Founders, Private Equity Investors and Underpricing in Entrepreneurial IPOs

Abstract

One of the most important events in the life of an entrepreneurial firm is when it undergoes an IPO. Combining signaling theory with research on the role of information asymmetry in pricing of IPOs, this study examines the performance outcomes of two distinct types of agency conflicts at the time of the IPO: adverse selection and moral hazard. Empirical results show a curvilinear (U-shaped) relationship between founders’ retained equity and underpricing. This suggests that founders’ retained ownership in an entrepreneurial IPO limits adverse selection problems and the associated IPO underpricing; however, at some point entrepreneur’s investment and risk become so great that entrepreneurs may no longer act rationally and moral hazard increases. Empirical findings also indicate that the retained ownership of business angels has a stronger mitigating effect on adverse selection and moral hazard problems than do venture capitalist investors.
Founders, Private Equity Investors and Underpricing in Entrepreneurial IPOs

An Initial Public Offering (IPO) can provide an entrepreneurial firm with critical resources for its future expansion. It can also provide the entrepreneur with the first substantive access to cash from their investment of time and resources in the entrepreneurial effort. Underpricing of the stock at the IPO, the difference between the initial price at which a firm’s stock is offered and the closing price of the stock on the first day of trading, is a major concern to the entrepreneurial firm and to the entrepreneur since it represents value the market ultimately sees in the stock but which the firm/entrepreneur did not obtain when the stock was first offered for sale (Daily et al., 2003; Ibbotson et al., 1988). Previous studies indicate that governance characteristics of IPO such as the presence of a founding entrepreneur ownership structure (Brennan and Franks, 1997; Filatotchev and Bishop, 2002), and the presence of “certifying” investors such as private equity investors (Daily et al., 2003) can signal the expected value of an IPO firm which in turn limits underpricing. But the prior research efforts have examined each of these characteristics individually. As yet, there is very little integrative research on the simultaneous effect of these corporate governance characteristics on the IPO underpricing.

This paper examines IPO underpricing in a sample of UK entrepreneurial IPOs where founders retain a significant ownership stake. The study combines both IPO signaling and agency (Jensen and Meckling, 1976) perspectives (Sanders and Boivie, 2004) Signaling research suggests that underpricing can be reduced by idiosyncratic signals through which an IPO team conveys information about the firm’s quality to outside parties (Sanders and Boivie, 2004).

1 Researchers commonly focus on a one day window (trading at the end of day one) when evaluating underpricing (Lowry and Schwert, 2002; Loughran and Ritter, 2004). A few studies have examined trading at the end of one month. However, the longer the time from the IPO the more other information and market fluctuations can be
Agency-based studies argue that these signals may be associated with the firm’s ownership structure and the governance roles of early stage investors (Barry et al., 1990; Filatotchev and Bishop, 2002).

This paper extends IPO studies in three ways. The first, and most significant contribution, is the exploration of agency conflicts, not as a unitary concept as has been done in prior research, but instead as two distinctive types of agency problems (adverse selection and moral hazard). We analyze the effectiveness of firm-level signals associated with ownership patterns with regard to each of these types of agency problems within entrepreneurial IPO firms. Second, in contrast with prior research which tends to either treat outside investors such as private equity investors as a unitary group, or to not define exactly who are included in such designations (i.e., Brav and Gompers, 2003), we compare the governance roles of two types of IPO private equity investors - “formal” (venture capitalists) and “informal” (business angels) private equity investors. A third contribution is that we develop our arguments in the context of founder entrepreneurs who lead IPOs; that is we examine IPOs where the original founders retain equity stakes and board positions. This environment, unlike the Berle and Means model of agency conflicts in public companies with dispersed ownership, offers a setting where the founders of IPO firms are typically the largest shareholders and they retain their majority control even after the IPO (Wasserman, 2003). Therefore, these firms provide a unique laboratory to test various assumptions of the agency and signaling perspectives since potential problems of adverse selection and founders’ opportunism may be particularly explicit in this important segment of IPO market.

argued to affect the stock price. Additionally, the concern here is the value of the stock that the IPO entrepreneurial founder does not receive thus a one day window appears the most appropriate.
To test the research hypotheses, we use a sample of IPOs in the United Kingdom (UK). As result the last contribution of the paper is to take IPO research outside the United States (US) context which helps to generalize our understanding of IPO agency problems in different country environments. This contribution is greater than simply looking at IPOs in a different country. The UK private equity industry is different from the US industry in that venture capital firms focus on later stage ventures and management buy-outs. At the same time, the UK has developed communities of business angels that are playing an increasingly important role in financing new ventures (Freear et al., 2002). These institutional aspects of the UK IPO market provide an opportunity to develop a more general analysis of entrepreneurs’ signaling strategies in the context of public listings.

**Review of Literature**

Information asymmetries, or differences in information between the various parties to the listing process, including the IPO firm, banks-underwriters, entrepreneur, and external investors has been the foundation of prior investigations of underpricing (Ritter and Welch, 2002: 1807). Results of information asymmetry are two distinctive types of agency problems - adverse selection and moral hazard. To illustrate adverse selection agency conflict a manager may not accurately reveal all he/she knows about a firm. Specifically, at IPO this may take the form of overly optimistic estimates of the firm’s revenues by one of these parties. These overly optimistic estimates can increase the expected value of the firm and in turn increases the rewards from the IPO and are a type of adverse selection agency conflict (Stein, 1998). Moral hazard problems emerge when information asymmetries make it is possible for managers to shirk their duties and not act at maximum efficiency and effectiveness for the firm (Nygaard and Myrtevit, 2000). As a result of these information asymmetries, there are potential agency costs when a
firm experiences an IPO since managers may not reveal actions within the firm or do not take certain actions that maximize the firm benefit (Sanders and Boivie, 2004).

