Growth to Value: A Difficult Journey for IPOs and Concentrated Industries *

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PRELIMINARY, COMMENTS WELCOME!

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ABSTRACT

We find evidence that the underperformance of some IPOs, and firms in concentrated industries, have common empirical roots. The most likely explanation for both is a confluence of two well known rational theories, which predict that: (1) entrepreneurs in concentrated industries optimally time their IPOs to coincide with a transition from growth to value (Maksimovic and Pichler (2001)); and (2) the increase in systematic risk associated with this transition generates lower returns (Pastor and Veronesi (2005)). We confirm this link using several tests based on specific portfolio returns, changes in systematic risk, unexpected real cashflows, and the characteristics of firms going public. In addition, we present new evidence of return predictability, and a new explanation for the role VC-backing plays in long-term IPO performance.

Beginning with seminal works by Ritter (1991), Loughran and Ritter (1995), and Brav and Gompers (1997), the debate regarding why and if IPO firms underperform in the long term is well known. Existing research examines the issue of broad underperformance, and also whether some variables can predict long-term IPO performance in cross section. Cross sectional studies include, among many others, Carter, Dark, and Singh (1998) (underwriter prestige), Jain and Kini (1994) (overhang), Lowry (2003) (IPO volume), Krigman, Shaw, and Womack (1999) (flipping by institutional investors), Houge, Loughran, Suchanek, and Yan (2001)), and Teoh, Welch, and Wong (1998) (earnings manipulation).

The importance of this literature is underscored by the large size of its predictable returns, typically 8% to 10% annually. To explain these returns, most studies rely on market inefficiency or behavioral explanations. For example, Ritter (1991) supports an explanation based on over-optimism. Baker and Wurgler (2000) attribute underperformance following equity issuance more generally to market timing, where issuers sell equity when stock prices are artificially inflated. Although it is likely that behavioral theories indeed explain many of these findings, it is also important to ask whether rational explanations also matter. We explore — for the first time as far as we know — exactly this "rational" link.[1] In particular, we seek a unified explanation of both the corporate finance and asset pricing issues underlying IPO performance. Our focus is on industrial organization. A key motivation for this approach derives from Hou and Robinson (2005), who show that industry competitiveness can explain stock returns. They suggest that a rational risk-based explanation is the likely cause.

We find that the underperformance of firms in concentrated industries reported in Hou and Robinson (2005) (henceforth the "concentration premium) is unique to concentrated industries with an active IPO market. By conditioning on an active IPO market, we find that the unconditional concentration premium (3.8% to 4.4% per annum) increases by roughly one third to (5.2% to 5.9%) even when we exclude IPO firms themselves from the sample. More strikingly, the spread for IPO firms themselves is more than double (8.9% to 10.1% annually) the unconditional spread. In contrast, industry concentration has no ability to predict returns in industries without active IPO markets. Because all of our findings are robust to either including or excluding observations from the hot IPO market of the late 1990s, we conclude that these pricing patterns are pervasive. Therefore we aim to extend Hou and Robinson (2005)'s analysis and explore a common explanation for both the concentration premium and long-term underperformance of some IPOs.

We find that these return patterns are related to differences in how competitive and concentrated IPO issuers make the decision to go public. Concentrated issuers are more likely to follow Maksimovic and Pichler (2001), and go public when their firm is transitioning from growth to value. Hence, the underperformance of IPO firms we observe in concentrated industries can be explained by the rise in systematic (HML) risk that accompanies the transition from growth to value. The logic

[1] A contemporaneous paper by Carlson, Fisher, and Giammarino (2005) explains the underperformance of SEOs in a real options framework. They link SEO underperformance to gradual declines in market betas post SEO. Our explanation of IPO underperformance is rooted in value versus growth along with the decision to go public, which is entirely different from their explanation of SEO underperformance.

behind why such an increase in priced systematic risk should result in lower stock returns is based on Pastor and Veronesi (2005). Because industrial organization is a common trait shared by firms in a given industry, we also find spillover effects. Our findings suggest that observing a single firm's IPO can increase the likelihood that the entire industry is transitioning from growth to value. This spillover relationship can fully explain the observed concentration premium in Hou and Robinson (2005). In contrast, for IPO firms in competitive industries, we find that exogenous innovation shocks and institutional pressure from venture capital financiers to exit quickly are most likely to drive the decision to go public. Consequently, because these motives are exogenous, no increase in systematic risk is expected for these IPOs or their industry rivals, and hence underperformance is also not expected. Our explanation can be cast in the spirit of Myers and Majluf (1984): firms going public in concentrated industries (but not in competitive industries) reveal new information, i.e. that they (and their entire industry) are transitioning from growth to value. [2]

We find considerable evidence supporting the link between industry concentrations and going public decision patterns. Using tests of firm characteristics and risk exposure, we find that issuers pursuing IPOs in concentrated industries indeed do so when their firms are transitioning from growth to value. On average, HML betas increase by 4.5 basis points in the three years post IPO for each 0.01 increase in the pre-IPO sales-based Herfindahl-Hirschman Index (HHI). Consistent with less pressure to raise funds quickly for investment and fewer growth options, concentrated-industry IPO issuers spend less on R&D expenditures both pre-IPO and post-IPO. They are also far less likely to have received VC backing, consistent with a history of funding fewer expensive innovation shocks, and fewer financial constraints. These results suggest that concentrated issuers are less likely to face exogenous pressures to go public, and hence these issuers likely have the freedom to go public at the time of their own choosing. The lack of VC funding further increases timing flexibility for institutional reasons, as VCs might apply pressure to exit quickly in order to free up resources for additional investment. Concentrated issuers also sell more secondary shares at issuance, which is further consistent with the timing of the IPO being optimal from the issuer's perspective. The evidence suggests that concentrated issuers face less pressure to raise funds quickly, and have more flexibility to go public at an endogenously determined optimal time.

Our findings suggest that firms going public in competitive industries are more likely to do so in response to exogenous innovation shocks. These firms face competitive pricing within their industries, and innovation is more likely to occur (Schumpeter (1912)). When a competitive industry experiences innovation, firms must respond quickly and raise external capital to fund new investment. We find that competitive IPO firms spend considerably more on research and development both pre-IPO and post-IPO. Hence, it is likely that the purpose for going public is indeed to fund exogenous innovation shocks. Pre-IPO shareholders also sell fewer secondary shares, consistent with the timing of the IPO being sub-optimal from the owner's perspective, and hence more likely that it was driven by an exogenous

[2]Pagano, Panetta, and Zingales (1998) find empirical support for this relationship, and find that Italian firms are more likely to go public after high investment and growth. Chemmanur, He, and Nandy (2005) also show that higher capital intensity increases the likelihood of going public.

shock. Furthermore, these issuers are more likely to be VC-backed, and hence are more susceptible to exogenous influence by VC firms who might seek early exit for institutional reasons.

Overall, our evidence suggests that concentrated issuers are more likely to follow the theoretical motives identified in Maksimovic and Pichler (2001) (i.e. they go public when they are transitioning from growth to value), and competitive issuers are less likely to do so. Consequently, the decision to issue an IPO in a concentrated industry is informative, and can signal the entire industry's transition from growth to value. On the other hand, issuers going public in competitive industries do so following exogenous innovation stocks. Provided that the innovation shock itself is common knowledge, this exogeneity in IPO timing likely renders the decision to issue IPOs in a competitive industry to be void of information regarding the firm making the decision, and also uninformative regarding its industry.

Our findings provide broad support for Pastor and Veronesi (2005), who present a rational theory of asset pricing, and suggest that firms experiencing increases in systematic risk should experience lower returns. Importantly, traditional empirical asset pricing tests, which assume factor loadings are constant over time, will report underperformance when priced systematic risk suddenly increases. One simple way to understand the negative link between increases in systematic risk and stock returns is through the discount rate. Higher systematic risk increases the discount rate, which in turn decreases the present value of the firm's future cashflows, and thus the value of the firm itself.

Our paper also contributes to the debate regarding whether IPO firms actually underperform in the long run. Brav and Gompers (1997), Brav, Geczy, and Gompers (2000), and Eckbo, Masulis, and Norli (2000), among others, suggest that this underperformance is not robust to standard multifactor asset pricing models that control for risk. Schultz (2003) shows that the clustering of IPOs can lead to ex-post underperformance even in an efficient market, and suggests that future researchers should use calendar-time return methods. Although Lougharn and Ritter (2000) address many of these concerns, some scholars do not consider this debate to be fully resolved.

