

$$\text{First-Day Return}_i = a_0 + a_1\text{Tech Dummy}_i + a_2\ln(1 + \text{Age})_i + a_3\text{Pure Primary Dummy}_i + a_4\text{Overhang}_i + a_5\ln(\text{Mkt/Sales})_i + a_6\text{Prestigious Underwriter Dummy}_i + a_7\text{Prestigious Underwriter Dummy}_i * \text{Nineties Dummy}_i + a_8\text{Prestigious Underwriter Dummy}_i * \text{Bubble Dummy}_i + a_9\text{Lagged Nasdaq Return}_i + a_{10}\text{Negative Price Revision}_i + a_{11}\text{Positive Price Revision}_i + a_{12}\text{Positive Price Revision} * \text{Nineties Dummy}_i + a_{13}\text{Positive Price Revision} * \text{Bubble Dummy}_i + a_{14}\text{Nineties Dummy}_i + a_{15}\text{Bubble Dummy}_i + e_i$$

In Table 8, the tech stock dummy and ln(1+age) measure changing risk composition. The pure primary dummy variable is a measure of the realignment of incentives. The realignment of incentives hypothesis predicts a positive coefficient on the pure primary dummy variable. The interactions of the prestigious underwriter dummy with time period dummies measure changes in the willingness of decision-makers to accept greater underpricing from prestigious underwriters, as predicted by the changing issuer objective function hypothesis.

Several variables capture the predictions of multiple hypotheses. For example, the valuation uncertainty component of the changing risk composition hypothesis predicts a positive coefficient on ln(market value/sales) if there is more risk associated with firms priced at a high multiple. The changing issuer objective function hypothesis makes the same prediction because analyst coverage is more important for firms with high multiples. It is also likely that the executives are wealthier when the firm is valued at a high multiple, so a positive coefficient is consistent with the realignment of incentives hypothesis due to a wealth effect. All three hypotheses are consistent with a positive coefficient on overhang, because the opportunity cost of underpricing is less the smaller is the fraction of the firm sold (and thus the larger the overhang) and small proportionate offerings are associated with high valuations.

Recall that the average first-day return increased from 7.4% in the 1980s to 14.8% in the 1990s to 65.0% during the internet bubble. We seek to explain the increase of 7.4% from the 1980s to the 1990s, and the increase of 57.6% from the 1980s to the internet bubble period. In Table 8, the row 1 coefficient on the nineties dummy of 6.12, or 6.1%, suggests that little of the increase in underpricing from the 1980s to the 1990s has been explained. The coefficient on the bubble dummy variable of 16.60 implies that most of the 57.6% difference in underpricing between the eighties and the internet bubble period is accounted for. By far the most economically important explanatory variable in the row 1 regression is the interaction of the prestigious underwriter dummy with the bubble period dummy. The coefficient of 36.01 implies that IPOs underwritten by prestigious underwriters had first day returns that were higher by

52.6% (36.01 plus the 16.60 bubble dummy coefficient) relative to the 1980s, whereas IPOs underwritten by nonprestigious underwriters saw an increase of only 16.6%, *ceteris paribus*. This increase in underpricing associated with prestigious underwriters is consistent with the changing issuer objective function, as is the increasing market share of prestigious underwriters reported in Table 8. Issuers increasingly hired prestigious underwriters, who charged for their services by leaving more money on the table. As we have argued, the decision-makers at issuing firms were willing to pay this price because of the side payments and positive analyst coverage that they received.

Inspection of the subperiod results in rows 2-4 of Table 8 shows that the parameter estimates on the tech stock dummy, the prestigious underwriter dummy, share overhang, and the pure primary dummy have changed over time. This nonstationarity suggests that the increase in underpricing over time is not entirely attributable to just an increase in the fraction of IPOs that are from riskier companies or a realignment of incentives, unless, for example, omitted variable bias has different effects in different subperiods. The coefficients are generally consistent with the univariate results reported in our earlier tables. The insignificant or significantly negative coefficients on the pure primary dummy in the non-bubble subperiods cast doubt on Ljungqvist and Wilhelm's (2003) interpretation that a realignment of incentives accounts for a large part of the increase in underpricing during the bubble period.

In row 5, we add explanatory variables measuring revisions in the final offer price relative to the midpoint of the original file price range. Specifically, we add a negative price revision variable, defined as the minimum of zero or the percentage decrease in the final offer price from the original file price range midpoint, and a positive price revision variable, defined as the maximum of zero or the percentage increase in the final offer price from the original file price range midpoint. We also interact these variables with the time period dummy variables. Also included is the lagged 15-trading day return on the Nasdaq Composite index, since prior studies have shown that first-day returns can be predicted on the basis of prior market movements (Hanley (1993), Loughran and Ritter (2002), and Lowry and Schwert (2002b)).

The inclusion of these variables dramatically boosts the R^2 in the pooled row 5 regression and the subperiod regressions in rows 6-8, relative to the results reported in rows 1-4. The strong positive coefficients on the interactions of the positive revision with the nineties and bubble dummies shows that the relation has been very nonstationary, consistent with the changing issuer

objective function hypothesis. The significant positive coefficient in all subperiods on the lagged 15-day Nasdaq return variable shows that there is partial adjustment to public information, consistent with Loughran and Ritter's (2002) prospect theory explanation of underpricing.

In row 5, the coefficient on the nineties dummy falls to 4.22 (4.2%), indicating that we are able to explain only a portion of the unconditional difference in underpricing between the 1980s and 1990s of 7.4%. Most importantly, the coefficient on the bubble dummy falls to an economically and statistically insignificant 1.73 (1.7%). Since the unconditional difference in underpricing between the 1980s and the bubble period is 57.6%, the row 5 regression is able to account for essentially all of the extra underpricing associated with the bubble period.[13]

In Table 9, we decompose the change in underpricing over time. Using the coefficients in row 5 of Table 8, we multiply the coefficients by the change in the sample characteristics. Specifically, the changing risk composition hypothesis is associated with the changing percentage of tech stocks and changes in the age of firms going public. The realignment of incentives hypothesis is associated with the changing frequency of pure primary offerings. The changing issuer objective function hypothesis is associated with the increasing use of prestigious underwriters. Several other variables are consistent with all three hypotheses or are ambiguous to classify.

Table 9 shows that the changing risk composition and realignment of incentives hypotheses are relatively unsuccessful in explaining the change in underpricing over time. Instead, the changing issuer objective function hypothesis has the most support of these three hypotheses, due to the increased underpricing associated with IPOs from prestigious underwriters. Most of the changes in underpricing, however, are associated with variables that are consistent with all three hypotheses.

Two caveats are worth noting. First, we are testing the joint hypotheses of our three explanations for underpricing and the proxy variables used. Most of the variables that we examine are fairly crude proxies that are subject to multiple interpretations. Second, the most important variables in the row 5 regression are the offer price revision upgrade and especially its interaction with the bubble dummy. These findings are similar to those of Ljungqvist and

[13] Generally, the qualitative conclusions for our Table 8 regressions do not differ depending on the data source, although our larger and more accurate dataset produces higher t-statistics compared to one downloaded from Thomson Financial without further corrections or augmentation.

Wilhelm (2003) and Lowry and Schwert (2002a, 2002b). As we document in Table 2, during the 1980s the difference in first-day returns between IPOs with the offer price revised up to above the original file price range versus other IPOs was 15.0% (20.5% - 5.5%). During the bubble period, this difference increased to 99.3% (119.0% - 20.6%). The high level of underpricing for these IPOs during the bubble period does not fit neatly into any of the three hypotheses.

7. Alternative Explanations for the Underpricing of Internet Stocks

Many alternative explanations have been given for the severe underpricing of IPOs during the internet bubble.[14] One view is that many issuers were more concerned with what the market price would be when the lockup expired than with what the offer price was. Developing this idea, Aggarwal, Krigman, and Womack (2002) argue that severe underpricing generates "information momentum," resulting in a higher market price at the time that the lockup period expires, when insiders sell some of their shares. While this may be true, it is not clear that the benefits to the issuing firm exceed the opportunity cost associated with the increased dilution from underpricing the IPO. Nevertheless, we are comfortable with the notion that during the internet bubble issuers placed a lower weight on IPO proceeds and a higher weight on the proceeds from future insider sales and follow-on offerings than they did in prior periods.

During the internet bubble, there were widespread concerns about the valuation of internet stocks. One explanation for the severe underpricing of internet IPOs is that underwriters were unwilling to price the stocks at the level that the market was willing to pay out of concern about lawsuits and a tarnished reputation if and when the stocks eventually dropped in price. The argument is that unsophisticated day traders and others were bidding up the price to unjustified levels, and the underwriters were unwilling to price the IPOs at the market price determined by "noise traders." A variant of the argument is that in many cases day trader demand boosted the share price no matter what the offer price was.

While there may be some truth to these stories, we are skeptical that underwriters were resisting higher offer prices merely out of concern that the market prices were hard to justify. Loughran and Ritter (2002) partition IPOs from 1990-1998 on the basis of revisions in the offer

[14] Demers and Lewellen (2003), DuCharme, Rajgopal, and Sefcik (2001), Ofek and Richardson (2003), and Schultz and Zaman (2001), among others, examine various hypotheses for the high underpricing of U.S. internet stocks. Arosio, Giudici, and Paleari (2001) present evidence for the severe underpricing of European internet stocks.

price. If underwriters were "leaning against the wind," then the high returns associated with upward revisions should be transitory. They find no evidence that IPOs where the offer price was revised up are associated with unexpectedly poor market-adjusted returns, measured from the first-day close, during the following three years. Also inconsistent with the leaning against the wind hypothesis, Lowry (2002) finds no statistical linkage between first-day returns and subsequent three-year stock performance for IPOs during 1973-1996.