At IPO investors recognize the potential impact of the agency costs associated with information asymmetries, and protect themselves in part through underpricing of the IPO. However, the IPO team may use signals that allow potential investors to better understand the true value of the firm and the risks of agency problems which in turn can reduce underpricing (Sanders and Boivie, 2004). A signal involves a costly action which, because of its cost, is not likely to be done in settings where there is a low-quality entrepreneurial venture (Spence, 1973). But signals are not universal in the issues they address. For example, adverse selection agency conflict needs signals that validate that the entrepreneurial firm is presenting accurate information while moral hazard agency conflict needs signals that the entrepreneurial firm is being appropriately monitored.

Within this framework, our research is focused on two types of potential signals. Prior research recognizes that entrepreneurs themselves can provide signals that are difficult to imitate and which provide an indication of the IPO firm’s value (Brennan and Franks, 1997). Another potent type of signal comes from outside investors in the firm. Such private equity investors “certify” the potential value of the IPO firm and differentiate it from other listed firms (Daily et al., 2003). In this paper, we build on previous research and analyze how these two broad categories of signals (entrepreneur-related and outside investors) act in tandem and affect both adverse selection and moral hazard problems in IPO firms.

**Entrepreneur-Founder**

Previous studies that have focused on the entrepreneur himself or herself as a signal have principally been concerned with the effects of their retained share ownership on investors’
perceptions of possible agency costs (see Brennan and Franks, 1997, for a discussion). Since entrepreneurs have superior information about their ventures, they may be reluctant to fully disclose proprietary information to potential IPO investors. This may result in potential adverse selection costs (Shane and Cable, 2002). Alternatively, entrepreneurs can engage in opportunistic and self-seeking behavior when they disclose information, which may lead to moral hazard costs (Jensen and Meckling, 1976).

Signaling theory suggests that entrepreneurs may mitigate the agency problems by taking actions which will prove to be costly to those entrepreneurs in lower quality ventures. In other words, the cost of actions undertaken by entrepreneurs in high quality IPO firms is high enough to discourage entrepreneurs from employing them in low quality IPO firms (Downes and Heinkel, 1982). One potentially costly action which can signal that entrepreneurs expect high value from the venture is by retaining significant ownership in the venture after the IPO (Leland and Pyle, 1977).

An IPO represents the first and most important “liquidity event” which the founders and early stage investors can use to appropriate a proportion of wealth associated with the venture (Daily et al., 2003). After the IPO, the founders’ and early stage investors’ shareholdings are usually determined by a lock-up agreement that prevents sales of shares for a specified period of time, but they have a considerable discretion in terms of how many shares they would like to retain in the process of listing. In addition, there is evidence that there are often large amounts of stock released after the IPO as covenants of the lockup agreement are waived (Brav and Gompers, 2003). Therefore, although entrepreneurs look to get outside investors to invest in the venture at the time of an IPO, they will seek to maintain the maximum level of ownership if they believe the venture will ultimately have a high positive value. This action is costly for the
entrepreneur since s/he forgoes diversification of his/her personal portfolio (Downes and Heinkel, 1982: 3). Thus, high level of ownership by the entrepreneur signals that she/he believes there is high value in the venture, and this signal in turn reduces the adverse selection problem for IPO investors (Prasad et al., 2000). This will also lead to greater alignment of interest with other investors, and signals that the entrepreneur will aggressively seek to make decisions that maximize the value of the venture (Jensen and Meckling, 1976). Thus, the ownership level of the entrepreneur also reduces the moral hazard problem.

While signaling theory would indicate that increasing ownership would lower underpricing, there may be limits to the potential value of ownership by the founding entrepreneurs (Bruton, et. al., 2000). A number of studies indicate that a high level of insider ownership may contribute to their entrenchment, and may create conflicts of interests with external shareholders when insiders obtain private benefits of control at the expense of minority shareholders (Mello and Parsons, 1998; Sapienza et al, 1996; Schulze et al., 2003). Busenitz et al. (2005) find that high levels of ownership and personal net worth invested in a venture by founding teams do not provide a valid signal of actual success to venture capitalists in the US. Looking outside of the US, Roosenboom and Schramade (2006) suggest that owner-managers in French IPOs often pursue their own interests, usually at the expense of minority shareholders. Therefore, there may be a trade-off between incentive alignment and entrenchment effects associated with insider ownership. As a result, the effects of founder ownership on IPO underpricing may be non-linear. In line with signaling research, entrepreneurial stock ownership may signal high levels of commitment that mitigate adverse selection problems and reduce underpricing, but only up to some point. An increase in the founder-entrepreneur’s stock ownership beyond that point can lead to increasing levels of moral hazard problems associated
with entrenchment and conflicts with other investors. As a result, high levels of entrepreneurial ownership may be interpreted as negative signals by investors after some point, and lead to an increase in underpricing\(^2\). Hence:

\textit{Hypothesis 1: There is a curvilinear (U-shaped) relationship between underpricing and retained (post IPO) ownership by the founding entrepreneurs: Underpricing first decreases and then increases with an increase in founding entrepreneurs’ retained ownership.}

\textbf{Outside Investors}

As entrepreneurial firms gradually “professionalize”, they increasingly look outside for financial recourses provided by various early stage investors. Principal among early stage investors are private equity investors who are the second most important group of shareholders, after founders, in an entrepreneurial venture (Lerner, 1998). Agency research and related “certification” framework (e.g., Barry et al., 1990; Black and Gilson, 1998; Lerner, 1995) suggests that an entrepreneurial venture can signal its expected value by who has invested in the firm. This is because successful investors’ time and ability to invest in numerous new ventures is limited so they will invest in those ventures they feel will be the most successful. Thus, private equity investors would be expected from an agency perspective to be involved with those ventures they feel are going to be successful and as a result their presence can certify to public investors the value of the IPO firm.

This perspective places an emphasis on the roles of private equity investors in the price discovery process at the time of an IPO, and argues that they may reduce the information asymmetry at the time of the issue, and their presence can have a value-enhancing effect (Lerner, 1997). Supporting these arguments, Smart and Zutter (2003) show that underpricing is lower in IPOs with dual class shares that give insiders relatively more control. Although their findings were questioned in a later study by Aruğaslan et al. (2004), this research explicitly suggests that insiders in the IPO firm may behave opportunistically and try to reduce the extent of monitoring by external investors.