We employ methods that address the concerns raised by these studies, and we begin our analysis with a larger sample than previously used. We do find evidence of underperformance of some IPOs, but our findings also lend support to ideas presented on both sides of this debate. In particular, we find that one group of IPOs consistently underperforms: non venture-backed IPOs residing in concentrated industries. We also find that some previously reported findings are not robust in our larger sample: we find little evidence that other IPOs underperform, that recent market returns matter, or that IPO size plays any role. For the group that does underperform, we find that changes in risk is a likely explanation. In particular, underperformance is most evident for IPOs where the transition from growth to value hypothesis suggests it should be: concentrated industries and non-VC-backed IPOs. As discussed earlier, these firms are most likely to optimally time their IPOs because they face fewer exogenous shocks and less institutional pressures.

We also examine Hou and Robinson (2005)'s puzzling finding that unexpected

real cash flow shocks are *positive* and significant in concentrated industries at the same time that returns are *negative* and significant. Although the non-negativity of these real cashflow shocks can help to rule out the market inefficiency explanation of the concentration premium, importantly, their paper does not explain why these cash flows are significantly positive rather than zero. Our paper suggests that these firms are more profitable in the short run because the transition from growth to value mechanistically implies a wholesale maturing of growth options. Hence, the short-term profit growth of these firms exceeds that of control firms as profits from these options are realized. This explanation suggests that underperformance still arises despite higher profits because these gains are more than offset by undesirable increases in systematic risk.

The remainder of the paper is organized as follows. Section I describes data and the methodologies we use. Section II presents our findings on the relation between industry concentration and long-term abnormal returns. Section III explores the relation between industry concentration and unexpected profitability. Section IV looks at the difference in characteristics between concentrated IPOs and competitive IPOs. Section V examines changes in risk exposure in the three years post IPO. Section VI finds whether the performance of concentrated IPOs and non-VC backed IPOs is linked, and section VII concludes.

I Data and Methodology

Issue-specific IPO data are from the Securities Data Company (SDC) U.S. New Issues Database. The sample consists of all U.S. IPOs issued between January 1, 1973 and December 31, 2004. An IPO's industry is identified by its three-digit SIC code, as reported by CRSP. A total of 7,891 IPOs exist in this sample. Stock performance data and firm financial data are from CRSP and COMPUSTAT, respectively.

We consider stock performance using monthly returns, and we present results using two methods to ensure robustness. First we compute a firm's abnormal return as its raw monthly return minus the monthly return of a portfolio matched on the basis of NYSE/AMEX breakpoints of size, industry adjusted book to market, and past year returns (Daniel, Grinblatt, Titman, and Wermers (1997)). Our second methodology is to compute the monthly returns of various portfolios, and then define abnormal performance as the intercept from regressing the portfolios' excess returns on the three Fama French factors (Lougharn and Ritter (2000)). We define a firm to be "IPO firm" in a given month if the given firm went public in the past three years. Importantly, our use of monthly returns avoids biases attributed to the high variance and skewness of long-term returns.[3]. To avoid biases due to benchmark contamination, we also eliminate all firms that went public in the last five years from all benchmark portfolios and from the Fama-French factors as suggested by Lougharn and Ritter (2000).

Our industry concentration measure is based on three-digit SIC codes. The main concentration measure we consider is the HHI index based on COMPUSTAT sales

[3]See Fama (1998) and Barber and Lyon (1997)

data, averaged over past three years, as in Hou and Robinson (2005). We also compute an HHI index from COMPUSTAT segment data as a robustness check.

We define a firm's change in systematic risk as the change in its annual factor loadings (betas) using daily data. We begin by running daily time series regressions for each stock on the three Fama French factors plus momentum (UMD) as follows.

$$r_{i,t} - r_f = \alpha + \beta_1\ HML + \beta_2\ SMB + \beta_3\ MKT + \beta_4\ UMD + \ \epsilon \tag{1}$$

The return $r_{i,t}$ is firm i's return on day t, r_f is the riskless rate, and the model is estimated using daily data spanning one calendar year. The motivation for using high frequency data is to reduce the impact of error-in-variables. To further mitigate this problem, we also control for non-synchronous stock returns by adding a one day lead and one day lag term to the estimation as in Dimson (1979), and we winsorize the resulting factor loadings on a yearly basis at the 1% level.

To measure unexpected profitability, we follow Fama and French (2000), Vuolteenaho (2002), and Hou and Robinson (2005). We define unexpected profitability as the residual term from the following regression:

$$\frac{E_t}{A_t} = \alpha_0 + \alpha_1 \frac{V_t}{A_t} + \alpha_2 DD_t + \alpha_3 \frac{D_t}{B_t} + \alpha_4 \frac{E_{t-1}}{A_{t-1}} + \epsilon_t \tag{2}$$

Using COMPUSTAT data, the earnings to asset ratio (E/A) is data item 18 divided by data item 6, firm market value to asset ratio (V/A) is (market cap at the end of last year (CRSP) plus total assets (item 6) minus book common equity (item 60)) divided by data item 6, and the dividend to book value of equity (D/B) is data item 21 divided by data item 60. The non-dividend payer dummy equals one if the firm did not pay any dividend in the given year.

Table I displays summary statistics. There are a total of 1,785,322 firm-month observations of CRSP stock returns. About 5% of these observations are identified as IPO observations, i.e., within three years of IPO date. For variables that are observed once per year, we have a total of 160,243 firm-year observations. The asset pricing models we use to calculate abnormal firm performance are well specified, because the average monthly abnormal return is 0% on average. This is consistent with the notion that the market is efficient on average.

II Industry Concentration and Long-term Abnormal Returns

Ritter (1991), Loughran and Ritter (1995), and Lougharn and Ritter (2000) document that IPO firms underperform in the long run relative to market-wide benchmarks. To examine whether this underperformance is related to industry concentration, in each year, we form concentration quintiles based on the Sales HHI at the 3-digit SIC industry level. Quintiles are labeled one through five, with one being the most competitive quintile, and five being the most concentrated quintile.

Following Daniel, Grinblatt, Titman, and Wermers (1997), we calculate a firm's abnormal return as its raw monthly return minus the monthly return of its benchmark portfolio. The benchmark portfolios are formed on the basis of NYSE/AMEX breakpoints of size, industry-adjusted book to market, and past year returns. These benchmark portfolios are purged of IPOs issued in the past five years, as suggested by Lougharn and Ritter (2000). We define an industry to be "IPO industry" if there is at least one IPO in that industry over the past twelve months.[4]

Panel A of Table II reports sample-wide results from year 1973 to 2004. Panel B of the table reports results excluding the 1999-2000 hot IPO market. Row one replicates the findings of Hou and Robinson (2005), and confirms the negative relationship between industry concentration and monthly abnormal returns. Rows two and three show that this relationship is entirely driven by industries with an active IPO market. Moreover, our exclusion of IPO firms from our test of IPO industries in row two further illustrates that the concentration premium, although linked to IPO activity, is not entirely driven by the returns of IPO firms themselves. However, row four shows that the concentration premium is indeed largest for IPO firms.

The results for non-IPO firms in IPO industries in row two can be viewed as a "spillover effect". In turn, this underperformance generates the unconditional result reported in Hou and Robinson (2005). Overall, these patterns (largest for IPO firms, next largest for same industry firms, and non-existent for other firms) are consistent with information first being revealed by the actions of IPO firms (effect is largest), and then spilling over into the industries in which they operate (effect is smaller but still significant). Panel B confirms that these patterns are not driven by the 1999-2000 hot IPO market.

Table III examines the relationship between abnormal returns and concentration using monthly Fama MacBeth regressions. As before, Panel A includes the whole sample, and Panel B excludes the hot IPO market of 1999 and 2000. The dependent variable in all regressions is the monthly abnormal return of each firm.

Our regressions are similar to those in Hou and Robinson (2005), and row (1) reproduces their finding that firms in concentrated industries underperform those in competitive industries. Because the dependent variable, the monthly abnormal return, already controls for the traditional four risk factors, these results cannot be explained by each firm's average exposure to HML, SMB, MKT and momentum risk. Finding similar results, Hou and Robinson (2005) suggest that the negative relationship between concentration and returns is driven by a new competitive risk factor. Additional tests (presented later) confirm that risk exposure matters, but our analysis supports the conclusion that changes in exposure to a well known risk factor (HML), rather than an entirely new risk factor, is responsible for these return patterns.