In unreported results, we do not find a negative relation between first-day returns and subsequent performance in either the 1980s or the 1990s, but we do find reversals during the internet bubble. Of the 19 IPOs with a first-day return of more than 300% during the internet bubble, the average buy-and-hold return from the first closing price until the end of October, 2002 is –95.5%. Measured from the first closing price to 180 calendar days later, the average return was –46.8%.[15] This is consistent with leaning against the wind. This is also consistent with a more sinister explanation, however. Throughout this paper, as is typical in the academic IPO literature, we take the first closing market price as exogenous. In an April 25, 2002 *Wall Street Journal* article, Smith and Pulliam state that "... the Securities and Exchange Commission is examining whether some securities firms coerced investors who got hot IPO shares into placing orders for the same stocks at higher prices on the first day of trading, as a condition of getting the IPOs. That practice, known as 'laddering,' contributed to the huge one-day run-ups in many IPOs during the tech-stock mania. The SEC's laddering probe has focused on firms including Goldman Sachs Group Inc., Morgan Stanley, Robertson Stephens and J.P Morgan Chase."

Investors would be willing to buy these additional shares in the aftermarket if the profits from the sum of the IPO allocation they received and the aftermarket purchases are positive. The profits for the investor would be calculated using a weighted average of the purchase price (shares allocated at the offer price plus additional shares purchased in the aftermarket at inflated prices) and the actual sales price at a point later than the first day. In many cases the sales price would be the closing market price on the day that the quiet period ends, which is when the underwriters' analysts initiate coverage, almost always with "buy" ratings. Thus, tainted analyst

[15] The book-runners (with partial credit given for joint book-runners) on these 19 IPOs were SG Cowen for 1, CSFB for 3, Deutsche Bank for 1.5, Donaldson Lufkin Jenrette for 0.5, Goldman Sachs for 1.5, Merrill Lynch for 2, Morgan Stanley for 8.5, and Robertson Stephens for 1.

recommendations, which unsuspecting individual investors paid attention to, allow an exit at an inflated price.

The reason that laddering would contribute to a negative correlation between first-day returns and long-run returns is that the extra buying pressure on the first day from these purchase orders would result in subsequent selling pressure when these shares are sold. Unless the market price is unaffected by buying and selling pressure, there will be price impacts. The evidence of stock price effects for analyst initiations at the end of the quiet period (Bradley, Jordan, and Ritter (2003) and Ofek and Richardson (2003)) and at the end of the lockup period (Bradley, Jordan, Roten, and Yi (2001), Brav and Gompers (2002), and Field and Hanka (2001)) suggests that such effects are present for IPOs.

More importantly, if underwriters were concerned that the market prices on internet stocks were too high, presumably their analyst recommendations once the quiet period ends would have been bearish. Bradley, Jordan, and Ritter (2003) find that this was in fact not the case.

8. Conclusions

Why has underpricing changed over time? This paper presents three non-mutually exclusive explanations: the changing risk composition hypothesis, the realignment of incentives hypothesis, and the changing issuer objective function hypothesis.

A small part of the increase in underpricing can be attributed to the changing risk composition of the universe of firms going public. Measures of the physical riskiness of firms going public, as measured by age and industry composition, are not associated with large differences in first-day returns during the 1980s. Because valuations increased substantially during our sample period, for any given physical characteristics, valuation uncertainty increased. The cross-sectional relation between a measure of valuation, ln(market/sales), and first-day returns does not show enough sensitivity, however, to explain the magnitude of the increase in underpricing that we observe. Thus, a stationary risk-return relation combined with a change in the risk composition of firms going public can account for only limited changes in underpricing.

The realignment of incentives hypothesis argues that managerial incentives to reduce underpricing have decreased over time because of, among other reasons, reduced CEO ownership and a higher fraction of IPOs with no secondary shares. The cross-sectional relations

for the whole sample period between underpricing and both the fraction of the firm sold (as measured by share overhang) and a dummy variable for whether the offer encompassed primary shares only are too weak, however, to explain large changes. Furthermore, when we calculate the approximate number of shares retained by the median CEO, we find that this was higher in the bubble period than earlier, suggesting that this incentive to bargain for a higher offer price may have gone in the wrong direction to explain the severe underpricing during the internet bubble. Thus, the realignment of incentives hypothesis is at best an incomplete explanation of the changes in underpricing over time.

The changing issuer objective function hypothesis asserts that there are several reasons why issuers have become more complacent about underpricing over time. First, the analyst lust hypothesis states that analyst coverage has become a more important factor for issuers when choosing a lead underwriter. Since underwriters do not charge explicit fees for providing analyst coverage, issuers pay via the indirect cost of underpricing. Second, the corruption hypothesis argues that venture capitalists and the executives of issuing firms have been co-opted through the setting up of personal brokerage accounts to which hot IPO shares are allocated. This gives these decision-makers an incentive to choose a lead underwriter with a reputation for leaving money on the table in IPOs. Although the excessive dilution that results from underpricing their own IPO lowers their wealth, these decision-makers gain on personal account when other hot IPOs are allocated to them. Since the profits from these other IPOs are imperfectly correlated with their undiversified paper wealth from their own company, the decision-makers are willing to accept excessive underpricing when their own firm goes public.

Corruption as a motivation for underpricing has increased in importance over time for several reasons. In the 1980s, relatively little money was left on the table in IPOs because valuations were low and analyst coverage was not perceived to be as important as it became in the 1990s. When there were few hot IPOs to hand out, IPOs were not a good currency to use to influence decision-makers. As IPO underpricing increased in the 1990s, however, the ability to use hot IPOs to reward decision-makers resulted in the decision-makers seeking out underwriters with reputations for leaving money on the table, rather than avoiding these underwriters.

This paper also documents patterns in the U.S. IPO market. The universe of companies going public in the U.S. has changed over time. For example, we document that there has been a pronounced shift towards technology stocks and firms with negative earnings. How firms are

brought public has changed over time, too. The market share of the prestigious national underwriters has increased, with regional investment banking firms increasingly shut out of lead underwriter positions. First-day trading volume increased over time, roughly doubling from the 1980s to the 1990s, and roughly doubling again during the internet bubble period.

Evidence that in recent years underpricing has not been merely equilibrium compensation to investors for providing information or for adverse selection problems is contained in recent regulatory actions. In particular, the January 22, 2002 SEC and NASD settlement with CSFB includes statements that the firm allocated IPOs in 1999 and 2000 to hedge funds in return for trades whose sole purpose was to generate commissions for CSFB, with details on the number of shares allocated and the amount of commissions received. The profits that CSFB made on this trading activity allowed CSFB to capture some of the money left on the table in IPOs.

The reasons that IPOs are underpriced varies depending upon the environment. In the 1980s, it is conceivable that the winner's curse problem and dynamic information acquisition were the main explanations for underpricing that averaged 7% in the U.S. During the internet bubble, we claim that these were *not* the main reasons for underpricing. Instead, we argue that other considerations (i.e., analyst coverage and side payments to CEOs and venture capitalists) increased in importance.

References

Aggarwal, Rajesh, Laurie Krigman, Kent Womack (2002) "Strategic IPO underpricing, information momentum, and lockup expiration selling," *Journal of Financial Economics* 66, 105-137.

Aggarwal, Reena (2003) "Allocation of initial public offerings and flipping activity," *Journal of Financial Economics,* forthcoming.

Arosio, R., G. Giudici, and S. Paleari (2001) "Why do (or did?) internet-stock IPOs leave so much money on the table?" unpublished Politecnico di Milano (Italy) working paper.

Baron, David (1982) "A model of the demand of investment banking advising and distribution services for new issues" *Journal of Finance* 37, 955-976.

Barry, Chris (1989) "Initial public offerings underpricing: The issuer's view—A comment" *Journal of Finance* 44, 1099-1103.

Beatty, Randolph P., and Ivo Welch (1996) "Issuer expenses and legal liability in initial public offerings," *Journal of Law and Economics* 39, 545-602.

Benveniste, Lawrence M., and William J. Wilhelm (1997) "Initial public offerings: Going by the book," *Journal of Applied Corporate Finance* 10 (Spring), 98-108.

Bradley, Daniel and Brad Jordan (2002) "Partial adjustment to public information and IPO underpricing," *Journal of Financial and Quantitative Analysis* 37, forthcoming.

Bradley, Daniel, Brad Jordan, and Jay R. Ritter (2003) "The quiet period goes out with a bang," *Journal of Finance* 58, forthcoming.

Bradley, Daniel J., Bradford D. Jordan, Ivan C. Roten, and Ha-Chin Yi (2001) "Venture capital and IPO lockup expiration: An empirical analysis," *Journal of Financial Research* 24, 465-494.

Brav, Alon, and Paul Gompers (2002) "The role of lock-ups in initial public offerings," *Review of Financial Studies*, forthcoming.

Busse, Jeffrey A., and T. Clifton Green (2002) "Market efficiency in real time," *Journal of Financial Economics* 65, 413-437.

Campbell, John Y., Martin Lettau, Burton G. Malkiel, and Yexiao Xu (2001) "Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk," *Journal of Finance* 56, 1-43.

Carter, Richard B., and Steven Manaster (1990) "Initial public offerings and underwriter reputation," *Journal of Finance* 45, 1045-1068.

Carter, Richard B., Frederick H. Dark, and Ajai K. Singh (1998) "Underwriter reputation, initial returns, and the long-run performance of IPO stocks," *Journal of Finance* 53, 285-311.

Cooney, John W., Ajai K. Singh, Richard B. Carter, and Frederick H. Dark (2001) "IPO initial returns and underwriter reputation: Has the inverse relationship flipped in the 1900s?" unpublished University of Kentucky, Case Western Reserve, and Iowa State working paper.

Demers, Elizabeth, and Katharina Lewellen (2003) "The marketing role of IPOs: Evidence from internet stock sales," *Journal of Financial Economics*, forthcoming.

DuCharme, Larry L., Shivaram Rajgopal, and Stephan E. Sefcik (2001) "Why was internet IPO underpricing so severe?" unpublished University of Washington working paper.

Dunbar, Craig G. (2000) "Factors affecting investment bank initial public offering market share," *Journal of Financial Economics* 55, 3-41.

Elkind, Peter, and Mark Gimein (2001) "The trouble with Frank," *Fortune* (September 3, 2001).