\(^2\) A number of studies argue that insiders may try to reduce monitoring by rationing share allocation and increasing underpricing (Brennan and Franks, 1997). Supporting these arguments, Smart and Zutter (2003) show that underpricing is lower in IPOs with dual class shares that give insiders relatively more control. Although their findings were questioned in a later study by Aruğaslan et al. (2004), this research explicitly suggests that insiders in the IPO firm may behave opportunistically and try to reduce the extent of monitoring by external investors.
Thus, the presence of private equity investors can mitigate the adverse selection problem in an entrepreneurial venture. Depending on their retained ownership, early stage investors may have the incentive to be involved in the decision-making process and to exert a significant influence on management before and after flotation. Since seed and development funding normally causes dilution of initial founders’ holdings, it can create a misalignment of incentives in issuing firms. The private equity firms design their contracts to reduce this information asymmetry and maximize the disclosure of private knowledge by the entrepreneur-founder (Shane and Cable, 2002). As a result, private equity investors can act as a signal about the value of the entrepreneurial venture and limits it underpricing. Hence:

*Hypothesis 2: The greater the private equity investors’ retained ownership in the new venture the lower the underpricing of the firm’s IPO.*

The prior hypothesis addresses private equity investors as a group. This approach has been the typical view of prior research. But private equity can involve different types of investors. Specifically, venture capitalists and business angels are both two central types of private equity investors who may both play a “certification” role in reducing information asymmetries and adverse selection costs associated with the IPO firm. To date, despite the theoretical arguments which would indicate that private equity investors should send a strong signal about the value of the new venture, empirical evidence that supports their value as a signal to investors is patchy. Daily et al. (2003), for example, found in their meta-analysis that venture capital investment does not reduce underpricing. This meta-analysis was not, however, clear on how the different studies define venture capitalists. Often researchers combine two distinct types of private equity investors, venture capitalists and business angels, and refer to both as venture capitalists. While the capital sourced by both may indeed be private equity, the two sources of capital themselves are distinctly different. Venture capital is provided by formally organized
funds while business angels are an informal source of capital. Venture capitalists and business
angels play roles that can be complementary in financing the firm. Business angels often provide
funds at an earlier stage in the investment life-cycle of a firm at a time when the venture is too
small and too risky for venture capitalists (Lerner, 1998; Prowse, 1998). The venture capitalist
then invests in the new venture as it becomes more mature and established (Lerner, 1995). Prior
research has tended to combine such private equity investors into a single group. However, a
number of studies suggest that they have different incentive systems and monitoring capacities
(Shane and Cable, 2002), and, therefore, angels may differ in terms of their effects on moral
hazard problems associated with managerial opportunism.

One of the principal differences between the two types of private equity is that the
venture capitalist invests largely for others, although many limited partners will not join a
venture capital fund unless the venture capitalists co-invest their personal saving. In contrast,
business angels invest totally for themselves (Wetzel, 1983), so even if the venture capitalist
heads a limited partnership there is a less direct monitoring incentive than if all the funds were
their own. As a result of this difference there is also a difference in agency risk (Fiet, 1995)
which may lead to differences in the monitoring mechanisms adopted by venture capitalists and
business angels with the later being more active at monitoring (Prowse, 1998; Osnabrugge,
2000). In addition, business angels are under less pressure to cash in their investment and exit
the venture, and this extends their time horizon (Shane and Cable, 2002). In the UK, venture
capital firms are mainly focused on later stage ventures and management buy-outs, and they
normally exit their investments when the lock-up agreement expires after the IPO (Wright et al.,
1997).
Considerably less is known about business angels than about venture capitalists (Sohl, 1999). In large measure this is because they are wealthy, successful individuals, and there is limited reporting required from them about their activities. However, business angels are generally seen as investing on the basis that they trust the entrepreneur (Fiet, 1995). In addition, some studies suggest that business angels may be considered to be patient investors (Sohl, 1999). The time pressures of either being in a limited partnership or working for a financial institution such as a bank places pressures on the venture capitalist to obtain fast results. But since they are investing for themselves business angels can be more patient for the firm to perform as desired. The fact they invest for themselves also means that they do not have to exit the invested firm in the way a venture capitalist may need to since there are limits on the time a limited partnership can exist while angels have no set time limits.

A number of studies investigate informal ties between business angels and entrepreneurs that may enhance their monitoring capacity. For example, business angels have a preference to invest in closer geographic area than do venture capitalists (Sohl, 1999). The closer the funded firms are the easier it will be for the business angel to monitor them. The business angel also is more likely to invest with those that they have contact with (Mason and Harrison, 2002). The result of these direct social ties is that they provide a mechanism to the business angle to obtain private information about the quality of entrepreneurs’ talents and their tendency to behave opportunistically. These informal ties also generate obligations that mitigate self-interested behavior of founders (Shane and Cable, 2002).

These arguments suggest that, although business angels and venture capitalists may provide similar, ex ante “certification” signals, their ex post monitoring capacities and incentives may differ. As a result, business angels’ involvement in the venture at the time of IPO may be a
more potent signal of superior monitoring that mitigates potential moral hazard costs of
founders’ opportunism.

Hypothesis 3: The mitigating effect of the business angels’ retained ownership on
underpricing of the firm’s IPO is higher than that of the venture capitalists’ retained
ownership.

Database and Methodology

Sample

Since our research is focused on an interplay between entrepreneur/founder
characteristics and early stage investors, we constructed a sample of entrepreneurial IPOs (i.e.,
firms that are floated by their original founder) using a multi stage data collection procedure.
Initially, we compiled a list of all IPOs that have been floated on the London Stock Exchange
(LSE) and the Alternative Investment Market (AIM) from 1 January, 2000 to 1 January, 2003.
We obtained our primary list of IPOs from the London Stock Exchange New Issues files. We
gathered additional information from the AIM Market Statistics publications. From the original
list of 631 IPOs, we excluded re-admissions and transfers from the main market to AIM. In line
with previous IPO studies we also excluded flotation of unit and investment trusts and focused
on manufacturing and services firms (Beatty and Ritter, 1986; Beatty and Zajac, 1994). We also
excluded listings which represented investment and acquisition vehicles because their
governance systems were extremely simplified and their management teams resemble investment
committees of private equity firms. Next, we excluded all IPOs that represented de-mergers,
corporate spin-offs, reverse takeovers, equity reorganizations, and flotations of MBO/MBI firms
since these are more mature firms that are associated with less extensive information
asymmetries compared to entrepreneurial ventures. Finally, we required that all firms’ founders
still remained as board members and/or block-shareholders at the time of IPO. After these steps, the final sample included 275 entrepreneurial IPOs.

