Key Investors in IPOs*

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Abstract

We document a robust and novel fact about investors who participate in IPOs: investors who buy the highest initial return IPOs this year are significantly more likely to buy the highest initial return IPOs next year, and every year for 10 years. These key investors' participation is not explained by IPOs' characteristics, but is related to informational advantages. Key investors' participation more strongly relates to initial returns when key investors are small and specialize in IPO firms' industries, and when firms are hard to value. Key investors have strong relationships with underwriters, but relationships do not explain high initial returns.

JEL Classifications: G23, G24, G32
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1 Introduction

It is well established that initial public offerings (IPOs) experience significant first-day price increases, averaging upwards of 15% (Loughran, Ritter and Rydqvist, 1994; Loughran and Ritter, 2002; Ritter and Welch, 2002; Ljungqvist, 2007). We document a robust and novel fact about the investors who participate in initial public offerings (IPOs): the investors who buy the most profitable IPOs this year are significantly more likely to invest in the most profitable IPOs next year, and every year for 10 years. These "key investors" appear to be important and persistent demand-side participants in the market for new issues. Key investors' participation in *future* IPOs is strongly related to initial returns — key investors' participation explains 23% of the variation in initial returns, and a one-standard deviation increase is associated with 12 percentage points higher initial returns.

Many studies have investigated investors' roles in IPOs from a supply-side perspective, either focusing on favoritism directed to some investors (Reuter, 2006; Goldstein, Irvine and Puckett, 2011), or on data from one underwriter (Cornelli and Goldreich, 2001; Jenkinson and Jones, 2004). We utilize a broad sample of US IPOs to examine investors' potential demand-side role in IPOs. We find evidence that key investors' tendencies to buy IPOs with high initial returns are consistent with a broad set of information-based, value-adding theories of IPOs (Benveniste and Spindt, 1989; Benveniste and Wilhelm, 1990; Sherman and Titman, 2002). For example, key investors who specialize in IPO firms' industries explain the majority of the relation between key investors' participation and initial returns. At the same time, our results indicate that key investors are not conduits for rent extraction by underwriters as suggested by Aggarwal, Krigman and Womack (2002), Loughran and Ritter (2004), and Hao (2007).

We use IPOs as a laboratory to identify well-performing investors and to shed light on potential explanations for their performance. Given that key investors appear informed, our classification can be used to study key investors in other contexts such as investment performance and persistence (Berk and van Binsbergen, 2015; Hoberg, Kumar and Prabhala, 2017), activism and corporate governance (Brav et al., 2008; Fich, Harford and Tran, 2015) and firm transparency and disclosure (Boone and White, 2015; Bird and Karolyi, 2016). Specific to IPOs, our results highlight the

importance of the demand side on the cross-sectional variation in initial returns. Rather than simply benefiting from relationships with underwriters, key investors likely add value to firms.

Turning to the details of our analysis, we first develop several alternative methods of classifying key investors. In an ideal setting, we would classify investors based on their participation and key investors would be those who had participated in high-initial-return IPOs. Lacking actual IPO participation data, we follow the existing literature (Binay, Gatchev and Pirinsky, 2007; Reuter, 2006) and use 13F holdings reported at the end of the quarter to proxy for IPO participation.[1] As 13F holdings data allow for noise in the number of shares reported, we use three alternative performance measures to classify investors, each based on holdings reported over the prior four quarters. The first measure incorporates shares reported by estimating the economic value (commonly referred to as money left on the table) each investor would have received in past IPOs if shares reported accurately reflected allocations. The second and third measures excludes the number of shares reported, instead using the mean and median returns of past IPOs that an investor reported holding.

For each quarter in our sample, we use Monte Carlo methods to generate counter-factual distributions based on the IPOs which occurred over the previous four quarters, as if investors randomly participated in those IPOs. We classify an investor as key if his actual performance measure is in the top 1% of the counter-factual distributions. If investors' participation in IPOs was random, we would expect to classify 1% of investors as key. Our measure using mean (median) initial returns classifies 11% (10%) of investors as key, while our measure using money left on the table classifies only 1% as key. That two of our measures classify significantly more investors as key than would happen by chance suggests that somehow a large group of investors manages to beat the odds and buy IPOs with high initial returns. Moreover, our classification of key investors is persistent. Examining non-overlapping yearly periods, we find that three times more key investors (based on the prior year's classification) remain classified as key investors than would occur by chance. Furthermore, the classifications are persistent for 10 years, suggesting that key investors are not