Ellis, Katrina, Roni Michaely, and Maureen O'Hara (2000) "When the underwriter is the market maker: An examination of trading in the IPO aftermarket," *Journal of Finance* 55, 1039-1074.

Field, Laura C., and Gordon Hanka (2001) "The Expiration of IPO Share Lockups," *Journal of Finance* 56, 471-500.

Field, Laura C., Wayne Mikkelson, and Megan Partch (2002) "The consequences of going public early," unpublished Penn State and University of Oregon working paper.

Foerster, Bruce (2000) Securities Industry Association's *Capital Markets Handbook* (2nd edition) Aspen, CO: Aspen Publishers.

Grinblatt, Mark, and Chuan-Yuan Hwang (1989) "Signalling and the pricing of new issues," *Journal of Finance* 44, 393-420.

Habib, M., and A. Ljungqvist (2001) "Underpricing and entrepreneurial wealth losses: Theory and evidence," *Review of Financial Studies* 14, 433-458.

Hanley, K. W. (1993) "Underpricing of initial public offerings and the partial adjustment phenomenon," *Journal of Financial Economics* 34, 231-250.

Krigman, L., W. Shaw, and K. Womack (1999) "The persistence of IPO mispricing and the predictive power of flipping," *Journal of Finance* 54, 1015-1044.

Krigman, L., W. Shaw, and K. Womack (2001) "Why do firms switch underwriters?" *Journal of Financial Economics* 60, 245-284.

Leland, Hayne, and David Pyle (1977) "Informational asymmetries, financial structure, and financial intermediation," *Journal of Finance* 32, 371-387.

Ljungqvist, Alexander P., and William J. Wilhelm (2003) "IPO pricing in the dot-com bubble," *Journal of Finance*, forthcoming.

Logue, D., Rogalski, R., Seward, J., and Foster-Johnson, L. (2002) "What is special about the roles of underwriter reputation and market activities in initial public offerings?" *Journal of Business*, 75, 213-243.

Loughran, Tim, and Jay R. Ritter (2002) " Why don't issuers get upset about leaving money on the table in IPOs?" *Review of Financial Studies* 15, 413-443.

Lowry, Michelle (2003) "Why does IPO volume fluctuate so much?" *Journal of Financial Economics*, forthcoming.

Lowry, Michelle, and G. William Schwert (2002a) "IPO market cycles: Bubbles or sequential learning?" *Journal of Finance* 57, 1171-1200.

Lowry, Michelle, and G. William Schwert (2002b) "Is the IPO pricing process efficient?" unpublished Penn State and University of Rochester working paper.

Lowry, Michelle, and Susan Shu (2002) "Litigation risk and IPO underpricing" *Journal of Financial Economics* 65, 309-335.

Muscarella, Chris, and Michael Vetsuypens (1990) "Firm age, uncertainty, and IPO underpricing: Some new empirical evidence," unpublished Southern Methodist University working paper.

NASD Regulation (2002) "NASD Regulation charges Credit Suisse First Boston with siphoning tens of millions of dollars of customers' profits in exchange for "hot" IPO shares," January 22, 2002 news release available at http://www.nasdr.com/news.

New York Stock Exchange (2001) *Fact Book*, New York: New York Stock Exchange.

Ofek, Eli, and Matthew Richardson (2003) "Dotcom mania: The rise and fall of internet stock prices," *Journal of Finance* 58, forthcoming.

Ritter, Jay R. (1984a) "The 'hot issue' market of 1980" *Journal of Business* 57, 215-240.

Ritter, Jay R. (1984b) "Signalling and the valuation of unseasoned new issues: A comment" *Journal of Finance* 39, 1231-1237.

Ritter, Jay R., and Ivo Welch (2002) "A review of IPO activity, pricing, and allocations," *Journal of Finance* 57, 1795-1828.

Rynecki, David (2002) "Rebuild the Chinese wall," *Fortune* (June 24, 2002).

Schack, Justin (2002) "Promises, Promises," *Institutional Investor* (Oct. 2002) 39-45.

Schultz, Paul, and Mir Zaman (2001) "Do the individuals closest to internet firms believe they are overvalued?" *Journal of Financial Economics* 59, 347-381.

Securities and Exchange Commission (2002) "SEC sues CSFB for IPO violations; CSFB will pay $100 million," Litigation release 17327 available at http://www.sec.gov/litigation.

Sherburne, Jane C. "Letter to the Honorable Michael G. Oxley," available at http://financialservices.house.gov/media/pdf/citiresp2_001.pdf.

Sherman, Ann (2000) "IPOs and long-term relationships: An advantage of bookbuilding," *Review of Financial Studies* 13, 697-714.

Sherman, Ann E., and Sheridan Titman (2002) "Building the IPO order book: Underpricing and participation limits with costly information," *Journal of Financial Economics* 65, 3-29.

Siconolfi, Michael (1997a) "Underwriters set aside IPO stock for officials of potential customers," November 12, 1997 *Wall Street Journal*, p. A1.

Siconolfi, Michael (1997b) "SEC broadens 'spinning' probe to corporations," December 24, 1997 *Wall Street Journal*, p. A1.

Smart, Scott, and Chad J. Zutter (2003) "Control as a motivation for underpricing: A comparison of dual- and single-class IPOs," *Journal of Financial Economics*, forthcoming.

Smith, Randall, and Susan Pulliam (2002a) "Two more Wall Street firms are targeted in trading probe," April 25, 2002 *Wall Street Journal*, p. A1.

Smith, Randall, and Susan Pulliam (2002b) "How a technology-banking star doled out shares of hot IPOs," September 23, 2002 *Wall Street Journal*, p. A1.

Smith, Randall (2002) "Goldman gave hot IPO shares to top executives of its clients," October 3, 2002 *Wall Street Journal*, p. A1.

Smith, Randall, Ann Grimes, Gregory Zuckerman, and Kara Scannell (2002) "Something ventured and something gained?" October 17, 2002 *Wall Street Journal*, p. C1.

White, Hal (1980) "A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity," *Econometrica* 48, 817-838.

Appendix 1: Founding Dates

The founding date is generally defined as the date of incorporation. An attempt has been made to make this the date of original incorporation, rather than a later date if the firm has reincorporated in Delaware or changed its name. Founding dates for 1980-1984 generally come from inspection of the prospectus. For 1985-1995, most of the founding dates have been provided by Laura Field. For 1985-1987, Moody's is the main source of data. For 1988-1992, the prospectus is the main source. For 1993-1995, Disclosure and S&P Corporate Descriptions are the main sources. For 1993, some of the founding dates have come from Renaissance Capital. For 1996-2000, founding dates have come from a variety of sources: Securities Data Co., Moody's, Dunn and Bradstreet's *Million Dollar Directory*, inspection of the prospectuses on Edgar, etc. and have been collected primarily by Laura Field (Field, Mikkelson, and Partch (2002)) and Li-Anne Woo. Some founding dates for 1999-2000 are from Thomson Financial's *The IPO Reporter*, an industry newsletter. According to Laura Field, for 1988-1992, the founding date is earlier than the date of the most recent incorporation for 48% of the firms. An example of this is from the April 2000 prospectus of Krispy Kreme doughnuts. The firm going public was incorporated in 1999, but the predecessor corporation was incorporated in 1982. Elsewhere in the prospectus, however, one finds the statement that their first doughnut shop was opened in 1937. We would use 1937 as the founding date.

For 1996-2000, we have used some of the founding dates that Alexander Ljungqvist and William Wilhelm have tabulated for their paper (Ljungqvist and Wilhelm (2003)). They inspected the prospectuses and made judgments on many spinoffs.

Firms with inflation-adjusted (2000 purchasing power) sales in the last twelve months prior to going public of $200 million or more and less than 2 years of age are frequently "reverse LBOs" or divisional spinoffs. For spinoffs, the founding date of the division is used, when possible. This may be the founding date of the parent corporation. For example, Lucent Technologies (a 1996 IPO) is the former Bell Labs division of AT&T. Its founding date is given as the founding date of Bell Labs. In general, "roll-ups" are given a founding date corresponding to the founding date of the parent firm (frequently a year before the IPO).

Age is defined as the calendar year of offering minus the calendar year of founding. Thus, a 2-year old firm may be anywhere from 13 months old to 35 months old.

Because some years (1980-1984,1988-1993, and 2000) have founding dates that are primarily from the prospectus, rather than dates of incorporation from Moody's et al, some of the variation over time may be due to using different data sources.

Appendix 2: Dual-class Shares

Of the 6,169 IPOs in our sample, 408 are identified as having multiple classes of shares outstanding after the IPO. Most of these are firms where the IPO is composed of Class A shares. Class B shares with superior voting rights are owned by pre-issue shareholders, and are not publicly traded. For computing the market capitalization, these firms present a problem. CRSP only reports the shares outstanding for share classes that are publicly traded on Nasdaq, the Amex, or the NYSE. Thus, if one uses the CRSP-reported shares outstanding to compute the market capitalization, only part of the market value is captured. To take an extreme example, the United Parcel Services IPO of November 9, 1999 issued 109,400,000 shares of Class A stock, but 1,093,832,427 shares of Class B stock also existed. Using only the Class A shares outstanding would underestimate the market value by 91%. The December 9, 1998 IPO of Infinity Broadcasting is another example. 140,000,000 Class A shares were issued. CRSP reports this as the number of shares outstanding. But there were also 700,000,000 Class B shares outstanding, giving a market cap six times as big when all of the shares are included. In all of our calculations of market capitalization, we assume that non-traded shares have the same price per share as the publicly traded class.

Unfortunately, Thomson Financial Securities Data has many errors in reporting the number of post-issue shares outstanding, although they attempt to capture all classes. For single-class IPOs, CRSP is much more reliable. For dual-class IPOs, Thomson Financial is more reliable. Ljungqvist and Wilhelm (2003), in their analysis of IPOs from 1996-2000, also report substantial error rates in Thomson Financial's data on post-issue shares outstanding, EPS, venture-capital backing, founding dates, etc.