Our main variables of interest were obtained from the information provided in the IPO prospectuses that contained detailed information on the career histories and pre- and post-IPO ownership of managing officers and other board members. The IPO prospectuses were obtained from the Thomson One Banker database that comprehensively covers companies’ files for publicly quoted firms in the U.K. The missing listing prospectuses were collected directly from the firms and/or their advisors by sending written requests. The stock market-related data were obtained from Datastream.

**Measures – Dependent Variable.**

To measure the IPO’s Underpricing we used the percentage difference between the offer price and the price at the end of the first day of trading (e.g., \[
\frac{\text{end 1st day price}}{\text{initial price}} - 1
\]). This is consistent with prior IPO literature (e.g., Barry et al., 1990; Certo et al., 2001; Filatotchev and Bishop, 2002).

**Measures – Independent Variables.**

In the UK listing prospectuses provide data on pre- and post-IPO ownership structure including equity stakes of individual and institutional investors. Previous research has identified equity retention by early stage investors as a signal that outside investors consider when evaluating the IPO firm. This information is disclosed before an IPO, and, therefore, using retained ownership disclosure does not create a causality problem when studying factors affecting underpricing. One way to measure the extent of retention is to use the ratio of the shares retained to the shares held before IPO. However, this may distort the hypothesized incentive/entrenchment effects of the retained equity since it does not differentiate between
investors’ absolute shareholdings before and after an IPO. Therefore, we followed previous studies and used the percentage ratio of the total number of ordinary shares a particular early stage investors owned after the IPO to the total number of the firm’s shares after the IPO as a driver of incentives and/or entrenchment effects associated with share ownership (Brennan and Franks, 1997; Filatotchev and Bishop, 2002; Chahine et al., 2006; Wright et al., 2007).

*Founders’ Ownership* was measured by the percentage ratio of the total number of ordinary shares the founders owned after the IPO to the total number of the firm’s shares outstanding after the IPO as reported in the listing prospectus. Although the UK IPOs do not usually involve dual class shares (see Smart and Zutter, 2003, for a discussion of possible effects of dual class shares on underpricing) the founders’ ownership variable included shareholdings whose voting rights have been effectively controlled by the founders through various trusts, as well as stakes owned by outside firms which the founders controlled. This latter measure allowed us to account for an “ownership pyramid effect” that may increase founders’ voting powers beyond their immediate share ownership.

*External Investors’ Ownership.* Similarly to the founders’ ownership variable, we measured the venture capitalist equity by the percentage ratio of the total number of ordinary shares retained by venture capitalists after the IPO to the total number of the firm’s shares outstanding after the IPO as reported in the listing prospectus. We identified venture capital firms from the British Venture Capital Association 2000/2001 Directory, 2000 Pratt’s Guide to Venture Capital Sources, and 2000/2001 Venture Capital Report Guide to Venture Capital in the U.K. (see Lerner, 1995, for a discussion of these sources of information).

The business angels were identified from the “Other substantial interests” section in the prospectus. This section contains ownership by individual persons that had invested in the
venture as private individuals, and we made sure that the identified individuals are not associated with founders, other board members, senior managers, and venture capital investors. Where possible, we verified business angels using the *British Business Angel Association*’s directory. Business angel equity is measured by the percentage of the total number of ordinary shares retained by business angels at the IPO, similar to the venture capital ownership variable.

**Measures - Control Variables.**

Previous research acknowledges the importance of firm size and age in determining organizational performance (Amit et al., 1990; Mikkelson et al., 1997). The IPO’s size was measured in terms of the logarithm of the firm’s capitalization at the offer price. IPO age was measured by the number of years elapsed between the firm’s founding date and its IPO date. The IPO firms come from a variety of industries and the IPO could be impacted by potential investors’ assessment of the industry risk of particular IPOs. Therefore, to control for the riskiness level of IPO firms, we used a “Hi-tech” dummy variable that was equal to one if the firm was from the information technology and software sectors. Following more recent studies we added two more firm-specific variables that approximate the risk of the IPO firm. First, we introduced a dummy which was equal to 1 if the firm made a net loss in the year prior to the IPO date, and zero otherwise. Second, we used the standard deviation of the stock return during the 30 days following the end of the first day of trading. Using the ex-post return standard deviation as a measure of the ex-ante perception of risk involves assumptions about the market's ability to foretell the future; previous studies (e.g., Bhagat and Ranjan, 2004) suggest that this proxy of the ex-ante uncertainty of the IPO firm is statistically significant in explaining underpricing.

Prior research suggests that the certification role played by more prestigious underwriters allows for a lower underpricing (Beatty and Ritter, 1986). More recently, Cooney et al. (2001)
found a positive association between underpricing and underwriter reputation. This is consistent with the agency argument of Loughran and Ritter (2004) where underwriters may seek their own advantage by charging lower fees, and leaving more money on the table leading to higher underpricing. Hence, our empirical investigations also controlled for the underwriter reputation using a dummy variable equal to 1 for more prestigious underwriters, and zero otherwise. More prestigious underwriters included the top 10 UK underwriters based on their cumulative market share over the period 1996-1999, as well as the most prestigious international underwriters as ranked in Loughran and Ritter (2004). Further sensitivity analysis of the underwriter reputation calculation method indicates a stable ranking over the study period.