Table III also shows that if we separate the sample into firms in IPO industries and compare them to firms in non-IPO industries, this negative relation between concentration and abnormal returns only exists for firms in IPO industries. Fur-

[4]We use a shorter horizon of one year to identify "IPO industries" rather than the three years used to identify "IPO firms". If we use a three year horizon for industries, a majority of industry-years would be tagged as IPO industries.

thermore, this relationship in IPO industries is stronger than in the overall sample. Based on the Sales HHI standard deviation of 0.3098 reported in Table I, the table suggests that one additional standard deviation of Sales HHI decreases expected annual returns by 1.4% for the entire sample, and 2.3% for firms residing in industries that had at least one IPO (even when IPO firms themselves are excluded). Firms residing in industries without IPOs experience no significant difference in expected return whether they are in a competitive industry or in a concentrated industry. More strikingly, row (6) suggests that IPO firms experience a 4.8% reduction in expected return when they are issued in an industry with one standard deviation higher Sales HHI.

Within the entire sample including all observations, rows (4) and (5) illustrate the same finding. In particular, comparing row (1) to row (4) shows that including the interaction term of sales HHI X IPO industry dummy, renders the unconditional sales HHI coefficient to become insignificant. In contrast, the coefficient of the interaction term is significantly negative at -0.0066, which is nearly 70% larger than the sales HHI coefficient in row (1). The IPO industry flag itself is not significant, indicating that industry concentration within an active IPO market is what matters most. We conclude that the underperformance of concentrated IPO industries drives the observed concentration premium. Because the IPO market is active during booms, and dormant during recessions, the cyclical nature of the IPO market might also explain why the concentration premium in Hou and Robinson (2005) varies over time.

Rows (5) and (9) show that using the number of IPOs instead of a dummy identifying the existence of at least one IPO, the results are similar, but are not statistically significant. Hence, the existence of at least one IPO is more important than whether or not many IPOs are issued at the same time.

III Industry Concentration and Unexpected Profitability

Following Hou and Robinson (2005), we examine the relationship between industry concentration and unexpected cash flow shocks to ascertain whether observed underperformance is accompanied by real decreases in cash flows (negative cash flow shocks). The existence of negative shocks, if they are predictable, would lend support to behavioral explanations, as it would suggest that ex-ante prices were above fundamental valuations. In contrast, evidence of zero shocks or positive shocks can be viewed as evidence against behavioral explanations that are rooted in overvaluation, and can thus be seen as support favoring rational hypotheses. Unexpected profitability is measured as the residual from Equation (2) as in Fama and French (2000), Vuolteenaho (2002), and Hou and Robinson (2005).

Although we do not report the results of the first-stage regression in equation (2) to conserve space, we can report that our coefficient estimates are in line with previous works. Firms with higher lagged cash flows ($\frac{E_{t-1}}{A_{t-1}}$), higher dividend ratios ($\frac{D_t}{B_t}$), and higher value ratios ($\frac{V_t}{A_t}$) are more profitable. Firms that do not pay

dividends (DD_t) are less profitable. The residuals from this regression, unexpected profitability, are used as the dependent variable in Table IV.

Table IV reports Fama-MacBeth regressions where the dependent variable is each firm's annual unexpected profitability. We confirm Hou and Robinson (2005)'s finding of a positive relationship between industry concentration and unexpected profitability in rows (1) and (7) for both the full sample and the subsample excluding the hot IPO market.

As in our analysis of abnormal returns, we separate the sample into firms in IPO industries and firms in non-IPO industries in rows (2) and (3). The table shows that the positive relationship is slightly larger in magnitude for IPO industries, and insignificant in the non-IPO industry group. Rows (4) and (5) show that including an IPO industry dummy and its interaction term with Sales HHI in the unconditional sample renders the unconditional Sales HHI coefficient to be insignificant. In contrast, the interaction term (IPO dummy x Sales HHI) is significantly positive. If we base the interaction term on the number of IPOs rather than the IPO dummy, the results are similar. This suggests that the positive cash flow shocks reported by Hou and Robinson (2005) are robust, but also that they are driven by positive shocks occurring uniquely in industries with active IPO markets.

Given existing literature, it is a mystery that concentrated industries with active IPO markets can experience both *positive* cash flow shocks and *negative* abnormal returns. Because our finding of a link between positive cashflow shocks and underperformance is strong, and also robust across subsamples where each matters most, viable explanations of the concentration premium must explain both results. Our unified explanation suggests that the positive cashflow shocks are a direct result of the transition from growth to value. This transition implies a rapid exercise and maturing of growth options, and this maturing process can explain the observed increasing short-run profitability relative to control firms. These *positive* shocks are consistent with inferior returns because these short run profitability gains are more than offset by the undesirable increase in the discount rate associated with this transition. The following sections will further explore this hypothesis.

IV Industry Concentration and Characteristics of Issuing Firms

Table V examines whether IPOs in concentrated industries have different characteristics relative to IPOs in competitive industries. One observation is one IPO, and the table uses the Fama-MacBeth regression method to ensure that all years receive equal weighting.[5] Rows (1) and (2) show that IPO firms in competitive industries spend far more on research and development (COMPUSTAT item 46 normalized by total assets, item 6) both pre-IPO and post-IPO, although rows (5) and (6) show that no significant differences exist in capital expenditures. The large scale differences in research and development are consistent with IPO firms in competitive industries

[5]Results are robust to OLS or panel data methods (not displayed).

making the decision to go public in order to fund investment associated with costly innovation shocks. Their smaller R&D expenditures in concentrated industries suggests that concentrated issuers are less likely to be constrained by such shocks, and are likely to go public at the optimal time of their own choosing. Hence, rational models of IPO timing are more likely to apply to issuers in concentrated industries rather than those in competitive industries.

Table V also shows that IPOs in concentrated industries are less likely to be backed by venture capital, and tend to sell more of their own (secondary) shares at the time of IPO.[6] This suggest that concentrated issuers do not face the financial and institutional constraints associated with VC-financing, and are more free to issue IPOs at an optimal time of their own choosing. The observed higher levels of secondary sale shares in concentrated IPOs is further consistent with the timing of these IPOs indeed being more optimal from the owner's perspective.

All results are robust to the exclusion of the hot IPO market from 1999 to 2000. Put together, the results of Table V show that IPOs in concentrated industries are different from IPOs in competitive industries. Existing research on IPO timing may help to explain the link between these characteristics and observed underperformance. Maksimovic and Pichler (2001) model firms' financing decisions between public (IPO) capital and private venture capital. They show that it is optimal for mature firms to choose public capital, and for immature growth firms to choose private capital. Because Table V suggests that only concentrated issuers have the flexibility to follow any optimal theory of IPO timing, it follows that this theory predicts that concentrated issuers (and not competitive issuers) are undergoing the transition from growth to value. Stated differently in terms of Myers and Majluf (1984), observing the decision to go public in concentrated industries reveals the likelihood of this transition, but observing a similar decision in a competitive industry is void of information.

The next section tests whether IPO firms in concentrated industries are indeed transitioning toward value firms, and whether those in competitive industries are not. The answer is yes.

V Industry Concentration and Changes in Systematic Risk

Table VI formally tests the relation between industry concentration and changes in risk exposure. Individual firms' risk exposure (betas) are calculated using daily data in a given year. We take three measures to reduce error in variables: (1) we use high frequency daily data, (2) we control for non-synchronous stock returns as in Dimson (1979), and (3) all firm betas are winsorized at the 1% level on an annual basis.

The table examines the relationship between industry concentration and the three-year change in risk exposure (beta) for each of the three Fama-French fac-

[6]Secondary shares are shares sold by initial owners. Primary shares are sold by the firm going public, and proceeds are delivered to the firm itself for new investment rather than to the owners.

tors plus momentum. Within the entire sample, row (1) shows that sales HHI is associated with a positive change in HML beta. Rows (2), (3), and (4) show that this positive association is driven by firms in IPO industries only. In fact, firms in non-IPO industries experience a significant *decline* in HML beta over the following three years. In contrast, within the subsample of IPO industries, the positive association between industry concentration and increases in HML beta is statistically significant, and also larger in magnitude than the association in the whole sample. Most strikingly, row (4) shows that the positive association between industry concentration and HML beta increases is statistically and economically largest within the sample of IPO firms alone. Here, the positive coefficient is roughly three times larger than the positive coefficient noted for the entire sample.