If we use just the CRSP-reported shares outstanding, the median market cap figure that we calculate is 4% lower than the Table 1, Panel B numbers that we report. The mean market cap using CRSP data is 17% lower than the numbers reported in Table 1, Panel A.

Scott Smart and Chad Zutter (2003) have supplied us with a list of 258 dual-class IPOs from 1990-1998, along with the post-issue shares outstanding. CRSP does not identify all of the IPOs that involve dual-class shares that Smart and Zutter identify. The post-issue shares outstanding number that Smart and Zutter have recorded is the same as the Thomson Financial number only a little over 50% of the time. For discrepancies where we could check the prospectus using EDGAR (beginning in 1996), we found that Smart and Zutter were correct 90% of the time. For dual-class IPOs where we could not verify the number, we use the Smart and Zutter number as the first choice and the maximum of the Thomson Financial and the CRSP number as the second choice. We use Dealogic's number if we cannot inspect the prospectus on EDGAR.

Appendix 3: Underwriter Rank for IPOs from 1992-2000

For underwriter prestige rankings, we have started with the Carter and Manaster (1990) and Carter, Dark, and Singh (1998) rankings. When a firm goes public, the underwriting section of the prospectus lists all of the investment banking firms that are part of the underwriting syndicate, along with the number of shares that each underwrites. More prestigious underwriters are listed higher in the underwriting section, in brackets, with the underwriters in higher brackets underwriting more shares. If an underwriter always appears in the highest bracket, it is assigned the top ranking of 9 on a 0-9 scale.

For underwriters in the 1992-2000 period, we have assigned a ranking based on the following: The May 1999 Goldman Sachs prospectus lists over 120 underwriters, with numerous brackets. Managing and co-managing underwriters are assigned a ranking of 9, with other underwriters given a ranking based on the bracket they are in, with a few minor adjustments made by the authors. For other underwriters that are not included in the Goldman Sachs prospectus, we assign a ranking of 1 or 2 if they were penny stock underwriters that had been subject to enforcement actions by the SEC during 1995-1999 (the information on enforcement actions was provided by the Chicago office of the SEC's Division of Enforcement). The numerical reputation ranking of remaining underwriters was determined by Bruce Foerster of South Beach Capital in Miami. Foerster has been an investment banker for close to thirty years, participating in the underwriting of 150 IPOs and hundreds of other transactions while a managing director at A.G. Becker Paribas, Paine Webber, Lehman Brothers, and South Beach Capital. He is also the editor of the Securities Industry Association's *Capital Markets Handbook* (Foerster (2000)), and has an encyclopedia's knowledge of the investment banking industry during the last few decades. For the handful of other underwriters that Bruce Foerster was not familiar with and that were not identified from our other procedures, we assigned a rank based upon the offer price of IPOs that they underwrote, with penny stocks getting the lowest ranks.

We have made several alterations to the Carter and Manaster rankings for 1980-1984 and the Carter, Dark, and Singh rankings for 1985-1991. Carter, Dark, and Singh assign Hambrecht & Quist a 9.0, which we have lowered to 8.1. Carter and Manaster assign a rank of 2.0 to D.H. Blair in the 1980-1984 period, and Carter, Dark, and Singh assign a rank of 8.0 to D.H. Blair during 1985-1991. We assign a 4.1 to D.H. Blair for all years. A potential flaw with the Carter and Manaster methodology is that a penny stock underwriter that is never allowed into a syndicate of reputable underwriters might never be in a low bracket. Our judgment methodology avoids this problem. It should be noted, however, that relatively few major changes in rankings are present. All of the rankings that we have assigned are integers followed by a 0.1 (1.1 up to 9.1). The purpose of attaching a 0.1 to all of our rankings is so that other researchers can easily distinguish between our rankings and those from Carter and Manaster and Carter, Dark, and Singh, which never end with a 0.1.

In 2000, our prestigious underwriter list is composed of ABN Amro, Banc of America Securities, BancBoston Robertson Stephens, Bear Stearns, CIBC, Credit Suisse First Boston, Chase H&Q, Deutsche Banc Alex Brown, Donaldson Lufkin Jenrette, Goldman Sachs, JP Morgan, Lehman Brothers, Merrill Lynch, Morgan Stanley, PaineWebber, Salomon Smith Barney, Thomas Weisel Partners LLC, and UBS Warburg.

Appendix 4: Internet and Technology Firms

To identify IPOs that are internet-related at the time of their offer, we merge the internet identifications of Thomson Financial Securities Data, Dealogic, and IPOMonitor.com. In 1998, Securities Data classified only 18 IPOs as internet stocks, omitting such firms as uBID, Ticketmaster Online/Citysearch, NetGravity, and Verio. IPOMonitor.com classified 27 IPOs from 1998 as internet stocks, but omitted Cdnow and Interactive Magic, among others. Since these sources generally did not backdate the identification of early internet companies, we also have assigned a "1" value to America On-Line, Spyglass, and Netscape. The classifications have some inherent arbitrariness. For example, Storage Area Network (SAN) companies and telecommunications companies are not internet stocks, nor are such IPOs as VA Linux and Perot Systems.

Tech stocks are defined as those in SIC codes 3571, 3572, 3575, 3577, 3578 (computer hardware), 3661, 3663, 3669 (communications equipment), 3674 (electronics), 3812 (navigation equipment), 3823, 3825, 3826, 3827, 3829 (measuring and controlling devices), 3841, 3845 (medical instruments), 4812, 4813 (telephone equipment), 4899 (communications services), and 7370, 7371, 7372, 7373, 7374, 7375, 7378, and 7379 (software).

Table 1
Number of IPOs, First Day Returns, Number of Managing Underwriters, Amount of Money Left on the Table, Valuation Levels, and Sales by Cohort Year

IPOs with an offer price below $5.00 per share, unit offers, REITs, closed-end funds, banks and S&Ls, ADRs, and IPOs not listed on CRSP within six months of issuing have been excluded. Data are from Thomson Financial Securities Data, with supplements from Dealogic and other sources, and corrections by authors. The first-day return is defined as the percentage change from the offer price to the closing price. The number of domestic managers includes both lead underwriters and co-managers. Money on the table is defined as the first-day price change (offer price to close) times the number of shares issued (global offering amount, excluding overallotment options). Both valuation calculations use the post-issue number of shares outstanding. Valuations are computed by multiplying either the offer price times the post-issue shares outstanding or the first closing market price times the post-issue shares outstanding. Sales are for the last twelve months prior to going public, as reported in the prospectus. The mean and median sales are computed for the 6,086 firms for which a sales number is available. All dollar values are in dollars of 2000 purchasing power using the Consumer Price Index.

Panel A: Means

				Millions of dollars of 2000 purchasing power			
					Post-issue valuation		
Year	Number of IPOs	First-day return	Number of managing underwriters	Money on the Table	Offer Price	Market Price	Sales
1980	70	14.5%	1.4	$5.6	$147	$183	$78
1981	191	5.9%	1.3	$1.3	$100	$107	$54
1982	77	11.4%	1.4	$3.1	$104	$118	$38
1983	442	10.1%	1.5	$3.2	$141	$155	$86
1984	172	3.6%	1.5	$0.5	$84	$85	$79
1985	179	6.3%	1.5	$1.9	$176	$182	$189
1986	378	6.3%	1.5	$2.6	$166	$177	$156
1987	271	6.0%	1.8	$3.6	$206	$220	$233
1988	97	5.4%	1.7	$1.9	$288	$297	$283
1989	105	8.1%	1.6	$3.1	$216	$231	$227
1990	104	10.8%	1.9	$4.2	$197	$215	$350
1991	273	12.1%	2.0	$6.3	$191	$215	$206
1992	385	10.2%	2.0	$5.4	$201	$220	$205
1993	483	12.8%	2.1	$7.8	$249	$282	$244
1994	387	9.8%	2.0	$4.1	$166	$179	$189
1995	432	21.5%	2.3	$11.3	$249	$297	$196
1996	621	16.7%	2.4	$11.5	$308	$366	$149
1997	432	13.9%	2.5	$10.4	$266	$309	$167
1998	267	22.3%	2.9	$19.4	$496	$600	$305
1999	457	71.7%	3.4	$80.3	$826	$1,411	$343
2000	346	56.1%	3.7	$77.4	$900	$1,528	$253
1980-1989	1,982	7.4%	1.5	$2.6	$159	$170	$140
1990-1998	3,384	14.8%	2.3	$9.3	$260	$301	$205
1999-2000	803	65.0%	3.6	$79.0	$858	$1,461	$304
Total	6,169	18.9%	2.2	$16.2	$305	$410	$197

Panel B: Medians

Year	Number of IPOs	First-day return	Number of managing underwriters	Millions of dollars of 2000 purchasing power: Money on the Table	Post-issue valuation: Offer Price	Post-issue valuation: Market Price	Sales
1980	70	8.0%	1	$0.8	$66	$78	$44
1981	191	0.0%	1	$0.0	$63	$64	$25
1982	77	3.7%	1	$0.3	$53	$60	$19
1983	442	2.6%	1	$0.5	$76	$81	$25
1984	172	0.0%	1	$0.0	$46	$48	$35
1985	179	2.5%	1	$0.5	$62	$62	$44
1986	378	1.3%	1	$0.2	$65	$69	$44
1987	271	1.4%	2	$0.3	$78	$80	$45
1988	97	2.5%	2	$0.5	$102	$111	$88
1989	105	4.3%	2	$1.1	$94	$106	$52
1990	104	5.4%	2	$1.4	$106	$116	$52
1991	273	7.6%	2	$2.4	$111	$124	$62
1992	385	4.2%	2	$1.1	$103	$111	$51
1993	483	6.3%	2	$1.8	$98	$109	$54
1994	387	4.5%	2	$1.1	$81	$86	$43
1995	432	13.3%	2	$4.2	$118	$139	$34
1996	621	10.0%	2	$3.3	$126	$145	$31
1997	432	9.3%	2	$3.1	$119	$132	$37
1998	267	9.1%	3	$3.1	$163	$197	$41
1999	457	37.5%	3	$27.7	$321	$493	$16
2000	346	27.4%	3	$21.8	$407	$568	$11
1980-1989	1,982	1.9%	1	$0.3	$68	$72	$36
1990-1998	3,384	7.8%	2	$2.3	$113	$124	$43
1999-2000	803	32.3%	3	$25.4	$361	$525	$14
Total	6,169	6.3%	2	$1.5	$112	$122	$36