Stock market conditions vary with time, and there are periods when IPO investors exhibit (periodic) over-optimism (Finkle, 1998; Derrien and Womack, 2003). These periods are characterized by large positive short-run stock returns and a large number of new issues. To control these time affects on IPOs, we constructed two proxies for market momentum. A “Market return” variable was calculated as the weighted average of the buy-and-hold returns of the AIM index in the three months before the IPO date. The weights were equal to 3 for the first month, 2 for the second month and 1 for the third month before the offering, and the weighted sum was divided by 6. In addition, a “Market volatility” variable was calculated as the standard deviation of the one-month returns of the AIM index in the immediate month before the IPO first-trade date (see Derrien and Womack, 2003, for a discussion).

Finally, we included a number of founder-related characteristics as controls. Certo et al. (2001) and Wasserman (2003) provide evidence that founder-entrepreneurs who are also the CEOs of their firms may have a strong impact on organizational outcomes, including performance. Therefore, we included a Founder-CEO dummy variable in our analysis. Using a
sample of UK IPOs, Filatotchev and Bishop (2002) provide evidence that underpricing may be affected by founders’ human and social capital. Consistent with this research, we operationalized founders’ human and social capital by their external board positions or “board interlocks” (Carpenter et al., 2004). We calculated founders’ external board positions as those held in other firms at present and over the last five years before the IPO, which we obtained from the “Other Directorships” section of the prospectus (Finkle, 1998; Higgins and Gulati, 2003). A five-year period is a standard reporting cut-off date used in listing prospectuses in the United Kingdom (Filatotchev and Bishop, 2002).

**Testable Model**

To test our research hypotheses we used the following regression model:

\[
\text{Underpricing} = \alpha + \beta_1 \text{Founder ownership} + \beta_2 \text{VC ownership} + \beta_3 \text{BA ownership} + \beta_4 \text{Founder experience} + \beta_5 \text{Founder-CEO dummy} + \beta_6 \text{Log size} + \beta_7 \text{age} + \beta_8 \text{Hi-tech dummy} + \beta_9 \text{Loss dummy} + \beta_{10} \text{Aftermarket std. dev.} + \beta_{11} \text{Underwriter Reputation} + \beta_{12} \text{Market return} + \beta_{13} \text{Market Volatility}
\]

However, previous research suggests that founder ownership may be endogenously related to firm characteristics and involvement of outside investors (Wright et al., 2007). In order to deal with this endogeneity problem we used the 2SLS regression methodology that produces a consistent estimator when the explanatory variables are correlated with the error terms. This procedure requires an instrument that does not belong to the explanatory equation, which is correlated with the endogenous variable, and uncorrelated with the error term. The first stage of 2SLS analysis provides an estimate of the endogenous variable. This estimate is uncorrelated with the disturbance term of the endogenous variable and is used in the second stage as a substitute for the endogenous variable. We used the number of founders on board as an instrument variable for founder ownership. We believe this variable satisfies the necessary
conditions for a valid instrument for two reasons. First, founder ownership mechanically increases with the number of founders. Second, previous research associates founders’ equity with their power within organizations (Adams et al., 2005), and the number of board positions occupied by founders is another common proxy for founders’ power.

Empirical Results

Descriptive Statistics

Table 1 (panel A and B) presents the correlation matrix and descriptive statistics for the study’s variables. The average size (capitalization at the IPO) for the firms in the sample was £27 million (approximately $US 54 million) and they were 6 years old. The average level of underpricing in the sample is 14.2 percent, which is similar to the figures reported in other IPO studies (e.g., Certo et al., 2001; Brennan and Franks, 1997). The data suggests that underpricing is a widespread phenomenon even after the burst of “Internet bubble” of the late 1990s. Table 1 also shows that founders are by far the predominant group of insider shareholders, retaining 32 percent of voting shares after the IPO on average. Venture capital firms and business angels retain 4.1 and 5 percent of shares respectively.

The number of founders variable is significantly correlated with the founder ownership variable, whereas it is insignificantly related to underpricing. This confirms the choice of the Number of Founders as a valid instrument for founders’ ownership.

---TABLE 1 NEAR HERE---

Table 2 provides the average ratios of the shares retained after the IPO by the three groups of early stage investors relative to the number of shares they held before IPO. It shows that the founders’ shareholding falls almost by 24% in the IPO process followed by business angels (23%) and venture capitalists (15%). Our sample did not include cases where share
ownership of all early stage investors remained unchanged. This confirms our expectations that the retained ownership is a decision-making outcome that should have expected signaling characteristics.

---TABLE 2 NEAR HERE---

Underpricing, Founders and Private Equity Investors

Table 2 presents the results of the regression analysis of factors affecting underpricing as the dependent variable. In Model 1 we used the linear OLS regression analysis which shows that among our main explanatory variables only share ownership of business angels has a negative and significant effect on underpricing ($p=10\%$), in line with Hypothesis 3. However, Model (1) considers the exogenous determination of post-IPO shares ownership by founding entrepreneurs. Indeed, the decision to retain shares by founders may be affected by the extent to which private equity investors retain their shares. In other words, the signaling role of founder ownership depends on the signal provided by the involvement of other shareholders, such as venture capitalists and business angels.

---TABLE 3 NEAR HERE---

A Hausman (1978) specification test indicated potential endogeniety of the founders’ equity (at the 1 percent significance level). This suggests that the OLS estimations with founders’ equity used as an exogenous variable may generate inconsistent results. Model 2 includes the regression run for post-IPO founding entrepreneurs’ ownership using the “Number of founders” as an instrument variable. It shows that founders’ equity is positively associated with the number of founders, and it is higher when a founder is also the CEO. Founders are more likely to retain ownership in high-tech and profitable firms, whereas private equity investors have a negative effect on founders’ shareholding.
To verify the robustness of our estimations we performed a number of further tests. First, we used Sargan test to confirm that we do not have a problem with overidentifying restrictions. Second, we used the Pagan-Hall test for the presence of generalized heteroskedasticity. This test showed a small test statistic of 0.23, which does not reject the null hypothesis of homoskedasticity. We also performed the Breusch-Pagan test and the White’s general test, and both did not show evidence of heteroskedasticity in our model.