Panels B and D show that changes in two other risk factors, SMB and momentum, are not significantly related to industry concentration. However, Panel C documents that changes in the market factor are significant. Within the entire sample, competitive industries are associated with an increase in market beta over three years. Like the changes in HML risk noted above, this increase also appears to be stronger for competitive IPO firms and for firms residing in competitive IPO industries. One explanation is that the technological innovations that appear to fuel IPO issuance in competitive industries might lead these industries to become a larger fraction of the overall market portfolio, thus increasing their market beta. It also might be the case that the outcome of investment following innovations is tied to the performance of the economy as a whole, and because good economic performance can help to ensure success. However, because the dynamics of technological innovation are outside the scope of our study, we leave examination of this issue to future studies.

Importantly, because Fama and French (1993) show that the market factor is not a "priced" risk factor in the cross section of equity returns, the changes in market risk in Panel C likely are not important in understanding equity returns (the topic of our study). In contrast, Fama and French (1993) present evidence that HML is a priced risk factor, and hence the increases in HML risk observed in Panel A are highly relevant in explaining the cross section of expected stock returns. In particular, the evidence suggests that IPO firms and non-IPO firms in IPO industries are both transitioning from growth to value.

VI Industry Concentration and Venture Capital

Brav and Gompers (1997) show that VC-backed IPOs do not underperform in the long run. Given that competitive industries have a larger percentage of VC-backed IPOs than concentrated industries do, it is natural to ask whether the concentration premium results are driven by, or linked to, VC financing patterns.

We begin our exploration by examining long-term IPO performance within five sub-groupings of IPO firms based on: 1) industry concentration; 2) VC backing; 3) whether the given IPO is issued in a high volume market ("Market Temperature"); 4) whether it is issued after high market returns; and 5) whether it is a large or small IPO. Table VII and table VIII report the results using two different methodologies.

Table VII employs the calendar-time portfolio return method used in Lougharn and Ritter (2000). Table VIII reports calendar-time abnormal returns relative to benchmark portfolios as in Brav and Gompers (1997). Following Lougharn and Ritter (2000), for both methods, we purge firms that went public in the last five years from the factor portfolios, and from the benchmark portfolios, respectively.[7]

For all five classification variables, IPOs are sorted into two portfolio groups using annual sorts. Information needed to classify firms is public information that is known prior to the period of time over which we measure returns, so our results are predictive in nature. In order to compute an IPO's "Market Temperature", we first define a monthly variable, the IPO ratio, as the number of IPOs in a given month divided by the number of publicly traded firms on the CRSP tapes in the same month. We then define a given IPO's market temperature as the IPO ratio in the month preceding the given IPO date minus the mean IPO ratio over the past 36 months, divided by the IPO ratio's standard deviation over the past 36 months. This variable thus measures whether the IPO market is hot (in terms of volume) relative to conditions over the past three years. Past market performance is the equal weighted market return over the three years preceding the issue date. IPO size is the natural logarithm of the issue proceeds.

Rows (1) and (2) of Table VII show that IPOs did experience abnormal returns that are negative, but also that these unconditional returns are not statistically significant in our extended sample. However, comparing row (1) and row (2) shows that purging the Fama-French factors of IPO firms, as suggested by Lougharn and Ritter (2000), has a significant impact on the both the coefficient magnitude and the significance level of observed IPO underperformance. After this adjustment, however, the still non-significant T-statistic of -1.32 suggests that broad IPO underperformance is not robust in our larger sample.

We believe the mixed signals regarding unconditional IPO underperformance might be explained by the possibility that one identifiable group of IPOs (e.g. those without VC backing and in concentrated industries) does consistently underperform, and the rest do not. Under this hypothesis, outcomes of tests of broad IPO underperformance would hinge upon the percentage of IPOs that are in the underperforming group versus those that are not. The weaker evidence of broad underperformance in the extended sample would thus be consistent with more recent IPOs, especially those in the 1990s, having a higher tendency to be venture backed and being issued in competitive industries. This conjecture is backed by the well known influx of venture backed IPOs during the technology boom, and the declining concentration associated with the increase in the number of firms during this time. Particularly supportive of this logic, rows (3) to (6) indicate that IPOs issued in concentrated industries, and non-VC backed IPOs, consistently underperform in both samples even as unconditional IPO underperformance appears to be weaker in the extended sample. Comparing Table VII to Table VIII confirms that these findings are also robust to both methodologies.

The examination of underperformance versus market temperature and prior market returns is a direct test of the behavioral market timing explanation of IPO un-

[7]We thank Jay Ritter for providing purged HML and SMB risk factors on his website.

derperformance. This theory states that firms issue IPOs in hot markets because IPO valuations have risen above fundamentals. Hence, this theory would predict that IPOs issued following high prior market returns, and IPOs issued when IPO volume (market temperature) is high, should experience the worst ex-post performance as firm valuations eventually "correct".[8] The results in Panels D and E from both Table VII and Table VIII do not square well with this prediction. Panel D shows that IPOs issued in colder (not hotter) market temperatures underperform. Panel E shows virtually no relationship between recent market returns and ex-post performance. We conclude that behavioral theories that rely on overvaluation likely do not explain IPO underperformance.

From panel F in Table VII and Table VIII, there is also no clear evidence regarding whether small or large IPOs tend to underperform in the long run.

We next examine whether the results for VC-backing, industry concentration, and market temperature are driven by the same underperforming firms, or whether these variables contain unique information. Table IX presents average abnormal returns based on two dimensional sorts along these dimensions. Panel A shows that the concentration and VC-backed effects are distinct, and in fact, roughly additive. Concentrated non-VC backed IPOs underperform more than any other group at 0.88% per month (10.5% annually). For the groups of competitive non-VC backed IPOs and concentrated VC-backed IPOs, the two effects cancel, and we do not observe any robust underperformance.

Panel B of Table IX examines the concentration effect versus market temperature. The table shows that virtually no relationship exists between market temperature and IPO performance once controls for concentration are included. Concentrated IPOs underperform regardless of market temperature. The unconditional link between temperature and underperformance was likely driven by the fact that concentrated industries, by definition, have fewer firms. Hence, IPOs in these industries likely come in smaller waves, and such market conditions would thus be classified as cold more often than competitive IPO waves would.

Panel C confirms our earlier finding that non-VC backed IPOs underperform (rows 11 and 12), but also shows that these IPOs underperform regardless of whether the IPO market is hot or cold. We conclude that temperature plays little role in IPO performance. This evidence is consistent with rational explanations of observed underperformance, and raises the bar for behavioral explanations, which often rely on return reversals being more extreme following hot markets.

Overall, table IX suggests that concentrated non-VC backed IPOs underperform more than any other group of IPOs in the long run. This result is consistent with this group of issuers having the most flexibility to go public at the optimal time of their own choosing, which as our earlier findings suggest, is when their firm is

[8]Lougharn and Ritter (2000) use a different methodology to examine IPO volume find a result opposite to ours. Importantly, the difference is due to whether IPO volume is measured at the time of issuance (our approach) or during the ex-post return window (their approach). Because our agenda is only to examine whether the actual decision to go public is rooted in behavioral biases, we focus on whether or not the market is hot or cold at the time of issuance, as ex-post conditions are not known when this decision is made.

transitioning from growth to value. Following our earlier results concerning tests of increases in systematic risk, we now explore whether systematic risk changes can also explain this section's results concerning non-VC backed IPO underperformance.

Table X examines whether changes in HML risk are indeed linked to the same characteristics that predict IPO underperformance. The table's dependent variable, three-year change in HML exposure, is defined exactly as in Table VI, but now we restrict the sample to IPO firms alone. In order to test this specific hypothesis, we include the following explanatory variables in the Fama-MacBeth cross sectional regressions: VC backed dummy, log of IPO size, past 3-year market returns, and relative IPO market temperature. The table shows that the VC backed dummy is significantly and negatively correlated with HML beta changes. Ceteris paribus, a non-VC backed IPO on average experiences a 58 basis point increase in its HML beta in the three years following its IPO relative to VC backed IPOs. Table X also confirms our earlier finding that concentrated industry IPOs experience increases in HML betas. Row (2) shows that these two variables remain significant when regressed alone. Finally, rows (3) shows that the concentration effect is especially robust, and not influenced by multicollinearity, as it remains significant in a univariate model. The table also shows that IPO size and hot market variables do not correlate with changes in risk.

We conclude that Table X provides broad support for the unified rational explanation of IPO underperformance and the concentration premium, and illustrates the link to the transition from growth to value. Concentrated non-VC backed IPOs are most likely to follow Maksimovic and Pichler (2001)'s prediction of optimal IPO timing, thus they experience the largest change in risk exposure. In turn, this group of IPOs underperforms the most.