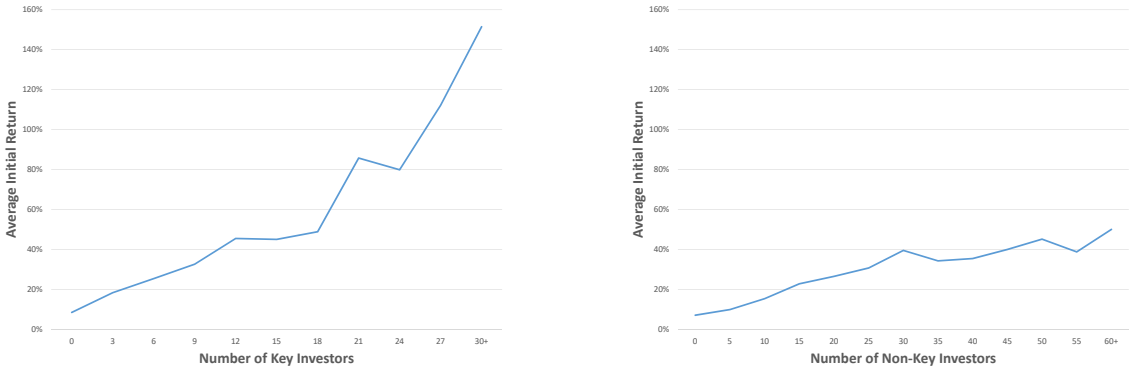
[1] Chemmanur, Hu and Huang (2010) uses institutional investor trading data from Abel/Noser Corporation to infer IPO allocations by linking the trading data to the 13F holdings data. Unfortunately, Abel/Noser Corporation no longer provides the investor identifiers required to link the trading data to 13F holdings.

just lucky, but have characteristics or abilities that lead to frequent and repeated participation in high-initial-return IPOs.

Our finding of persistence implies that participation by key investors, who are classified based on *past* holdings, may be related to *future* initial returns. Figure 1 shows this is the case: the number of key investors that report holding shares of an IPO firm is positively related to initial returns. However, if key investors are simply attracted to observable IPO characteristics which are correlated with high initial returns, then proxies for key investors' participation may become insignificant once we control for those characteristics.[2] To test this explanation, and to distinguish among our alternative performance measures, we regress initial returns on observable IPO characteristics and proxies of key investors' participation. First, we find that key investors' participation is strongly related to initial returns, even in the presence of controls. Second, in a horse-race between the three key investor performance measures, using mean past initial returns produces the strongest relation with future initial returns. Moreover, we find that the proxy of key investors' participation based on the number of key investors that report shares is more strongly related to initial returns than the proxy based on the percentage of shares reported by key investors. These results establish the existence of key investors and provide a proxy for their participation in IPOs, which we can use to examine why these investors manage to participate in IPOs with high initial returns.

We then analyze whether demand-side effects, such as adding value via information, or supply-side effects, such as being favored by underwriters, are more important for relating key investors' participation to initial returns. Before discussing several tests, we note that key investors are very heterogeneous, consisting of small investors such as Essex Investment Management Company, a hedge fund with $1 billion in assets, and Fidelity Management & Research with over $670 billion. Furthermore, key investors' characteristics suggest that underwriters' favoritism and information-based mechanisms may be at play. Key investors tend to have larger portfolios and stronger relationships with underwriters (based on holdings in past IPOs), but also are more specialized in IPO firms' industries (based on relative industry weights in their portfolios), and are more likely to buy tech and VC-backed IPOs.

[2]Field and Lowry (2009) attributes institutional investors' superior post-IPO investment performance to publicly observable characteristics.



(a) Key Investors

(b) Non-Key Investors

Figure 1: Key investors' participation is positively related to initial returns.

Despite key investors' heterogeneity, we only find evidence consistent with key investors' information driving their relation with initial returns. Participation by industry-specialist key investors is more strongly related to initial returns than participation by non-specialists, whereas participation by key investors connected to underwriters is no different from participation by unconnected key investors. Furthermore, key investors' participation is more strongly related to initial returns for firms that primarily consist of hard-to-value growth options, for which information is more valuable. Three additional tests support information-based mechanisms by analyzing: (i) the shape of the relation between key investors' participation and initial returns; (ii) the expected versus unexpected components of key investors' participation; and (iii) key investors' relations to offer price revisions.