Model 3 provides the results of 2SLS analysis of underpricing controlling for the endogenous level of founder ownership and using Model 2 as a first stage. Model 3 exhibits a positive and significant linear effect of founders’ share ownership on underpricing ($p=10\%$). This suggests that founders are more likely to entrench at higher levels of ownership, which increases underpricing.

Model 4 investigates our hypothesized non-linear association between underpricing and founder ownership. Consistent with Hypothesis 1, it shows evidence of a curvilinear (U-shaped) relationship between retained (post IPO) ownership by the founding entrepreneurs and underpricing: underpricing first decreases and then increases with an increase in founding entrepreneurs’ retained ownership. These results are represented in Figure 1 which shows that incentive alignments dominate this relationship first, and are then dominated by conflicts of interest when founder ownership is higher than 32 percent. Thus, Hypotheses 1 is supported.

---FIGURE 1 NEAR HERE---

Both Models 3 and 4 confirm the negative and significant relationship between business angel ownership and underpricing ($p=5\%$), and the insignificant effect of venture capitalist
ownership. Taken together, these results partially confirm Hypothesis 2. However, looking deeper the results are more in line with the prediction of Hypothesis 3. The involvement of business angels represents thus a more potent signal of the quality of IPO firm than does the involvement of venture capitalists. Thus, Hypotheses 3 is supported. Therefore, the partial support for Hypothesis 2 (the impact of all private investors ownership and underpricing) is at least in part driven by the results on business angels.

In terms of control variables, Table 3 indicates that underpricing increases with an increase in the uncertainty associated with the IPO firm. Both the Loss dummy and Aftermarket standard deviation variables as proxies of the IPO uncertainty are positive and statistically significant at the 5 percent significance level. Finally, consistent with Derrien and Womack (2003), underpricing is positively and significantly related to market momentum variables.

As a robustness check, we replaced founder ownership variable in our 2SLS analysis with all shares of insiders combined. The results show that both the linear and quadratic combined share ownership variables do not have significant effects on underpricing. This suggests that, in the specific context of IPOs, the impact of insider ownership is not one of insiders per se, but rather one of entrepreneur-founders, in line with our theoretical arguments.

Previous research indicates that VCs tend not to hold a significant number of shares subsequent to the IPO, and once the lockup period expires there is usually a flurry of sales by the VCs (Osnabrugge, 2000). We replaced the number of shares that is retained by the VC with a dummy variable which indicates whether the IPO firm is VC backed or not. However, the regression coefficients for this dummy variable were insignificant.

Discussion and Conclusions
Theoretically this research extends agency theory by integrating two distinct types of agency conflicts at the time of the IPO (adverse selection and moral hazard) into the understanding of underpricing. The support for a curvilinear (U-shaped) relationship between founders’ retained equity and underpricing demonstrates that each type of agency risk plays a role in underpricing. The founder’s ownership works increasingly to control one of these agency risks (adverse selection) however as ownership raises higher ultimate moral hazard agency risk increases and raises underpricing. This finding not only improves our understanding of agency theory but also enriches the literature on the signalling effects of founders’ share ownership (e.g., Brennan and Franks, 1997). The results show that founders’ retained equity may create a trade-off between incentives alignment (e.g., Jensen and Meckling, 1976) and entrenchment effects (e.g., Filatotchev, 2006). Our results are robust when we control for a potential endogeniety of the founders’ retained equity variable, and this represents a methodological advance with regard to previous studies.

The separation of private equity investors into venture capitalists and business angels in this research also provides further important insight. The findings here indicate that business angels’ retained share ownership is a more powerful signal of the venture’s quality than venture capital investment. Previous research generally emphasizes similarities between financing decisions of VCs and angel investors (see, for example, Shane and Cable, 2002, for a discussion of investors in high technology ventures in the US). Our research suggests the importance of recognizing the differences in venture capitalists and business angels in the context of the stock market evaluation of quality of IPO firms. The research therefore has strong implications for studies of the short-term IPO performance and venture capital. The results indicate in a manner
consistent with Busenitz et al. (2005) arguments that there is a need for more refined and specific examinations of signaling theory.

The results also suggest that founders’ characteristics, such as external board “interlocks” and CEO position may have significant effects on investors’ perception of the IPO’s value. Sanders and Boivie (2004) argue that an IPO firm has a number of potential “signals” that it can use to communicate its (expected) value to external investors, and this study re-enforces their arguments by suggesting that these signals can be used as complements or substitutes in the IPO process. The results here indicate that cognitive and institutional aspects of founders’ extra-organizational links may be another set of very potent signals that investors consider when evaluating the quality of an IPO.

For entrepreneurial firms the IPO is both a sign of a high degree of success to date and an indication that the firm will have greater resources to pursue its strategic goals in the future. For the entrepreneurs, who are often referred to as “paper millionaires” until the IPO stock market flotation, the IPO is the first opportunity to actually obtain cash from their entrepreneurial venture. The IPO is thus a highly significant event of the entrepreneurial firm, where underpricing can steal part of the benefit that the entrepreneurial firm and the entrepreneur may seek from the IPO. This research extends our understanding of how underpricing can be limited in the IPO process. It sheds light on the role played by founder and private equity investor ownership and informs future research on this important event in the life of an entrepreneurial firm.

Future Research

Our findings set the stage for further research on signalling theory and IPOs. It was highlighted in the introduction that the IPO represents typically the first key opportunity for the
entrepreneur and others to be able to obtain cash for their investment of time and money in the
venture. Thus, there is a strong desire for the IPO to suffer as little underpricing as possible.
Within this context, we have examined several key signals that can help limit such underpricing.
But there are other potential signals. For example, it has been argued that the financial
intermediaries associated with the IPO can have a significant impact on underpricing (Brau and
Facett, 2006). It has similarly been argued that the lockup period can impact underpricing, with
longer lockup periods leading to lower underpricing (Brau and Facett, 2006). These factors and
other potential signals need to be examined.