Table 2
Average First-day Returns on IPOs Categorized by Proceeds, Age, Sales, Industry, VC-backing, Share Overhang, and Underwriter Prestige

Unit offers, REITs, closed-end funds, banks and S&Ls, ADRs, IPOs with an offer price below $5.00, and IPOs not listed on CRSP within six months of the offer date have been excluded. Data are from Thomson Financial Securities Data and other sources, with corrections by the authors. The sample size is 6,169 IPOs for 1980-2000. High-prestige underwriters are those with a Carter and Manaster (1990) ranking of 8 or higher on a 9-point scale. Rankings for 1985-1991 are based upon the Carter, Dark, and Singh (1998) rankings. Rankings for 1992-2000 are by the authors of this paper. Further descriptions of how age, industry, and underwriter prestige are defined can be found in the appendices. Firms are classified by proceeds on the basis of whether the global gross proceeds are greater or less than the median issue size in the prior calendar year, with no adjustments for inflation made. Firms with trailing 12 month sales of $40 million or less (2000 purchasing power) are classified as low sales firms. Share overhang is the ratio of retained shares to the public float. Low share overhang IPOs have an overhang ratio of less than 2.333 (representing a global offer size of 30% or more of the post-issue shares outstanding, if all of the shares in the IPO are issued by the firm). The offer price is revised up if the offer price exceeds the maximum of the original file price range. The file price range is missing for 11 firms. Sales is missing for 83 firms. Age is missing for 111 firms.

	1980-1989		1990-1998		1999-2000	
Segmented by	Return	N	Return	N	Return	N
Proceeds						
Small	7.4%	878	12.1%	1,545	32.8%	233
Large	7.3%	1,104	17.0%	1,839	78.1%	570
Age						
Young (0-7 years old)	9.0%	1,003	17.1%	1,643	74.8%	539
Old (8 years and older)	5.8%	942	12.7%	1,670	45.4%	261
Sales						
Low	9.1%	1,033	18.4%	1,613	73.0%	566
High	5.2%	914	11.4%	1,726	45.9%	234
Industry						
Tech and internet-related	10.4%	521	22.7%	1,031	81.1%	576
Non-technology	6.3%	1,461	11.3%	2,353	23.9%	227
Segmented by venture capital backing						
NonVC-backed	7.1%	1,437	13.8%	1,993	38.5%	316
VC-backed	8.0%	545	16.2%	1,391	82.2%	487
Segmented by source of shares offered						
Exclusively sold by firm	7.7%	868	13.8%	1,988	69.4%	681
Including secondary shares	7.1%	1,114	16.1%	1,396	40.4%	122
Segmented by share overhang						
Low	7.8%	886	11.8%	1,836	26.1%	134
High	7.0%	1,096	18.2%	1,548	72.7%	669
Segmented by underwriter prestige						
Low-prestige	9.1%	1,119	12.9%	1,294	35.1%	151
High-prestige	5.1%	863	15.9%	2,090	71.9%	652
Segmented by whether the offer price exceeds the maximum of the file price range						
Revised up	20.5%	246	32.0%	775	119.0%	362
Not revised up	5.5%	1,725	9.6%	2,609	20.6%	441
All	7.4%	1,982	14.8%	3,384	65.0%	803

Table 3
Mean First-day Returns, Percentage of Firm Sold, and Market/Sales Ratio for IPOs Categorized by Industry, 1980-2000

Initial public offerings with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, REITs, bank and S&L IPOs, and those not listed by CRSP within six months of the offer date are excluded. An IPO is classified as an internet firm if either Thomson Financial Securities Data or IPOMonitor.com classifies the firm as an internet stock, with additional corrections by the authors. Tech firms are defined in appendix 4 (technology and internet companies, excluding biotech). Startup biotech and Mature non-tech non-biotech firms are subsets of the non-internet and technology category. Startups are defined as IPOs with an age of less than 8 years, negative trailing last twelve months earnings, and inflation adjusted annual sales for the last twelve months of less than $10 million (2000 purchasing power). Mature firms are defined as IPOs with an age of at least 20 years, positive trailing earnings, and trailing annual sales of at least $100 million (2000 purchasing power). Biotech firms have an SIC code of 2830, 2833, 2834, 2835, 2836, or 8731. The percentage of the firm sold is defined as the global number of shares sold (excluding overallotment options) divided by the post-issue number of shares outstanding. Market value is computed by using the post-issue number of shares outstanding multiplied by the offer price.

	1980-1989	1990-1998	1999-2000
Number of IPOs			
Internet and technology	521	1,031	576
Non-internet and non-technology	1,461	2,353	227
Startup biotech	37	127	29
Mature non-tech non-biotech	167	311	31
Mean first-day returns			
Internet and technology	10.4%	22.7%	81.1%
Non-internet and non-technology	6.3%	11.3%	23.9%
Startup biotech	8.0%	7.0%	39.2%
Mature non-tech non-biotech	3.8%	8.5%	16.6%
Mean percentage of firm sold			
Internet and technology	27.8%	29.5%	20.1%
Non-internet and non-technology	31.5%	35.0%	28.5%
Startup biotech	25.2%	27.7%	21.8%
Mature non-tech non-biotech	29.9%	34.9%	26.4%
Median market value/Median annual sales			
Internet and technology	3.6	4.9	32.4
Non-internet and non-technology	1.4	1.8	6.4
Startup biotech	41.6	56.9	220.2
Mature non-tech non-biotech	0.7	0.8	1.9

Table 4

Mean and Median First-day Returns, Median Age, Sales, Proceeds, Market Value, and the Percentage of Offer Prices Revised Upwards, Categorized by Share Overhang, 1980-2000

Unit offers, REITs, closed-end funds, banks and S&Ls, ADRs, and IPOs not listed on CRSP within six months of the offer date have been excluded. Data are from Thomson Financial Securities Data, Dealogic, and other sources. Annual sales, global proceeds, and market value of equity (post-issue shares outstanding multiplied by the offer price) are measured in millions of dollars of year 2000 purchasing power, using the Consumers Price Index. Share overhang is the ratio of retained shares to the public float (the shares issued in the IPO). Alternatively, overhang = (1/float) –1. Low share overhang IPOs have an overhang ratio of less than 2.333 (representing a global offer size of 30% or more of the post-issue shares outstanding, if all of the shares in the IPO are issued by the firm). The sample size is 6,169 IPOs from 1980-2000, except for age, sales, and offer price revisions, where some observations are lost due to missing information.

	1980-1989		1990-1998		1999-2000	
	Item	N	Item	N	Item	N
Share overhang						
Mean	2.98	1,982	2.56	3,384	4.58	803
Median	2.50	1,982	2.20	3,384	4.01	803
Mean first-day returns						
Low overhang	7.8%	886	11.8%	1,836	26.1%	134
High overhang	7.0%	1,096	18.2%	1,548	72.7%	669
Median first-day returns						
Low overhang	1.9%	886	6.3%	1,836	9.9%	134
High overhang	1.8%	1,096	10.0%	1,548	37.5%	669
Median age, years						
Low overhang	8 years	870	8 years	1,799	6 years	131
High overhang	7 years	1,075	7 years	1,514	5 years	669
Median sales, millions						
Low overhang	$29 m	860	$43 m	1,806	$32 m	132
High overhang	$42 m	1,087	$43 m	1,533	$13 m	668
Median proceeds, millions						
Low overhang	$16 m	886	$33 m	1,836	$71 m	134
High overhang	$21 m	1,096	$37 m	1,548	$71 m	669
Median market value, millions						
Low overhang	$40 m	886	$84 m	1,836	$177 m	134
High overhang	$99 m	1,096	$164 m	1,548	$403 m	669
Percentage of offer prices revised up						
Low overhang	11%	879	18%	1,836	30%	134
High overhang	14%	1,092	28%	1,548	48%	669

Table 5

IPO Turnover Categorized by Decade and First-Day Return, 1980-2000

IPOs with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, REITs, bank and S&L IPOs, and those with missing volume numbers on CRSP are excluded. Turnover is defined as first-day CRSP trading volume divided by number of shares issued. For NYSE and Amex-listed IPOs, the trading volume is doubled to allow more meaningful comparisons with Nasdaq-listed IPOs. If the first-day turnover is less than 0.2%, we delete the observation.

Panel A: Percentage of IPOs with Turnover Greater Than 100%

Time Period	Number of IPOs	Percentage with Turnover>100%	Percentage of IPOs on Nasdaq
1980-1989	1,705	1.6%	89%
1990-1998	3,382	23.6%	83%
1999-2000	802	74.7%	91%
Total	5,889	24.2%	87%

Panel B: Average Turnover Categorized by First-Day Returns

Return Categories	Number of IPOs	Average First-Day Returns	Average Turnover
Return $\leq$ 0%	1,692	-2.3%	44.0%
0% < Return $\leq$ 10%	1,740	4.7%	51.4%
10% < Return $\leq$ 60%	2,025	25.6%	84.7%
Return > 60%	432	135.7%	177.6%
Total	5,889	19.5%	70.0%

Panel C: Average Turnover Categorized by First-Day Returns & Decade

Return Categories	1980-1989	1990-1998	1999-2000
Return $\leq$ 0%	27.6%	48.5%	101.8%
0% < Return $\leq$ 10%	34.8%	54.5%	103.6%
10% < Return $\leq$ 60%	40.6%	87.4%	137.9%
Return > 60%	49.3%	148.4%	200.9%
Total	33.3%	69.8%	148.7%

Table 6

Median Number of Pre-issue Shares Owned by CEO, 1996-2000

The median number of pre-issue shares outstanding includes all classes of shares for firms with dual class shares. For non-dual class IPOs, the pre-issue number of shares outstanding is calculated as the CRSP-reported post-issue number of shares outstanding minus the number of primary shares issued. The median pre-issue % CEO ownership is from Ljungqvist and Wilhelm (2003, Table III). The median pre-issue number of CEO shares is computed as the product of the prior two columns. This should be viewed as an approximation to the actual median pre-issue number of CEO shares. The last column, the median CEO pre-issue market value, is in turn computed as the product of the prior two columns, and is also an approximation to the actual median. Neither the median offer price nor the median market value (median pre-issue number of CEO shares times the median offer price) is adjusted for price level changes (inflation). Inflation averaged less than three percent per year during this period.