Several tests cast doubt on alternative explanations for our findings. Comparing large versus small key investors, as large investors can generate more revenue for underwriters through other lines of business and are therefore more likely to be favored in IPOs, we find that small key investors' participation is more strongly related to initial returns, casting doubt on favoritism as the main driver of key investors' performance. Evidence is also inconsistent with post-IPO buying driving our results. We find that key investors' holdings do not systematically differ from other investors' holdings based on when an IPO occurs within a quarter. If post-IPO buying were driving key

investors' holdings, it is likely that IPOs occuring earlier in the quarter would have relatively more key investor participation. The lack of any difference suggests that post-IPO buying, particularly window-dressing, is not biasing our classification of key investors. We also show that several other explanations of our results are unlikely, including: (i) the Internet-bubble period; (ii) the desire for a liquid secondary market; and (iii) the desire for analyst coverage.

Our paper makes a number of contributions. First, we develop a methodology which classifies key investors who report holdings in past IPOs with abnormally high initial returns, and show that key investors' classification is persistent. Most closely related to our work, Liu (2014) studies the persistence of institutional investors' performance using Chinese IPOs, finding that institutional investors that performed well in the past tend to perform well in the future. We are the first to document persistent performance in US IPOs for a group of key institutional investors. Our classification of key investors, and their association with information, relates to a broader literature considering the identification of skilled asset managers.[3] Specifically related to our study, Hwang, Titman and Wang (2016) finds that mutual funds who are connected to underwriters via education generate excess returns in months when those underwriters issue IPOs. While their findings are consistent with either favoritism-based or information-based explanations, our results suggest key investors' information plays a role. Furthermore, as we consider all of investors' value-adding activities as information-based explanations, there is significant potential to examine key investors' roles in other areas, such as corporate governance via monitoring or activism. We leave the examination of key investors' performance and actions outside of the IPO process to future research.

We also contribute to the literature relating initial returns to distinct groups of investors. Hanley and Wilhelm (1995), Aggarwal, Prabhala and Puri (2002), Field and Lowry (2009) and Chemmanur, Hu and Huang (2010) all provide evidence of institutional investors' importance to the IPO process. Reuter (2006) and Ritter and Zhang (2007) study funds with close ties to underwriters. In a similar vain, Jenkinson and Jones (2004) uses proprietary data from an underwriter and finds that allocations of underpriced shares are tilted towards long-term investors. Also related, Akkus, Cookson and Hortacsu (2016) finds evidence consistent with underwriters' using underpricing to

[3]For examples, see Kacperczyk, Sialm and Zheng (2005, 2008), Cremers and Petajisto (2009), among others.

reward investment clients. While these studies provide insights into how various mechanisms contribute to IPO pricing and initial returns, using reported holdings data allows us to leverage a large time-series and cross-section of data to: (i) connect investors' past and future holdings; (ii) identify key investors most related to initial returns; and (iii) study the likely source of that relation.

Finally, we complement an existing literature finding that investors who provide information are important in the IPO process. Liu, Lu, Sherman and Zhang (2005) relates investors' attention, e.g. attending a road show and forming an opinion, to initial returns of IPOs. Similarly, Cornelli and Goldreich (2001) and Bubna and Prabhala (2011) use proprietary data from different underwriters, and document that the underwriters tend to allocate underpriced shares to investors that submit informative bids. Our findings are consistent with these papers; underwriters appear to seek key investors' attention, information and opinions.

2 Data and Sample

We use the Thomson Securities Data Corporation (SDC) Platinum Global New Issues database. The sample includes IPOs of U.S. firms' common stocks completed between 1985 and 2014. As is common in the literature, we exclude unit offerings, real estate investment trusts, rights issues, closed-end funds and trusts, and IPOs with an offer price less than five dollars. To be included in the sample, we require that a firm be in the Center for Research in Security Prices (CRSP) database and that at least one institution reports holding shares in the first quarter after the IPO. Holdings data are from the Thomson-Reuters 13F Institutional Holdings database. Consumer Price Index (CPI) data from the Bureau of Labor Statistics is used to adjust dollar values to year 2005 dollars. Founding dates, monthly underpricing and issuance activity, and underwriter rankings are taken from Jay Ritter's website.[4] Data are winsorized at the 1% and 99% levels to reduce the influence of outliers. The resulting sample includes 5,717 IPOs.