VII Conclusion

We present strong evidence that the underperformance of some IPO firms, and the concentration premium documented in Hou and Robinson (2005), have common empirical roots. Several tests based on specific portfolio returns, changes in systematic risk, unexpected real cashflows, and the characteristics of firms going public support this hypothesis. These tests also lead us to conclude that a rational theory of IPO timing and increased systematic risk explains our findings. The theoretical explanation draws from important contributions made in both the corporate finance and the asset pricing literature.

Our unified explanation is rooted in the hypothesis that firms going public in concentrated industries have the flexibility to do so at the optimal time of their choosing, and that this decision is made following the theoretical predictions of Maksimovic and Pichler (2001): when their firm is transitioning from growth to value. In contrast, competitive IPO issuers have little flexibility because their IPO decision is more likely to be forced by exogenous innovation shocks requiring quick financing as in Schumpeter (1912), or by venture capital financiers demanding quick exit. In turn, the transition from growth to value, which we observe more frequently in con-

centrated industries, directly implies an increase in systematic (HML) risk. Rational asset pricing theory presented in Pastor and Veronesi (2005) explains why these firms "underperform". This theoretical explanation can also be cast in the language of Myers and Majluf (1984). Observing the decision to go public in a concentrated industry reveals a transition from growth to value. Observing the same decision in a competitive industry is uninformative.

The unified theory can also explain the seemingly mysterious *positive* cash flow surprises that accompany the underperformance associated with the concentration premium reported in Hou and Robinson (2005). In particular, the transition from growth to value, although accompanied by a decline in realized returns, should produce positive cash flow surprises because the wholesale maturing of growth options should generate cash flow increases above those of control firms. Finally, our results shed new light on the role of VC backing in predicting IPO performance. A lack of VC backing appears to increase the issuer's flexibility to optimally time IPOs because VCs often seek quick exit. Hence, non-VC backed IPOs are likely to underperform for the same reason concentrated industry IPOs do.

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Table I: Summary statistics

Explanation: A firm's abnormal return is its raw monthly return minus the monthly return of a portfolio matched on the basis of NYSE/AMEX breakpoints of size, industry adjusted book to market, and past year returns as in Daniel, Grinblatt, Titman, and Wermers (1997). A firm is tagged as an "IPO firm" in a given month if the firm had its IPO in the last three years. Unexpected profitability is obtained from Fama MacBeth regressions as in Fama and French (2000). A firm's Sales HHI is the Herfindahl index based on sales over all firms residing its three digit SIC industry (averaged over the past three years). Betas are estimated using daily data and two measures are taken to reduce error-in-variables. First, each beta is the sum of three regression coefficients: same day, past day, and one day forward. Second, all betas are winsorized at the 1% level on an annual basis. A monthly observation is tagged as an "Industry IPO flag" if the given firm resides in a three digit SIC code that experienced at least one IPO over the past twelve months. The number of IPOs is the number of IPOs in the given industry. Research and Development along with Capital Expenditures are taken from COMPUSTAT, and are normalized by assets. The Venture Capital Backed dummy is one for firms financed by Venture Capital firms. Overhang is the number of shares retained by the entrepreneur (for all classes) divided by shares filed (including primary and secondary shares).

Variable	Mean	Standard Deviation	Minimum	Maximum	Number of Observations
		Panel A: Variables observed once per firm-month			
Abnormal Return	0.0000	0.1762	–1.1920	23.5040	1,785,322
Raw Return	0.0145	0.1896	–0.9810	24.0000	1,785,322
IPO firm dummy	0.0501	0.2180	0.0000	1.0000	1,785,322
		Panel B: Variables observed once per firm-year			
Unexpected profitability	–0.0024	0.3745	–12.06486	13.578	160,243
Earnings/Assets	0.0136	0.5423	–12.19214	0.440	160,243
Dividend/Book Value	0.0198	0.0405	0.000	0.4879	160,243
Value/Assets	2.7456	62.2407	0.000	11477	160,243
Non dividend payer dummy	0.5815	0.4933	0.000	1.000	160,243
HML beta	–0.8425	1.3641	–6.3039	5.5202	165,688
SMB beta	0.5306	1.2092	–3.1749	5.6040	165,688
MKT beta	0.8284	0.7326	–2.1722	4.2642	165,688
UMD beta	0.0380	1.1685	–6.1196	4.8326	165,688
3-Year Change in HML beta	0.12134	1.7815	–11.106	11.098	134,531
3-Year Change in SMB beta	–0.0724	1.4791	–9.1552	8.9264	134,531
3-Year Change in MKT beta	–0.0453	0.8372	–7.1180	6.2678	134,531
3-Year Change in UMD beta	0.0057	1.6530	–8.8753	8.2259	134,531
		Panel C: Variables observed once per industry-year			
Industry Sales HHI	0.4719	0.3098	0.000	1.000	10,247
IPO industry dummy	0.4165	0.4930	0.000	1.000	10,247
Number of IPOs	0.8921	3.9220	0.000	155	10,247
		Panel D: Variables observed once per IPO			
Pre-IPO CAPX/Assets	0.104	0.120	0.000	1.586	5,780
Post-IPO CAPX/Assets	0.097	0.113	0.000	1.140	6,771
Pre-IPO R & D/Assets	0.107	0.480	0.000	33.0	7,891
Post-IPO R & D/Assets	0.047	0.099	0.000	1.985	7,891
Overhang	2.968	8.188	0.000	609.2	7,870
Venture Capital Dummy	0.344	0.475	0.000	1.000	7,891

Table II: Average monthly abnormal returns by concentration quintile

Explanation: The table displays average monthly abnormal returns for various quintile portfolios in year t. Quintiles are formed at the industry level based on each three digit SIC code's average sales HHI over the years t-1, t-2, and t-3. Panel A includes all observations from 1972 to 2004, and Panel B excludes the hot IPO market of 1999 and 2000. The table displays average monthly abnormal returns. A firm's abnormal return is its raw monthly return minus the monthly return of a portfolio matched on the basis of NYSE/AMEX breakpoints of size, industry-adjusted book to market, and past year returns as in Daniel, Grinblatt, Titman, and Wermers (1997). A monthly observation is tagged as an "IPO industry" if the given firm resides in a three digit SIC code that experienced at least one IPO over the past twelve months. A firm is tagged as an "IPO firm" in a given month if the firm had its IPO in the last three years.

	Sample	Most Competitive	2	3	4	Most Concentrated	Annual Return Spread	Obser-vations
				Panel A: Sample-wide results				
(1)	All Firms	2.479	0.984	–0.364	–0.929	–1.939	–4.418	1,785,322
(2)	Non-IPO Firms in IPO Industries	3.413	1.334	–0.623	–1.435	–2.535	–5.948	956,889
(3)	Firms in non-IPO Industries	–2.980	0.049	0.119	–0.412	–1.600	1.380	672,454
(4)	IPO firms Only	1.884	–1.759	–2.913	–7.310	–8.215	–10.095	155,979
				Panel B: Excluding 1999-2000 hot IPO market				
(5)	All Firms	2.604	–0.350	–0.595	–0.377	–1.154	–3.758	1,632,712
(6)	Non-IPO Firms in IPO Industries	3.686	–0.721	–1.254	–0.863	–1.570	–5.256	869,790
(7)	Firms in non-IPO Industries	–3.180	0.554	0.621	0.116	–0.915	2.265	625,749
(8)	IPO firms Only	3.479	–4.073	–1.487	–4.859	–5.470	–8.949	137,173

Table III: Fama MacBeth regressions of abnormal stock returns

Explanation: The table displays Fama MacBeth regressions with t-statistics in parentheses. Panel A includes all observations from 1972 to 2004, and Panel B excludes the hot IPO market of 1999 and 2000. The dependent variable is each firm's monthly abnormal return. A firm's abnormal return is its raw monthly return minus the monthly return of a portfolio matched on the basis of NYSE/AMEX breakpoints of size, industry-adjusted book to market, and past year returns as in Daniel, Grinblatt, Titman, and Wermers (1997). A firm's Sales HHI is the Herfindahl index based on sales over all firms residing its three digit SIC industry (averaged over the past three years). A monthly observation is tagged as an "Industry IPO flag" if the given firm resides in a three digit SIC code that experienced at least one IPO over the past twelve months. A firm is tagged as an "IPO firm" in a given month if the firm had its IPO in the last three years.