Year	Number of IPOs	Median pre-issue number of shares	Median pre-issue % CEO ownership	Median pre-issue number of CEO shares	Median offer price	Median CEO pre-issue market value, millions
1996	621	6,957,603	10.4%	723,591	$12.00	$8.68 m
1997	432	6,878,133	12.8%	880,401	$11.75	$10.34 m
1998	267	10,073,530	11.8%	1,188,677	$12.50	$14.86 m
1999	457	17,429,200	8.0%	1,394,336	$14.00	$19.52 m
2000	346	29,324,000	5.3%	1,554,172	$14.00	$21.76 m

Table 7

Median First-day Returns, Age, Sales, EPS, Share Overhang, and Industry Representation on IPOs Categorized by Underwriter Prestige

Unit offers, REITs, closed-end funds, banks and S&Ls, ADRs, and IPOs not listed on CRSP within six months of the offer date have been excluded. Data are from Thomson Financial Securities Data, Dealogic, and other sources. High-prestige underwriters are those with a Carter and Manaster (1990) ranking of 8 or higher on a 9-point scale. Rankings for 1984 and later are based upon the Carter, Dark, and Singh (1998) rankings and updates by the authors of this paper. See Appendix 3 for details. Sales are measured in millions of dollars of year 2000 purchasing power, using the Consumers Price Index. Share overhang is the ratio of retained shares to the public float. Low share overhang IPOs have an overhang ratio of less than 2.333 (representing a global offer size of 30% or more of the post-issue shares outstanding, if all of the shares in the IPO are issued by the firm). Percentage tech is the percentage of IPOs that are classified as technology or internet-related, as defined Appendix 4. The sample size is 6,169 IPOs from 1980-2000, except for age, sales, EPS, and the offer price revision, where some observations are lost due to missing information.

	1980-1989		1990-1998		1999-2000	
	Item	N	Item	N	Item	N
Mean first-day returns						
Low prestige	9.1%	1,119	12.9%	1,294	35.1%	151
High prestige	5.1%	863	15.9%	2,090	71.9%	652
Median first-day returns						
Low prestige	2.5%	1,119	7.0%	1,294	12.2%	151
High prestige	1.2%	863	8.7%	2,090	37.5%	652
Median Age						
Low prestige	6 years	1,101	7 years	1,272	5 years	151
High prestige	9 years	844	8 years	2,041	5 years	649
Median trailing sales (millions)						
Low prestige	$20.2	1,086	$24.0	1,261	$8.5	150
High prestige	$75.0	861	$66.5	2,078	$16.1	650
Median trailing 12-month EPS						
Low prestige	$0.38	1,089	$0.26	1,273	-$0.58	151
High prestige	$0.59	855	$0.28	2,059	-$1.17	645
Median share overhang						
Low prestige	2.28	1,119	1.96	1,294	2.91	151
High prestige	2.82	863	2.45	2,090	4.31	652
Percentage with an offer price above the maximum of the file price range						
Low prestige	10%	1,119	11%	1,294	28%	151
High prestige	17%	863	30%	2,090	49%	652
Percentage tech						
Low prestige	27.7%	1,119	26.4%	1,294	68.2%	151
High prestige	24.4%	863	33.0%	2,090	72.5%	652
All	7.4%	1,982	14.8%	3,384	65.0%	803

Table 8

Regressions of Percentage First-Day Returns on a Tech Dummy, Log Age, Pure Primary Dummy, Share Overhang, Log Market/Sales, Prestigious Underwriter Dummy, Price Revision, Lagged 15-day Nasdaq Return, Time-Period Dummies, and Interaction Terms

The sample in rows 1-4 includes 5,980 U.S. operating firm IPOs from 1980-2000 where the offer price is at least $5.00 and complete data on all of the variables is available. The subperiods have, respectively, 1,913, 3,269, and 798 observations. In rows 5 and 6, 10 additional firms are excluded where the original file price range is missing. The dependent variable in all regressions is the percentage first-day return from the offer price to the first-day closing price. The Tech dummy takes a value of one (zero otherwise) if the firm was in the technology or internet business (industries are defined in Appendix 4). Ln(1 + age) is the natural log of the firm age (i.e., years since founding date) as of the IPO. Pure primary dummy equals one (zero otherwise) if the offering is a 100% pure primary (i.e., no secondary shares sold). Ln(Mkt/Sales) is the natural log of the ratio of market value (offer price multiplied by the post-issue number of shares outstanding) to trailing annual firm sales. The prestigious underwriter dummy variable equals one (zero otherwise) if the IPO's lead underwriter has a rank of 8 or above on the 0-9 Carter and Manaster (1990) scale. Share Overhang is the ratio of retained shares to the public float (the number of shares issued). Price revision is the offer price minus the midpoint scaled by the midpoint, expressed as a percentage. The lagged 15-day Nasdaq return is the compounded percentage return on the Nasdaq Composite index (excluding dividends) during the 15 trading days prior to the offer date. The Nineties dummy takes on a value of one (zero otherwise) if the IPO occurred during 1990-1998. The Bubble dummy takes on a value of one (zero otherwise) if the IPO occurred during 1999-2000. The interaction terms multiply the positive price revision and the prestigious underwriter dummy by the time period dummies. The t-statistics (in parentheses) are calculated using White's (1980) heteroskedasticity-consistent method.

$$\text{First-Day Return}_i = a_0 + a_1\text{Tech Dummy}_i + a_2\ln(1+\text{Age})_i + a_3\text{Pure Primary Dummy}_i + a_4\text{Overhang}_i + a_5\ln(\text{Mkt/Sales})_i + a_6\text{Prestigious Underwriter Dummy}_i + a_7\text{Prestigious Underwriter Dummy}_i * \text{Nineties Dummy}_i + a_8\text{Prestigious Underwriter Dummy}_i * \text{Bubble Dummy}_i + a_9\text{Lagged Nasdaq Return}_i + a_{10}\text{Negative Price Revision}_i + a_{11}\text{Positive Price Revision}_i + a_{12}\text{Positive Price Revision} * \text{Nineties Dummy}_i + a_{13}\text{Positive Price Revision} * \text{Bubble Dummy}_i + a_{14}\text{Nineties Dummy}_i + a_{15}\text{Bubble Dummy}_i + e_i$$

Period	Intercept	Tech Dummy	ln (1+age)	Pure Primary Dummy	Share Overhang	ln(Mkt/ Sales)	Prestige UW Dummy	Prestige UW Dummy * Nineties Dummy	Prestige UW Dummy * Bubble Dummy	Lagged 15-day Nasdaq Return	Negative Price Revision	Positive Price Revision	Revision$^+$ * Nineties Dummy	Revision$^+$ * Bubble Dummy	Nineties Dummy	Bubble Dummy	R^2_{adj}
(1)	-0.73	10.33	-1.52	-1.95	3.35	1.72	-4.70	4.94	36.01	--	--	--	--	--	6.12	16.60	0.26
All	(-0.52)	(10.72)	(-4.11)	(-2.66)	(8.36)	(5.57)	(-5.85)	(4.56)	(6.20)						(7.18)	(3.59)	
(2)	8.44	2.44	-0.44	-1.15	-0.06	1.48	-3.21	--	--	--	--	--	--	--	--	--	0.05
1980-1989	(7.62)	(2.75)	(-1.38)	(-1.59)	(-0.34)	(4.93)	(-4.92)										
(3)	9.61	7.88	-1.72	-3.24	2.73	0.91	0.75	--	--	--	--	--	--	--	--	--	0.09
1990-1998	(7.94)	(7.25)	(-5.14)	(-3.74)	(7.02)	(3.75)	(0.88)										
(4)	-29.52	37.01	-1.33	5.05	7.41	4.13	22.94	--	--	--	--	--	--	--	--	--	0.17
1999-2000	(-2.80)	(7.53)	(-0.43)	(0.96)	(4.62)	(2.91)	(3.89)										
(5)	4.35	4.89	-1.31	0.37	1.85	0.47	-4.26	2.55	18.37	0.84	0.32	0.56	0.11	1.22	4.22	1.73	0.53
All	(3.72)	(6.18)	(-4.36)	(0.60)	(5.41)	(1.72)	(-6.43)	(2.69)	(3.69)	(6.70)	(10.49)	(7.08)	(1.21)	(7.84)	(5.50)	(0.40)	
(6)	7.53	1.14	-0.69	0.73	0.01	0.88	-3.68	--	--	0.52	0.20	0.70	--	--	--	--	0.26
1980-1989	(7.61)	(1.45)	(-2.39)	(1.18)	(0.08)	(3.05)	(-6.38)			(6.33)	(7.82)	(7.99)					
(7)	9.08	5.18	-1.47	0.18	1.81	0.19	-1.74	--	--	0.73	0.28	0.69	--	--	--	--	0.27
1990-1998	(7.54)	(5.18)	(-4.94)	(0.25)	(5.72)	(0.86)	(-2.30)			(4.56)	(7.97)	(12.80)					
(8)	-5.55	9.96	-0.90	3.23	4.18	0.76	11.31	--	--	1.06	0.64	1.64	--	--	--	--	0.48
1999-2000	(-0.63)	(2.48)	(-0.35)	(0.69)	(3.01)	(0.61)	(2.19)			(3.72)	(4.18)	(10.20)					

Table 9

Decomposition of First-day Returns

The sample includes 5,980 U.S. operating firm IPOs from 1980-2000 where the offer price is at least $5.00 and complete data on all of the variables is available. The row 5, Table 8 regression coefficients are used to decompose the increase in first-day returns across the time periods into the component causes. The increase of 7.4% from the 1980s to the 1990s equals the difference in mean first-day returns of 14.8% in the 1990s and 7.4% in the 1980s reported in Table 1, Panel A. The increase of 57.6% from the 1980s to the internet bubble period equals the difference of 65.0% in the bubble period and 7.4% in the 1980s.