Lacking direct data on participation of investors in IPOs, we follow Binay, Gatchev and Pirinsky (2007) and Reuter (2006) and proxy for participation using the first reported institutional holdings

[4]The data are available at https://site.warrington.ufl.edu/ritter/ipo-data/

data after issuance.[5] While using holdings data overcomes a common limitation in the IPO literature (a lack of data on allocations in IPOs[6]), the 13F data has some shortcomings. First, only institutional investment managers that exercise investment discretion over $100 million or more of Section 13(f) securities must report their holdings. Second, the time between the IPO date and the end of the quarter is often considerable, allowing investors' reported holdings an opportunity to deviate from initial allocations. Fortunately, Hanley and Wilhelm (1995) provide evidence that this proxy is highly correlated with actual IPO allocations. Using proprietary data on a sample of 38 IPOs managed by a single underwriter, their study finds that the correlation between 13F holdings data and actual allocations is 91%. Furthermore, we consider several proxies for investors' IPO participation which are relatively robust to investors' post-IPO selling or buying. Section 5 discusses additional tests justifying our use of holdings data to proxy for IPO participation.

3 Are there Key Investors in IPOs?

In a typical IPO, underwriters "build the book" by contacting potential investors and eliciting their opinions and willingness to buy shares. Once investors submit bids, underwriters use their discretion to allocate shares to investors. Through this bookbuilding process, underwriters direct allocations to valued investors; a group we term key investors. In bookbuilding models, underwriters use allocation quantities and offer prices (and the associated underpricing) to elicit private information from investors (Benveniste and Spindt, 1989), or even to compensate investors' information production costs (Sherman and Titman, 2002). Alternatively, underwriters may direct large allocations of underpriced shares to the investors who are most likely to return a portion of their gains through other lines of business.[7] In either of these cases, some investors have particular value

[5] For a small number of IPOs occuring in the last week of the quarter, zero or very few institutions report holding shares, while many institutions report holdings in the subsequent quarter. We use holdings data from the second quarter when the IPO occurred within the last six days of the quarter, had at least 10 holdings reported in the second quarter, and at least 3 times more holdings were reported in the second quarter than the first quarter. Using second-quarter holdings applies to less than 3% of our sample, and excluding these IPOs from our sample does not qualitatively change our results.

[6] Jenkinson and Jones (2004) and Cornelli and Goldreich (2001) overcome this limitation by using detailed, proprietary underwriters' data about bids and allocations. In both cases, the data are from a single underwriter. However, the papers find mixed results, possibly due to differences between the underwriters that supplied the data.

[7] See Ljungqvist (2007) for a review of several favoritism-based theories.

to underwriters, making them more likely to report holdings in IPOs with high initial returns.

Whereas examples of small groups of investors' receiving highly-underpriced allocations exist, it is unclear whether any group, across underwriters and time, is consistently benefiting from high-initial-returns. Whether due to well-established relationships and favoritism, or their superior information, any group associated with high initial returns should exhibit two traits. First, the group should show persistence. If members are randomly assigned and inconsistent across periods, then it is unlikely that they share a common trait or value to underwriters. Second, their participation in *future* IPOs should be related to IPO pricing when controlling for observable characteristics.

To establish whether some investors meet these criteria and are associated with high-initial-returns IPOs, we consider several candidate classifications. For each classification, we consider investors' reported holdings over the prior four quarters, and exclude investors who report holdings in less than four IPOs. Given the importance of both allocation quantity and offer price in compensating or rewarding key investors, our first classification uses the "money left on the table" as a measure for the economic value of initial returns accruing to investors. Ideally, money left on the table is computed using actual allocations data. Lacking allocations data, we use reported shares instead of allocations in our calculation:

$$MoneyLeft_{k,i} = SharesReported_{k,i} * OfferPrice_i * InitialReturn_i \tag{1}$$

where k indexes investors, i indexes IPOs and $InitialReturn_i$ is the return from the offer price to the first day's closing price. We then compute an investors' aggregate money left on the table at quarterly intervals:

$$TotalMoneyLeft_{k,t} = \sum_{i \in I(t)} MoneyLeft_{k,i} \tag{2}$$

where $I(t)$ represents the set of IPOs over the prior four quarters. $TotalMoneyLeft_{k,t}$ is our first candidate measure for classifying key investors.