The key to such future research is employing finer grained methods which allow richer
insights to be drawn. As discussed earlier in the paper, the inconclusive results seen in much of
the prior research on signalling is likely in part due to the coarse methods that have been used.
Greater specification of the sample and of the variables is required for the investigation of IPOs
and signalling. The impacts of the variables are very distinct, and if these factors are blended in
a coarse manner their organizational outcomes may be ambiguous.

Future research should also continue the examination of signalling and IPOs outside the
United States. Too often research in entrepreneurial topics remains concentrated in the North
America (Bruton, Ahlstrom and Oblój, 2007). There is a diverse range of nations and
institutional settings in which entrepreneurship can be pursued. The examination of topics such
as signalling should be expanded beyond the US context to develop a better understanding of
factors that affect IPO performance. For example, today in Scandinavia there is extensive
entrepreneurship development, and how signalling impacts organizational outcomes in these
markets would appear ripe for investigation.

Managerial Implications
Our study has implications not only for research but also for practice. The signals analyzed here were ones that entrepreneurs can actively choose. This suggests that entrepreneurs are not passive participants. Entrepreneurs are able to make choices with regard to their firm’s capital structure, and the type of investors they will pursue. Hence, they should be aware of their ability to shape the success of the ultimate IPO as they build and develop the venture. They should seek to ensure that they use each opportunity that presents itself to send the correct signal to external investors.

The greatest danger that faces the entrepreneur in this process is not thinking about the long term implications of their actions. The push necessary to start and move the entrepreneurial firm forward is tremendous. The argument here is not that the entrepreneur should consume themselves with signals that may never be valuable if they do not go to IPO. Instead, if the entrepreneurs are aware of these issues they can make choices which may have long term implications for the IPO. Thus, if the entrepreneurs understand the process of signalling and the implications of their actions they can over the long term generate significant resources for themselves in the IPO process.
References


Table 1. Descriptive statistics and correlations.

Panel A – Descriptive Statistics in Mean and Standard deviation

<table>
<thead>
<tr>
<th>N</th>
<th>Variable</th>
<th>Mean</th>
<th>std dev</th>
<th>N</th>
<th>Variable</th>
<th>Mean</th>
<th>std dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Underpricing</td>
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<td>0.528</td>
<td>9</td>
<td>Age</td>
<td>6.247</td>
<td>6.390</td>
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<td>2</td>
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<td>0.213</td>
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<td>Hi-tech dummy</td>
<td>0.382</td>
<td>0.487</td>
</tr>
<tr>
<td>3</td>
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<td>11</td>
<td>Loss dummy</td>
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<tr>
<td>4</td>
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<td>Aftermarket std dev</td>
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<td>Underwriter Reputation</td>
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<td>6</td>
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<td>0.100</td>
<td>14</td>
<td>Market Return</td>
<td>-0.020</td>
<td>0.080</td>
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<tr>
<td>7</td>
<td>BA Ownership</td>
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<td>0.078</td>
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<td>Market Volatility</td>
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<td>0.008</td>
</tr>
<tr>
<td>8</td>
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</table>

Panel B - Pearson Correlation Coefficients

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<th>Founder Experience</th>
<th>Founder-CEO dummy</th>
<th>Number of Founders</th>
<th>VC Ownership</th>
<th>BA Ownership</th>
<th>LogSize</th>
<th>Age</th>
<th>Hi-tech dummy</th>
<th>Loss dummy</th>
<th>Aftermarket std dev</th>
<th>Underwriter Reputation</th>
<th>Market Return</th>
<th>Market Volatility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underpricing</td>
<td>0.103</td>
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<td>0.042</td>
<td>-0.007</td>
<td>-0.074</td>
<td>-0.019</td>
<td>0.127</td>
<td>0.111</td>
<td>0.248</td>
<td>-0.037</td>
<td>0.296</td>
<td>0.205</td>
<td></td>
</tr>
<tr>
<td>Founder Ownership</td>
<td>-0.021</td>
<td>0.262</td>
<td>0.280</td>
<td>-0.191</td>
<td>-0.053</td>
<td>0.005</td>
<td>0.154</td>
<td>-0.294</td>
<td>-0.017</td>
<td>-0.087</td>
<td>0.004</td>
<td>0.086</td>
<td></td>
</tr>
<tr>
<td>Founder Experience</td>
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<td>-0.043</td>
<td>-0.118</td>
<td>-0.077</td>
<td>-0.017</td>
<td>-0.002</td>
<td>0.023</td>
<td>-0.068</td>
<td>-0.182</td>
<td>-0.055</td>
<td>-0.042</td>
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<td></td>
</tr>
<tr>
<td>Founder-CEO dummy</td>
<td>0.170</td>
<td>-0.137</td>
<td>-0.085</td>
<td>-0.173</td>
<td>-0.078</td>
<td>-0.021</td>
<td>-0.187</td>
<td>-0.074</td>
<td>-0.100</td>
<td>-0.011</td>
<td>0.027</td>
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</tr>
<tr>
<td>Number of Founders</td>
<td>0.054</td>
<td>-0.073</td>
<td>0.020</td>
<td>0.035</td>
<td>-0.042</td>
<td>-0.002</td>
<td>0.080</td>
<td>0.206</td>
<td>-0.048</td>
<td>0.086</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>VC Ownership</td>
<td>-0.084</td>
<td>0.020</td>
<td>-0.054</td>
<td>0.066</td>
<td>-0.142</td>
<td>0.024</td>
<td>-0.062</td>
<td>0.010</td>
<td>0.025</td>
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<tr>
<td>BA Ownership</td>
<td>-0.078</td>
<td>-0.036</td>
<td>0.027</td>
<td>0.072</td>
<td>-0.016</td>
<td>-0.021</td>
<td>0.013</td>
<td>-0.086</td>
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<td>LogSize</td>
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<td>0.015</td>
<td>-0.059</td>
<td>0.005</td>
<td>0.574</td>
<td>-0.051</td>
<td>0.171</td>
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<td></td>
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<tr>
<td>Age</td>
<td>-0.097</td>
<td>-0.306</td>
<td>-0.058</td>
<td>0.093</td>
<td>0.074</td>
<td>0.062</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hi-tech dummy</td>
<td>0.149</td>
<td>0.088</td>
<td>0.056</td>
<td>0.011</td>
<td>0.333</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss dummy</td>
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<td>0.031</td>
<td>0.098</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aftermarket std dev</td>
<td>0.045</td>
<td>0.209</td>
<td>0.163</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underwriter Reputation</td>
<td>-0.059</td>
<td>0.053</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Market Return</td>
<td>-0.026</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