Sample	Sales HHI	Industry IPO Flag	Sales HHI x Industry IPO Flag	Number of Industry IPOs	Sales HHI x Industry # IPOs	Number of Obs.
Panel A: Sample-wide results (1972 to 2004)						
(1) All firms	–0.0039					1,785,322
	(–1.949)					
(2) non-IPO Firms in IPO industries	–0.0063					956,889
	(–2.419)					
(3) non-IPO Firms in non-IPO industries	–0.0007					672,454
	(–0.473)					
(4) All firms	–0.0007	0.0021	–0.0066			1,785,322
	(–0.473)	(1.495)	(–2.221)			
(5) All firms	–0.0010			0.0019	–0.0105	1,771,443
	(–0.463)			(1.465)	(–1.471)	
(6) IPO firms Only	–0.0130					155,979
	(–2.369)					
Panel B: Exclude hot IPO market (1999 to 2000)						
(7) All firms	–0.0024					1,632,712
	(–1.323)					
(8) non-IPO Firms in IPO industries	–0.0044					869,790
	(–1.837)					
(9) non-IPO Firms in non-IPO industries	–0.0006					625,749
	(–0.384)					
(10) All firms	–0.0006	0.0013	–0.0044			1,632,712
	(–0.384)	(1.015)	(–1.680)			
(11) All firms	–0.0001			0.0018	–0.0108	1,619,566
	(–0.058)			(1.436)	(–1.420)	
(12) IPO firms Only	–0.0120					137,173
	(–2.102)					

Table IV: Fama MacBeth regressions of unexpected profitability surprises

Explanation: The table displays Fama MacBeth regressions with t-statistics in parentheses. Panel A includes all observations from 1972 to 2004, and Panel B excludes the hot IPO market of 1999 and 2000. The dependent variable is each firm's unexpected profitability in year t. Expected profitability is obtained from Fama MacBeth regressions (unexpected profitability is the residual) of the following form as in Fama and French (2000), Vuolteenaho (2002), and Hou and Robinson (2005).

$$\frac{E_t}{A_t} = \alpha_0 + \alpha_1 \frac{V_t}{A_t} + \alpha_2 DD_t + \alpha_3 \frac{D_t}{B_t} + \alpha_4 \frac{E_{t-1}}{A_{t-1}} + \epsilon_t \tag{3}$$

$\frac{E}{A}$ is the earnings to asset ratio, DD_t is a dummy variable identifying non-dividend paying firms, $\frac{V}{A}$ is the firm market value to assets ratio, and $\frac{D}{B}$ is the dividend to book value of equity ratio. A firm's Sales HHI is the Herfindahl index based on sales over all firms residing its three digit SIC industry (averaged over the past three years). A monthly observation is tagged as an "Industry IPO flag" if the given firm resides in a three digit SIC code that experienced at least one IPO over the past twelve months. A firm is tagged as an "IPO firm" in a given month if the firm had its IPO in the last three years.

Sample	Sales HHI	Industry IPO Flag	Sales HHI x Industry IPO Flag	Number of Industry IPOs	Sales HHI x Industry # IPOs	Number of Obs.
Panel A: Sample-wide results (1972 to 2004)						
(1) All firms	0.0398					160,243
	(2.84)					
(2) non-IPO Firms in IPO industries	0.0471					108,858
	(2.63)					
(3) non-IPO Firms in non-IPO industries	0.0048					51,385
	(1.23)					
(4) All firms	0.0048	–0.0198	0.0423			160,243
	(1.23)	(–2.51)	(2.33)			
(5) All firms	–0.0005			–0.0042	0.0131	160,243
	(–0.14)			(–1.70)	(2.06)	
(6) IPO firms Only	0.0369					18,451
	(2.77)					
Panel B: Exclude hot IPO market (1999 to 2000)						
(7) All firms	0.0474					141,913
	(3.51)					
(8) non-IPO Firms in IPO industries	0.0537					95,899
	(3.11)					
(9) non-IPO Firms in non-IPO industries	0.0068					46,014
	(1.29)					
(10) All firms	0.0068	–0.0235	0.0470			141,913
	(1.29)	(–2.92)	(2.60)			
(11) All firms	0.0047			–0.0048	0.0072	141,913
	(0.84)			(–1.70)	(0.76)	
(12) IPO firms Only	0.0549					16,398
	(3.59)					

Table V: Fama-MacBeth regressions of IPO characteristics

Explanation: The table displays Fama MacBeth regressions with t-statistics in parentheses. Panel A includes all observations from 1972 to 2004, and Panel B excludes the hot IPO market of 1999 and 2000. The dependent variable varies by specification as noted. Research and Development along with Capital Expenditures are taken from COMPUSTAT, and are normalized by assets. The Venture Capital Backed dummy is one for firms financed by Venture Capital firms. Overhang is the number of shares retained by the entrepreneur (for all classes) divided by shares filed (including primary and secondary shares). A firm's Sales HHI is the Herfindahl index based on sales over all firms residing its three digit SIC industry (averaged over the past three years).

	Variable	Sales HHI Coefficient	Sales HHI t Statistic	Obser-vations	Average R-Squared
	Panel A: full sample				
(1)	Pre-IPO Research and Development	-0.126	-5.430	7,891	0.033
(2)	Post-IPO Research and Development	-0.073	-9.618	7,891	0.056
(3)	Venture Capital Backed	-0.249	-7.578	7,891	0.023
(4)	Overhang	-1.188	-2.707	7,870	0.025
(5)	Pre-IPO Capital Expenditures	-0.056	-0.799	5,780	0.088
(6)	Post-IPO Capital Expenditures	-0.016	-1.167	6,771	0.018
	Panel B: excluding 1999-2000 hot IPO market				
(7)	Pre-IPO Research and Development	-0.115	-5.101	7,068	0.034
(8)	Post-IPO Research and Development	-0.072	-9.067	7,068	0.058
(9)	Venture Capital Backed	-0.242	-7.042	7,068	0.023
(10)	Overhang	-1.217	-2.621	7,047	0.026
(11)	Pre-IPO Capital Expenditures	-0.060	-0.807	5,031	0.093
(12)	Post-IPO Capital Expenditures	-0.019	-1.285	6,006	0.019

Table VI: Fama-MacBeth regressions of risk changes

Explanation: The table displays Fama MacBeth regressions with t-statistics in parentheses. The dependent variable is the three year change in firm level HML beta (Panel A), SMB beta (Panel B), MKT beta (Panel C), and UMD beta (Panel D). The regressions includes all observations from 1973 to 2004. Risk exposures (betas) are estimated using daily data over one calendar year using the following model:

$$r_{i,t} - r_f = \alpha_1 + \beta_1\ HML + \beta_2\ SMB + \beta_3\ MKT + \beta_4\ UMD + \ \epsilon$$

The dependent variables for changes in HML, SMB, MKT, and UMD respectively, are the differences between year t and year t+3 in the estimates of β_1, β_2, β_3, and β_4. The independent variable "initial risk exposure" is the HML, SMB, MKT, or UMD beta (factor loading) from the initial year t. Three measures are taken to reduce error-in-variables. First, betas are estimated using daily data. Second, each beta is the sum of three regression coefficients: same day, past day, and one day forward. Third, all betas are winsorized at the 1% level on an annual basis. A firm's Sales HHI is the Herfindahl index based on sales over all firms residing its three digit SIC industry (averaged over the past three years). A yearly observation is tagged as an "Industry IPO flag" if the given firm resides in a three digit SIC code that experienced at least one IPO over the past year. A firm is tagged as an "IPO firm" in a given year if the firm had its IPO in the last three years.