Using the number of reported shares at the end of the quarter may be problematic due to post-IPO buying or selling. Because IPO allocations are often small, many institutions may buy more shares after the IPO to attain desired portfolio allocations. Some investors may also choose to sell

their allocations (some of which is necessary, as otherwise a secondary market would not exist). Chemmanur, Hu and Huang (2010) shows that institutions sell over 33% of their allocations in the first month, consistent with Aggarwal (2003), and sell 70% of their allocations within a year. In the best-case scenario, buying and selling would only add noise to the measure of money left on the table. However, it is possible that institutions' post-IPO trading is related to their characteristics and their roles in IPO pricing. For example, if large institutions are more likely to increases their holdings after IPOs, then using the number of shares reported at the end of the quarter may bias our classification of key investors.

We consider two alternative measures that are robust to the number of shares reported. The first share-neutral measure uses the mean abnormal initial returns of an investors' reported holdings over the prior four quarters. For each IPO, we calculate abnormal initial return by subtracting the month's average initial return:

$$AbnormalInitialReturn_i = InitialReturn_i - \frac{\sum_{j=1}^{J(i)} InitialReturn_j}{J(i)} \tag{3}$$

where $J(i)$ is the set of IPOs completed in the same month as IPO i.[8] An investor's mean abnormal return is the mean of the abnormal initial returns for the IPOs for which the investor reported holdings:

$$MeanAbnormalReturn_k = \frac{\sum_i^I AbnormalInitialReturn_i \times \mathbb{1}_{i,k}}{\sum_i^I \mathbb{1}_{i,k}} \tag{4}$$

where k indexes investors and $\mathbb{1}_{i,k}$ equals 1 if investor k reported holding shares in IPO i and I is the set of IPOs over the past four quarters. By using only initial returns, an investor who reports few shares is equally likely to be classified as key as an investor who reports many shares. As a result, this measure is less sensitive to post-IPO buying and selling. Because $MeanAbnormalReturn$ can be sensitive to extreme observations, our final measure is calculated similarly, using median rather than mean abnormal initial returns to calculate $MedianAbnormalReturn$.

[8] Alternatively, using raw initial returns gives qualitatively similar results to those presented.

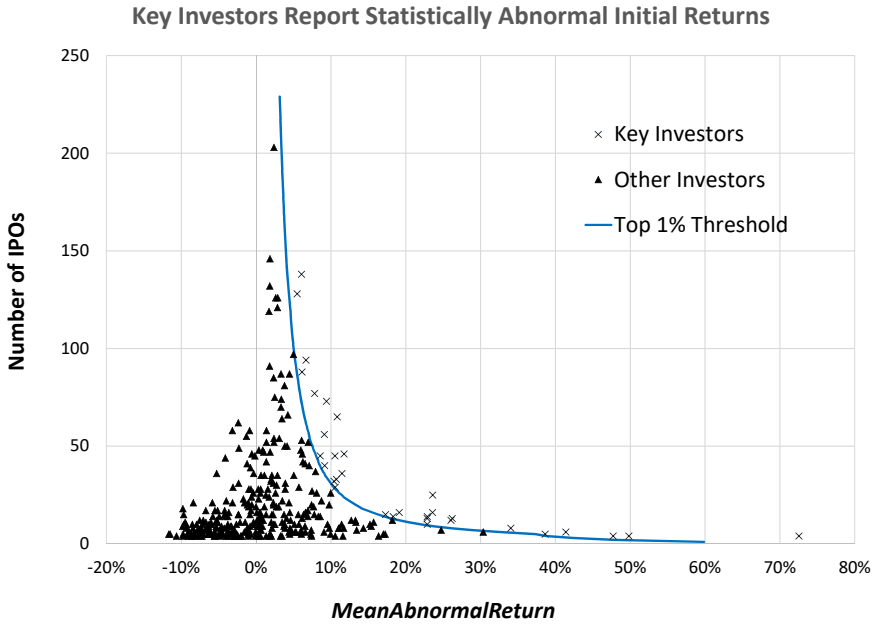
3.1 Classifying Key Investors

Having developed several measures of an investor's association with past initial returns, we use Monte Carlo methods to determine which investors are associated with statistically-significant initial returns. For each measure and each quarter, we generate 100,000 random outcomes to establish statistical thresholds. For example, consider $TotalMoneyLeft$ calculated in July 1994 for an investor who reported holdings in 10 IPOs between July 1, 1993 and June 30, 1994. To benchmark that investor, we draw 10 random values of $MoneyLeft$ (with replacement) from all values of $MoneyLeft$ between July 1, 1993 and June 30, 1994, and then sum those random values. We repeat this process 100,000 times for each quarter and for each number of IPO holdings reported. Finally, we compare each realized value of $TotalMoneyLeft_{k,t}$ to the distribution of randomly generated values that corresponds to the number of holdings reported by investor k in the four quarters prior to time t. We repeat a similar process for $MeanAbnormalReturn$ and $MedianAbnormalReturn$.