NOTES: N = 275; ownership variables are measured by the percentage ratio of the total number of ordinary shares a particular type of block-holders owned after the IPO to the total number of the firm’s shares outstanding after the IPO as reported in the listing prospectus; correlation coefficients greater than 0.125 are significant at the 0.05 level or higher. BA = business angel. VC = venture capital.
Table 2. The ratio of number of shares held by early stage investors before and after the IPO

<table>
<thead>
<tr>
<th></th>
<th>Founders</th>
<th>VCs</th>
<th>Business angels</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>0.763</td>
<td>0.849</td>
<td>0.776</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>0.760</td>
<td>0.831</td>
<td>0.783</td>
</tr>
<tr>
<td><strong>Standard deviation</strong></td>
<td>0.232</td>
<td>0.588</td>
<td>0.248</td>
</tr>
</tbody>
</table>
Table 3. Factors affecting underpricing

<table>
<thead>
<tr>
<th></th>
<th>Underpricing</th>
<th>Founder Ownership</th>
<th>Underpricing</th>
<th>Founder Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS (1)</td>
<td>OLS (2)</td>
<td>2SLS (3)</td>
<td>2SLS (4)</td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.019</td>
<td>0.352***</td>
<td>0.087</td>
<td>0.021</td>
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<tr>
<td></td>
<td>(0.133)</td>
<td>(0.058)</td>
<td>(0.080)</td>
<td>(0.076)</td>
</tr>
<tr>
<td>Founder Ownership</td>
<td>0.249</td>
<td>0.246†</td>
<td>-1.104†</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.232)</td>
<td>(0.138)</td>
<td>(0.628)</td>
<td></td>
</tr>
<tr>
<td>Founder Ownership²</td>
<td></td>
<td></td>
<td>1.700*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.820)</td>
<td></td>
</tr>
<tr>
<td>Founder Experience</td>
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<td>0.002</td>
<td>-0.010*</td>
<td>0.011*</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.004)</td>
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<tr>
<td>Founder-CEO dummy</td>
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<td>0.023†</td>
<td>0.004</td>
<td>-0.006</td>
</tr>
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<td>(0.023)</td>
<td>(0.013)</td>
<td>(0.024)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>Number of Founders</td>
<td>0.041***</td>
<td>0.012</td>
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<td></td>
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<tr>
<td>VC Ownership</td>
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<td>-0.410***</td>
<td>-0.117</td>
<td>-0.014</td>
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<td>(0.199)</td>
<td>(0.088)</td>
<td>(0.192)</td>
<td>(0.174)</td>
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<tr>
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<td>-0.414***</td>
<td>-0.660*</td>
<td>-0.470*</td>
</tr>
<tr>
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<td>(0.296)</td>
<td>(0.119)</td>
<td>(0.312)</td>
<td>(0.233)</td>
</tr>
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<td>Log size</td>
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<td>-0.005</td>
<td>-0.080</td>
<td>-0.086</td>
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<td>(0.061)</td>
<td>(0.027)</td>
<td>(0.061)</td>
<td>(0.062)</td>
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<td>Age</td>
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<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.003)</td>
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<tr>
<td>Hi-tech dummy</td>
<td>0.029</td>
<td>0.071**</td>
<td>0.049</td>
<td>0.033</td>
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<td>(0.058)</td>
<td>(0.025)</td>
<td>(0.064)</td>
<td>(0.060)</td>
</tr>
<tr>
<td>Loss dummy</td>
<td>0.133*</td>
<td>-0.131***</td>
<td>0.097*</td>
<td>0.125*</td>
</tr>
<tr>
<td></td>
<td>(0.067)</td>
<td>(0.028)</td>
<td>(0.048)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>Aftermarket std. dev.</td>
<td>2.762*</td>
<td>-0.182</td>
<td>2.721*</td>
<td>2.647*</td>
</tr>
<tr>
<td></td>
<td>(1.280)</td>
<td>(0.386)</td>
<td>(1.296)</td>
<td>(1.236)</td>
</tr>
<tr>
<td>Underwriter Reputation</td>
<td>0.005</td>
<td>-0.028</td>
<td>-0.005</td>
<td>0.013</td>
</tr>
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<td>(0.056)</td>
<td>(0.032)</td>
<td>(0.062)</td>
<td>(0.062)</td>
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<tr>
<td>Market Return</td>
<td>1.660***</td>
<td>0.035</td>
<td>1.673***</td>
<td>1.664***</td>
</tr>
<tr>
<td></td>
<td>(0.449)</td>
<td>(0.133)</td>
<td>(0.450)</td>
<td>(0.435)</td>
</tr>
<tr>
<td>Market Volatility</td>
<td>10.498**</td>
<td>1.653</td>
<td>10.876**</td>
<td>11.263***</td>
</tr>
<tr>
<td></td>
<td>(3.461)</td>
<td>(1.551)</td>
<td>(3.417)</td>
<td>(3.422)</td>
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<td>Adjusted R-squared</td>
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<td>0.255</td>
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<td>6.881</td>
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<td>5.167</td>
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<tr>
<td>Prob(F-statistic)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Notes: Ownership variables are measured by the percentage ratio of the total number of ordinary shares a particular type of block-holders owned after the IPO to the total number of the firm’s shares outstanding after the IPO as reported in the listing prospectus. Model (1) contains the OLS regression of Underpricing, whereas Models (3) to (4) present the 2SLS regressions controlling for the endogenous determination of founder ownership using the results of the OLS regression in Model (2). White heteroskedasticity-consistent standard errors and covariance. Standard errors are in parentheses. N=275; † p<0.10; * p<0.05; ** p< 0.01; *** p< 0.001.
Figure 1

Underpricing vs. Founder Ownership