	Sample	Risk Factor	Sales HHI	Lagged Risk Exposure	Number of Obs.
	Panel A: three-year changes in HML beta				
(1)	All firms	HML	0.1409	–0.7741	127,839
			(3.633)	(–24.277)	
(2)	Non-IPO Firms in IPO industries	HML	0.2628	–0.7733	57,383
			(3.125)	(–24.227)	
(3)	Non-IPO Firms in non-IPO industries	HML	–0.1318	–0.8257	54,579
			(–3.778)	(–27.363)	
(4)	IPO firms only	HML	0.4462	–0.7651	19,651
			(5.466)	(–30.170)	
	Panel B: three-year changes in SMB beta				
(5)	All firms	SMB	–0.0045	–0.7687	127,839
			(–0.124)	(–37.463)	
(6)	Non-IPO Firms in IPO industries	SMB	0.0160	–0.7493	57,383
			(0.229)	(–35.499)	
(7)	Non-IPO Firms in non-IPO industries	SMB	0.1596	–0.7807	54,579
			(1.863)	(–39.321)	
(8)	IPO firms only	SMB	–0.1431	–0.8804	19,651
			(–1.643)	(–44.542)	
	Panel C: three-year changes in MKT beta				
(9)	All firms	MKT	–0.0834	–0.6341	127,839
			(–3.930)	(–29.961)	
(10)	Non-IPO Firms in IPO industries	MKT	–0.1285	–0.6361	57,383
			(–1.949)	(–28.609)	
(11)	Non-IPO Firms in non-IPO industries	MKT	0.0306	–0.6577	54,579
			(1.937)	(–28.791)	
(12)	IPO firms only	MKT	–0.1517	–0.6818	19,651
			(–3.609)	(–27.966)	
	Panel D: three-year changes in UMD beta				
(13)	All firms	UMD	–0.0315	–1.0411	127,839
			(–0.952)	(–25.450)	
(14)	Non-IPO Firms in IPO industries	UMD	–0.1219	–1.0506	57,383
			(–1.340)	(–26.620)	
(15)	Non-IPO Firms in non-IPO industries	UMD	0.0016	–1.0246	54,579
			(0.064)	(–25.257)	
(16)	IPO firms only	UMD	–0.1274	–1.0419	19,651
			(–1.639)	(–23.468)	

Table VII: Calendar-time IPO portfolio abnormal returns from factor regressions

Explanation: The table reports regression interecepts and slopes (with t-statistics in parenthesis) for various calendar-time IPO portfolios based on regressions of calendar-time portfolio excess returns on the three Fama French Factors.

$$r_{p,t} - r_f = \alpha + \beta_1\ MKT + \beta_2\ HML + \beta_3\ SMB + \ + \epsilon$$

With the exception of row (1), which is based on the factors provided from Ken French's website, all specifications use HML and SMB factors constructed from a universe of firms that is purged of recent IPO firms (provided by Lougharn and Ritter (2000)). Each IPO firm enters a given portfolio in the month of its issuance, and exits the portfolios upon its third year anniversary. The table presents results both for the full sample (1973 to 2003) and for a sample that closely matches the one used in Lougharn and Ritter (2000). Each panel reports average abnormal returns for portfolios comprised of IPOs based on various groupings. In all cases, IPOs are sorted into portfolio groups using annual sorts. The Sales HHI is the Herfindahl index based on sales over all firms residing its three digit SIC industry (averaged over the past three years). The venture capital dummy is one if the firm is venture capital backed. Log IPO size is the natural logarithm of the issue proceeds. The Past 3-year Market return is the equal weighted market return over the three years preceding the issue date. The IPO ratio is equal to the number of IPOs in a given month divided by the number of publicly traded firms. The Relative IPO Market Temperature is equal to the IPO ratio in the month preceding the IPO date minus the mean IPO ratio over the past 36 months, divided by the IPO ratio's standard deviation over the past 36 months. This variable measures whether the IPO market is hot at the time a given IPO is issued.

		Whole Sample (1973 to 2003)				***Loughran and Ritter Sample (1973 to 1996)***			
	Sample	Alpha	MKT	HML	SMB	Alpha	MKT	HML	SMB
				Panel A: All IPOs (unpurged versus purged factors)					
(1)	All firms (FF factors)	–0.1971	1.1793	–0.1064	1.1421	–0.2612	1.0554	–0.1046	1.3688
		(–0.910)	(23.210)	(–1.400)	(17.410)	(–1.420)	(23.320)	(–1.410)	(20.230)
(2)	All firms (purged factors)	–0.2989	1.2531	–0.1947	1.1841	–0.4368	1.1487	–0.0594	1.3365
		(–1.320)	(23.900)	(–2.170)	(15.680)	(–2.170)	(23.920)	(–0.660)	(17.210)
				Panel B: Issued in high versus low concentration industries (purged factors)					
(3)	Issued in competitive industries	0.0444	1.3002	–0.3944	1.2928	–0.1622	1.1968	–0.1151	1.3568
		(0.170)	(21.140)	(–3.740)	(14.600)	(–0.670)	(20.720)	(–1.060)	(14.530)
(4)	Issued in concentrated industries	–0.6502	1.1982	0.0007	1.0769	–0.7257	1.0979	–0.0021	1.3127
		(–2.760)	(22.010)	(0.010)	(13.740)	(–3.130)	(19.800)	(–0.020)	(14.640)
				Panel C: VC versus non-VC backed IPOs (purged factors)					
(5)	VC backed IPOs	0.2557	1.4256	–0.6412	1.5214	0.0842	1.3474	–0.2793	1.5671
		(0.870)	(20.940)	(–5.490)	(15.530)	(0.300)	(20.090)	(–2.200)	(14.460)
(6)	non- VC backed IPOs	–0.5558	1.1664	0.0087	1.0545	–0.6913	1.0840	0.0440	1.2370
		(–2.560)	(23.230)	(0.100)	(14.590)	(–3.200)	(21.000)	(0.450)	(14.820)
				Panel D: Issued in high versus low IPO market temperature markets (purged factors)					
(7)	Issued in cold markets	–0.4051	1.2468	–0.1473	1.1779	–0.5747	1.1563	–0.0627	1.3325
		(–1.790)	(23.710)	(–1.630)	(15.590)	(–2.570)	(21.600)	(–0.620)	(15.440)
(8)	Issued in hot markets	–0.2410	1.2565	–0.2738	1.1810	–0.3567	1.1395	–0.0665	1.3057
		(–0.860)	(19.530)	(–2.480)	(12.750)	(–1.440)	(19.290)	(–0.600)	(13.680)
				Panel E: Issued in recent high versus low past three year return markets (purged factors)					
(7)	Issued after down markets	–0.3477	1.2600	–0.3002	1.1878	–0.4863	1.1785	–0.0489	1.3135
		(–1.410)	(22.130)	(–3.080)	(14.490)	(–2.110)	(21.370)	(–0.470)	(14.730)
(8)	Issued after up markets	–0.3532	1.2704	–0.0829	1.1636	–0.5342	1.1605	–0.0700	1.3244
		(–1.320)	(20.520)	(–0.780)	(13.050)	(–1.970)	(17.940)	(–0.570)	(12.660)
				Panel F: Large versus small IPOs (purged factors)					
(9)	Small IPOs	–0.1734	1.1817	–0.2357	1.3547	–0.4721	1.0944	0.0144	1.4578
		(–0.610)	(17.890)	(–2.080)	(14.240)	(–1.710)	(16.610)	(0.120)	(13.690)
(10)	Large IPOs	–0.4490	1.3254	–0.1771	0.9577	–0.4065	1.2055	–0.1935	1.1626
		(–2.020)	(25.770)	(–2.010)	(12.930)	(–1.940)	(24.040)	(–2.040)	(14.340)

Table VIII: Calendar-Time averaged abnormal returns for various IPO portfolios

Explanation: The table reports average monthly abnormal returns (with t-statistics in parenthesis) for various groups of IPOs. A monthly return in CRSP is identified as an IPO return if the given month is before the IPO's third anniversary. A firm's abnormal return is its raw monthly return minus the monthly return of a portfolio matched on the basis of NYSE/AMEX breakpoints of size, industry-adjusted book to market, and past year returns as in Daniel, Grinblatt, Titman, and Wermers (1997). Benchmark portfolios are purged of firms prior to their fifth IPO anniversary. The table presents results both for the full sample (1973 to 2003) and for a sample that closely matches the one used in Lougharn and Ritter (2000). Each panel reports average abnormal returns for portfolios comprised of IPOs based on various groupings. In all cases, IPOs are sorted into two portfolio groups using annual sorts. The Sales HHI is the Herfindahl index based on sales over all firms residing its three digit SIC industry (averaged over the past three years). The venture capital dummy is one if the firm is venture capital backed. Log IPO size is the natural logarithm of the issue proceeds. The Past 3-year Market return is the equal weighted market return over the three years preceding the issue date. The IPO ratio is equal to the number of IPOs in a given month divided by the number of publicly traded firms. The Relative IPO Market Temperature is equal to the IPO ratio in the month preceding the IPO date minus the mean IPO ratio over the past 36 months, divided by the IPO ratio's standard deviation over the past 36 months. This variable measures whether the IPO market is hot at the time a given IPO is issued.