	1990s from1980s	Bubble from 1980s
Increase in First-day Returns Explained by:		
Changing risk composition Hypothesis:		
(1) Change in tech composition[a]	0.2%	2.2%
(2) Change in median age[b]	-0.2%	0.4%
Realignment of Incentives Hypothesis		
(3) Change in pure primary proportion[c]	0.1%	0.2%
Changing Objective Function Hypothesis:		
(4) Change in underwriters[d]	0.8%	13.3%
Consistent with All Hypotheses:		
(5) Change in mean share overhang[e]	-0.8%	3.0%
(6) Change in negative revisions[f]	0.4%	0.9%
(7) Change in positive revision[g]	1.9%	29.9%
(8) Change in ln(Mkt/Sales)[h]	0.1%	0.4%
(9) Other Explained[i]	0.7%	5.6%
(10) Total Explained	3.2%	55.9%
(11) Unexplained[j]	4.2%	1.7%
(12) Increase in First-day Returns	7.4%	57.6%

[a] The change in underpricing attributable to changing tech composition is calculated as the Table 8, row 5 coefficient of 4.89 multiplied by the change in the fraction of the sample that is a tech stock, from Table 2. This is 4.89×(0.30-0.26)=0.2% for the 1990s and 4.89×(0.72-0.26)=2.2% for the internet bubble period.

[b] The change in underpricing attributable to median age is calculated as the coefficient of –1.31 multiplied by the difference in the median age from Figure 4. This is –1.31×(ln(1+8)-ln(1+7)) = -0.2% for the 1990s and –1.31×(ln(1+5)-ln(1+7)) = 0.4% for the internet bubble period.

[c] The change in underpricing attributable to pure primary offerings is calculated as the coefficient of 0.37 multiplied by the change in the fraction of the sample that is pure primary, from Table 2. This is 0.37×(0.59-0.44) = 0.1% for the 1990s and 0.37×(0.85-0.44) = 0.2% for the internet bubble period.

[d] The change in underpricing attributable to underwriter quality is calculated as (the fraction of the sample with a prestigious underwriter in a later subperiod multiplied by the sum of the base-period plus subperiod coefficients) minus (the 1980s effect of –4.26 multiplied by the 1980s fraction of IPOs with prestigious underwriters of 0.44). This is (0.62)×(2.55-4.26) – (0.44)×(-4.26) = 0.8% for the 1990s and (0.81)×(18.37-4.26) – (0.44)×(-4.26) = 13.3% for the internet bubble period, since the prestigious underwriter market shares are 0.44, 0.62, and 0.81, respectively.

[e] The change in underpricing attributable to share overhang is calculated as the coefficient of 1.85 multiplied by the difference in the mean share overhangs from Table 4. This is 1.85×(2.56-2.98) = -0.8% for the 1990s and 1.85×(4.58-2.98) = 3.0% for the internet bubble period.

[f] The change in underpricing attributable to the change in negative revisions is calculated as the coefficient of 0.32 multiplied by the change in the fraction of the sample with a negative revision multiplied by the average subperiod

revision magnitude. This is (0.32)×(0.42)×(-17.4) - (0.32)×(0.49)×(-17.2) = 0.4% for the 1990s and is (0.32)×(0.28)×(-20.6) - (0.32)×(0.49)×(-17.2) = 0.9% for the internet bubble period.

[g] The change in underpricing attributable to the change in positive revisions is calculated as the coefficient of 0.56 plus the 1990s interaction coefficient of 0.11 multiplied by the change in the fraction of the sample with a positive revision multiplied by the average subperiod revision magnitude. For the internet bubble period, the coefficients are 0.56 plus the bubble interaction coefficient of 1.22. This is (0.56+0.11)×(0.41)×(16.7) - (0.56+0.11)×(0.32)×(12.4) = 1.9% for the 1990s and (0.56+1.22)×(0.61)×(34.0) - (0.56+1.22)×(0.32)×(12.4) = 29.9% for the internet bubble period.

[h] The change in underpricing attributable to ln(Mkt/Sales) is calculated as the coefficient of 0.47 multiplied by the difference in the log of the ratio of the mean market value at the offer price/mean sales from Panel A of Table 1. This is 0.47×(ln(1.3)-ln(1.1)) = 0.1% for the 1990s and 0.47×(ln(2.8)-ln(1.1)) = 0.4% for the internet bubble period.

i "Other explained" is the difference between the "total explained" (row 10) and the sum of rows 1-8.

[j] "Unexplained" is equal to the coefficients on the time period dummy variables in row 5 of Table 8.

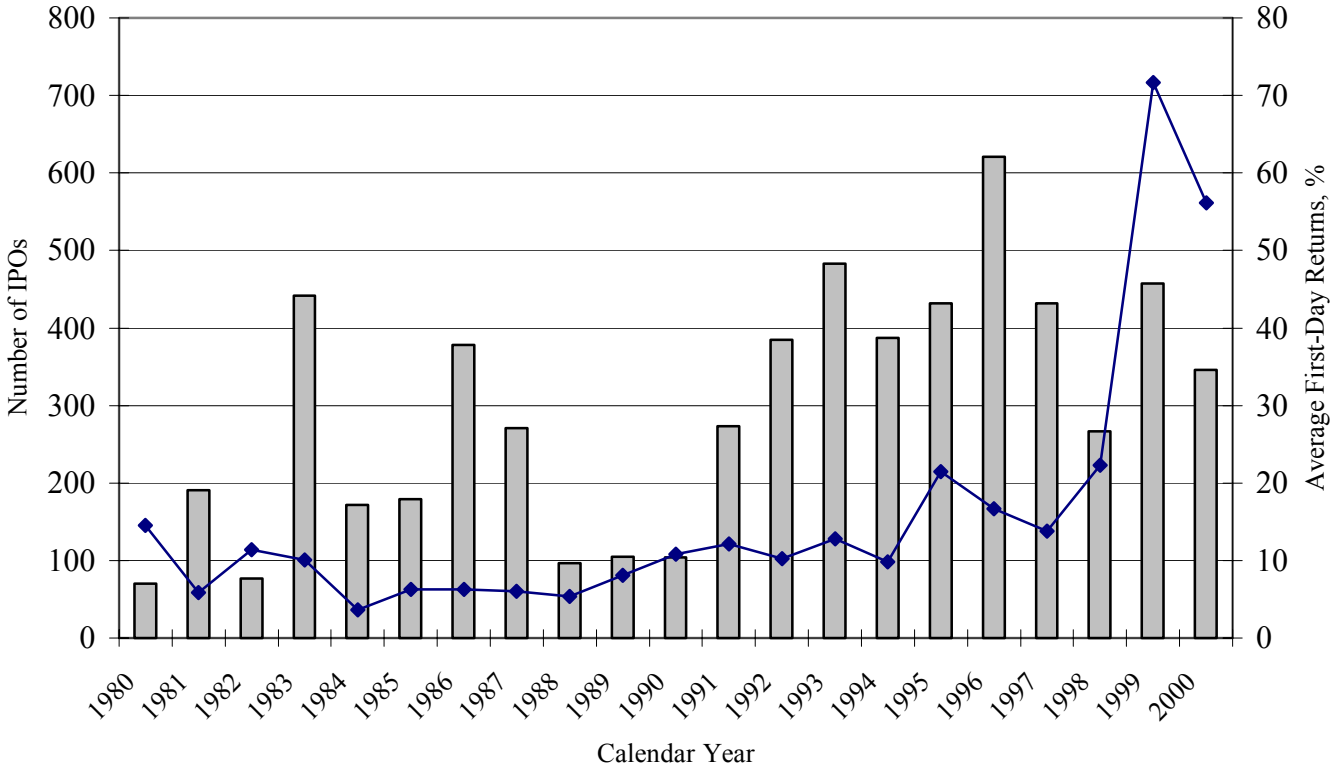

Figure 1: Number of IPOs (bars) and average first-day returns (diamonds) by cohort year. IPOs with an offer price below $5.00 per share, unit offers, REITs, closed-end funds, banks and S&Ls, ADRs, partnerships, and IPOs not listed on CRSP within six months of the offer date have been excluded. Data is from Thomson Financial Securities Data and other sources, with corrections by authors. The first-day return is defined as the percentage change from the offer price to the closing price. The data plotted are reported in Panel A of Table 1.