		1973 to 2003 IPOs		***1973 to 1996 IPOs***	
	Sample	Abnormal Return	Observations	Abnormal Return	Observations
	Panel A: All IPOs (unpurged versus purged benchmarks)				
(1)	All firms	–0.3845	161,292	–0.3525	99,010
		(–1.458)		(–1.555)	
	Panel B: Issued in high versus low concentration industries (purged benchmarks)				
(2)	Issued in competitive industries	–0.0187	83,168	0.0266	51,141
		(–0.053)		(0.085)	
(3)	Issued in concentrated industries	–0.7731	78,062	–0.7584	47,838
		(–3.534)		(–3.770)	
	Panel C: VC versus non-VC backed IPOs (purged benchmarks)				
(4)	VC backed IPOs	0.1309	51,246	0.2811	28,741
		(0.276)		(0.646)	
(5)	non- VC backed IPOs	–0.6335	110,046	–0.6434	70,269
		(–3.405)		(–3.675)	
	Panel D: Issued in high versus low IPO market temperature markets (purged benchmarks)				
(6)	Issued in cold markets	–0.4224	84,738	–0.5078	52,328
		(–1.680)		(–2.012)	
(7)	Issued in hot markets	–0.3324	76,551	–0.1649	46,679
		(–1.004)		(–0.609)	
	Panel E: Performance in recent high versus low past three year return markets (purged benchmarks)				
(8)	Issued after down markets	–0.5387	84,568	–0.4343	52,156
		(–1.840)		(–1.899)	
(9)	Issued after up markets	–0.2198	76,724	–0.2640	46,854
		(–0.784)		(–0.952)	
	Panel F: Small versus large IPOs (purged benchmarks)				
(10)	Small IPOs	–0.3421	81,331	–0.4426	49,748
		(–1.233)		(–1.868)	
(11)	Large IPOs	–0.4335	79,949	–0.2692	49,250
		(–1.406)		(–0.907)	

Table IX: Two by two tables of calendar-time averaged abnormal returns for various IPO groupings

Explanation: The table reports average monthly abnormal returns (with t-statistics in parenthesis) for various groups of IPOs. A monthly return in CRSP is identified as an IPO return if the given month is before the IPO's third anniversary. A firm's abnormal return is its raw monthly return minus the monthly return of a portfolio matched on the basis of NYSE/AMEX breakpoints of size, industry-adjusted book to market, and past year returns as in Daniel, Grinblatt, Titman, and Wermers (1997). Benchmark portfolios are purged of firms prior to their fifth IPO anniversary. The table presents results both for the full sample (1973 to 2003) and for a sample that closely matches the one used in Lougharn and Ritter (2000). Each panel reports average abnormal returns for portfolios comprised of IPOs based on various groupings. In all cases, IPOs are sorted into portfolio groups using annual sorts. The Sales HHI is the Herfindahl index based on sales over all firms residing its three digit SIC industry (averaged over the past three years). The venture capital dummy is one if the firm is venture capital backed. Log IPO size is the natural logarithm of the issue proceeds. The Past 3-year Market return is the equal weighted market return over the three years preceding the issue date. The IPO ratio is equal to the number of IPOs in a given month divided by the number of publicly traded firms. The Relative IPO Market Temperature is equal to the IPO ratio in the month preceding the IPO date minus the mean IPO ratio over the past 36 months, divided by the IPO ratio's standard deviation over the past 36 months. This variable measures whether the IPO market is hot at the time a given IPO is issued.

		1973 to 2003 IPOs		***1973 to 1996 IPOs***	
	Sample	Abnormal Return	Observations	Abnormal Return	Observations
	Panel A: VC-backed Status versus industry concentration (purged benchmarks)				
(1)	VC backed Competitive IPOs	0.4250	33,101	0.5911	18,793
		(0.763)		(1.066)	
(2)	VC backed Concentrated IPOs	–0.2248	18,138	–0.0522	9,944
		(–0.490)		(–0.126)	
(3)	Non- VC backed Competitive IPOs	–0.3666	50,067	–0.4018	32,348
		(–1.391)		(–1.789)	
(4)	Non- VC backed Concentrated IPOs	–0.8865	59,924	–0.8917	37,894
		(–4.680)		(–4.278)	
	Panel B: IPO market temperature versus industry concentration (purged benchmarks)				
(5)	Cold Market Competitive IPOs	–0.1089	43,051	–0.2387	26,982
		(–0.341)		(–0.814)	
(6)	Cold Market Concentrated IPOs	–0.7700	41,661	–0.8271	25,342
		(–3.011)		(–3.017)	
(7)	Hot Market Competitive IPOs	0.0459	40,117	0.2724	24,159
		(0.101)		(0.656)	
(8)	Hot Market Concentrated IPOs	–0.7392	36,398	–0.6239	22,493
		(–2.812)		(–2.639)	
	Panel C: VC-backed Status versus IPO market temperature (purged benchmarks)				
(9)	VC backed Cold Market IPOs	0.1699	25,322	0.1207	14,691
		(0.374)		(0.243)	
(10)	VC backed Hot Market IPOs	0.2805	25,924	0.6497	14,050
		(0.473)		(1.247)	
(11)	Non-VC backed Cold Market IPOs	–0.7020	59,416	–0.8179	37,637
		(–3.440)		(–3.900)	
(12)	Non-VC backed Hot Market IPOs	–0.5609	50,627	–0.4432	32,629
		(–2.349)		(–1.878)	

Table X: Fama-MacBeth cross sectional regressions of IPO risk changes

Explanation: The table displays Fama MacBeth regressions with t-statistics in parentheses. Panel A includes all observations from 1973 to 2003, and Panel B excludes the hot IPO market of 1999 and 2000. Panel B uses a sample that closely matches the one used in Lougharn and Ritter (2000). The dependent variable is each firm's change in HML beta from the first full calendar year following the IPO date (the beginning year) until the calendar year that is three years later (the end year). Three measures are taken to reduce error-in-variables in the measurement of the HML beta. First, betas are estimated using daily data. Second, each beta is the sum of three regression coefficients: same day, past day, and one day forward. Third, all betas are winsorized at the 1% level on an annual basis. The independent variables are as follows. The initial HML beta is the HML beta computed from the beginning year. The Sales HHI is the Herfindahl index based on sales over all firms residing its three digit SIC industry (averaged over the past three years). The venture capital dummy is one if the firm is venture capital backed. Log IPO size is the natural logarithm of the issue proceeds. The Past 3-year Market return is the equal weighted market return over the three years preceding the issue date. The IPO ratio is equal to the number of IPOs in a given month divided by the number of publicly traded firms. The Relative IPO Market Temperature is equal to the IPO ratio in the month preceding the IPO date minus the mean IPO ratio over the past 36 months, divided by the IPO ratio's standard deviation over the past 36 months. This variable measures whether the IPO market is hot at the time a given IPO is issued relative to the past three years.

	Sales HHI	VC Backed Dummy	Log IPO Size	Past 3 Year Market Returns	Relative IPO Market Temperature	Initial HML Risk Exposure	Obser-vations
				Panel A: 1973 to 2003 IPOs			
(1)	0.2536	–0.5829	0.0531	–0.1740	–0.0807	–0.7943	6,024
	(2.493)	(–5.534)	(0.696)	(–0.982)	(–0.932)	(–24.967)	
(2)	0.6934	–0.3780				–0.9654	6,025
	(1.930)	(–2.426)				(–8.557)	
(3)	0.8595					–0.8482	6,025
	(2.190)					(–10.187)	
(4)		–0.3287				–0.9289	6,025
		(–1.507)				(–7.623)	
(5)			0.0279			–0.7895	6,024
			(0.466)			(–18.095)	
(6)				–1.6957		–0.7684	6,025
				(–1.848)		(–17.605)	
(7)					0.3198	–0.7673	6,025
					(1.109)	(–13.521)	
				Panel B: 1973 to 1996 IPOs			
(8)	0.1427	–0.5986	0.0631	–0.1719	–0.0921	–0.7963	4,467
	(1.329)	(–4.812)	(0.688)	(–0.818)	(–0.882)	(–20.906)	
(9)	0.6714	–0.3498				–1.0017	4,468
	(1.544)	(–1.882)				(–7.393)	
(10)	0.8622					–0.8677	4,468
	(1.814)					(–8.658)	
(11)		–0.2863				–0.9593	4,468
		(–1.093)				(–6.531)	
(12)			0.0281			–0.8004	4,467
			(0.394)			(–15.371)	
(13)				–1.9953		–0.7736	4,468
				(–1.810)		(–14.794)	
(14)					0.3890	–0.7722	4,468
					(1.118)	(–11.308)	