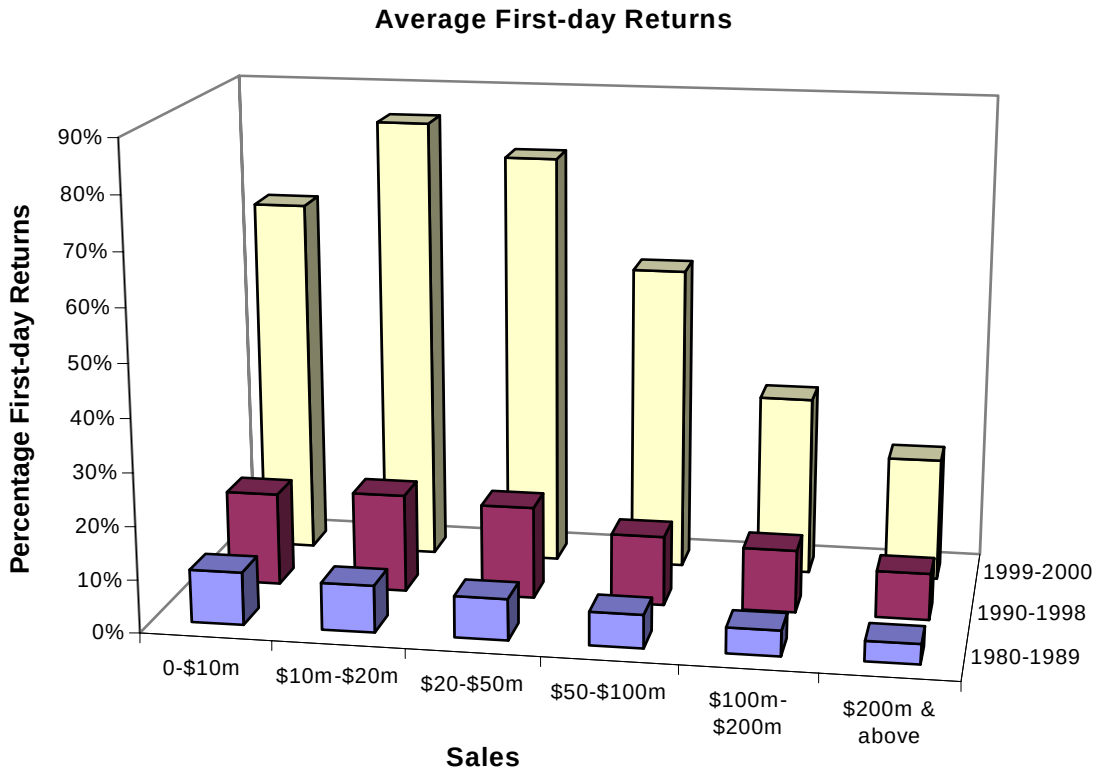

Figure 2: Average first day returns on IPOs, categorized by sales in 12 months prior to going public, in dollars of 2000 purchasing power using the CPI. The sample size is 1,947 IPOs from 1980-1989, 3,339 IPOs from 1990-1998, and 800 IPOs from 1999-2000. IPOs with missing sales are excluded.

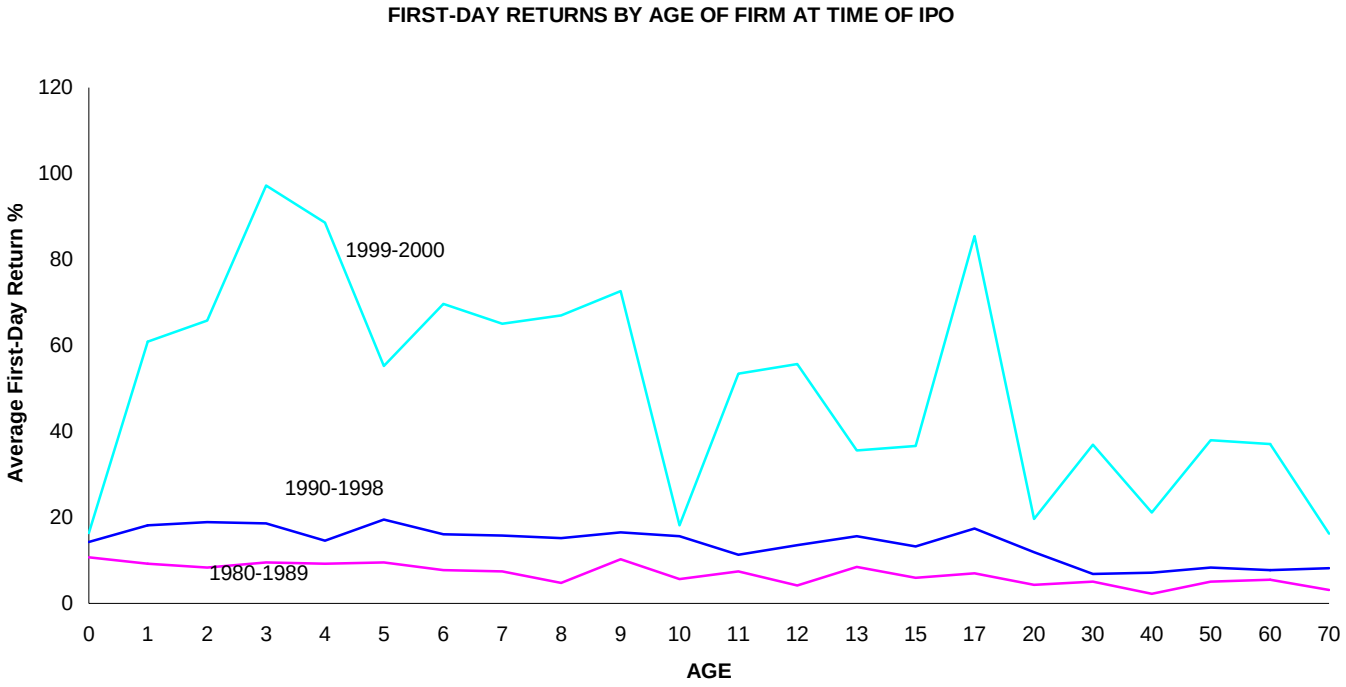

Figure 3: Average first-day returns on IPOs during 1980-1989 (N=1,945), 1990-1998 (N=3,313), and 1999-2000 (N=800) by age of the firm at the time of its IPO. IPOs with trailing 12-month sales of over $200 million that are less than two years old are not included, for these are typically spinoffs or reverse LBOs or situations where the founding dates is incorrectly listed as the date of reincorporation in Delaware. Bank and S&L IPOs, ADRs, units, REITs, stocks not listed on CRSP within six months of the offer date, partnerships, and IPOs with an offer price of less than $5.00 are also excluded. The age of the firm is defined as the calendar year of the IPO minus the calendar year of the founding.

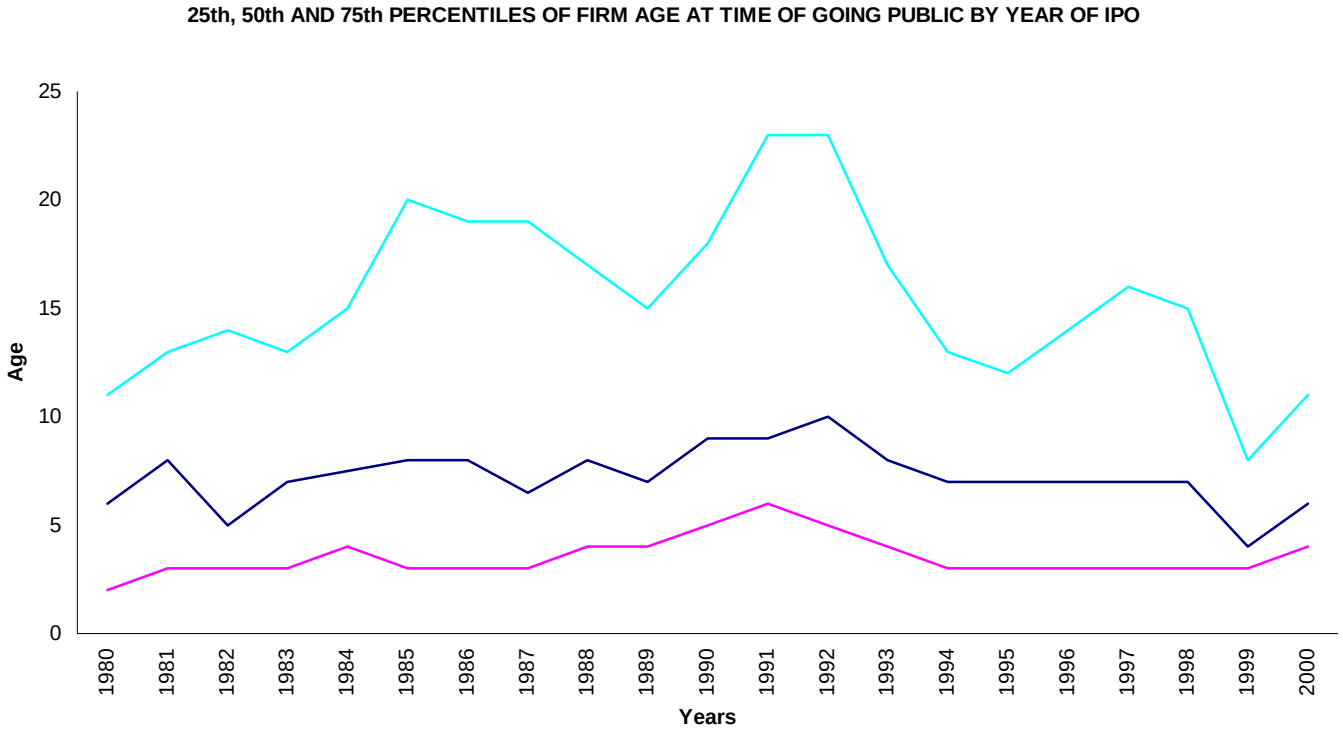

Figure 4: Each year, companies going public are ranked by firm age. The 25th percentile, 50th percentile (median), and 75th percentile of this age distribution are then plotted. For example, in 1980, 25% of IPOs were 2 years old or younger, 50% were 6 years old or younger, and 75% were 11 years old or younger. IPOs with trailing 12-month sales of over $200 million that are less than two years old are not included, for these are typically spinoffs or reverse LBOs or situations where the founding date is incorrectly listed as the date of reincorporation. Bank and S&L IPOs, ADRs, units, REITs, partnerships, and IPOs with an offer price of less than $5.00 are also excluded. The age of the firm is defined as the calendar year of the IPO minus the calendar year of the founding. There are 6,058 IPOs during this twenty-one year period meeting our sample selection criteria for which we have the age. For the 1980s as a whole the 25th, 50th, and 75th percentiles of the age distribution are 3 years, 7 years, and 16 years old at the time of going public (N=1,945). For 1990-1998, the 25th, 50th, and 75th percentiles of the age distribution are 4 years, 8 years, and 15 years old at the time of going public (N=3,313). For 1999-2000, the 25th, 50th, and 75th percentiles of the age distribution are 3 years, 5 years, and 9 years old at the time of going public (N=800). The 25th, 50th, and 75th percentiles of the age distribution for the entire 6,058 IPO sample are 3 years, 7 years, and 15 years.