We define key investors ($KeyInvestor = 1$) as those having realized values greater than a threshold proportion of the randomly generated values. For example, a statistical threshold of 1% corresponds to a realized value which is greater than at least 99,000 of the randomly generated values. Figure 2 shows our classification of investors in July 1994 to clarify our method. The x-axis displays $MeanAbnormalReturn$, while the y-axis displays the number of IPOs the investors reported holding. Note that a negative $MeanAbnormalReturn$ of -10% on the figure can still imply a positive mean initial return for an investor once one adds the mean initial return of 11% for the 462 IPOs spanning July 1, 1993 to June 30, 1994. The solid line represents the 1% threshold, while the Xs, which lie to the right of the threshold, represent key investors. Those investors have a $MeanAbnormalReturn$ which is in the top 1% of randomly generated values. The triangles represent other investors, and all lie to the left of the threshold.

Considering several particular investors clarifies our methods and highlights that we classify both large and small investors as key. First, Bankers Trust NY is classified as a key investor, having received a $MeanAbnormalReturn$ of 6.1% in the 138 IPOs in which Bankers Trust NY reported holdings. The relevant threshold for 138 IPOs over this period was 4.2%, so while Bankers Trust NY did report holdings in a large number of IPOs, the $MeanAbnormalReturn$ was sufficiently high

Figure 2: Scatter-plot of key investors (based on $MeanAbnormalReturn$) and other investors as of July 1994. The prior four-quarters' data (July 1993 - June 1994) are used to classify key investors. The solid line represents the threshold (generated from 100,000 random sample portfolios) for $MeanAbnormalReturn$ to be in the top 1% of randomly generated values.



for key investor classification. However, Fidelity Management & Research, which held 203 IPOs with a $MeanAbnormalReturn$ of 2.4%, failed to meet the relevant threshold of 3.4%. As a final example, Dreihaus Capital Management was classified as a key investor, having reported holdings in 25 IPOs with a $MeanAbnormalReturn$ of 23.6%, exceeding the relevant threshold of 11.5%.

If investors' reported holdings were entirely random, using a 1% threshold would lead to about 1% of investors being classified as key. Interestingly, the 1% threshold classifies very different proportions of key investors depending on the measure. The second columns of Table 1 shows that a 1% threshold identifies 1% of investors as key using $TotalMoneyLeft$, 11% of investors as key using $MeanAbnormalReturn$, and 10% of investors as key using $MedianAbnormalReturn$. The high percentages classified by $MeanAbnormalReturn$ and $MedianAbnormalReturn$ suggest that

there is a population of key investors that differ from other investors as they frequently participate in IPOs with the highest initial returns. The low percentage classified by $TotalMoneyLeft$ is no bigger than that expected by chance, suggesting that some investors may regularly report large numbers of shares held.

3.2 Persistence of Key Investors

If a group of investors persistently participate in IPOs, then they likely possess characteristics that underwriters value, leading them to be more likely to be classified as key investors in the future. To test whether key investor classifications are persistent, we examine the probability that key investors are classified as key in subsequent years. If key investor classification were random, we would expect the proportion of investors classified as key in future years (conditional on being a key investor in the first year) to remain constant. We use annual key investor classifications to avoid overlapping sample periods, and thus, any persistence we find is not due to mechanical correlations.

Table 1 shows that annual classifications by each measure are persistent over the ten years following initial key investor classifications. As an example, for key investors classified based on $MeanAbnormalReturn$ using a 1% threshold (11% of all investors), 39% of key investors are classified as key investors at the beginning of the following year. 39% is economically and statistically greater than 11%, and furthermore, significant persistence continues until the 10th year when 19% are classified as key.[9] Importantly, persistence suggests that key investors continue to report holdings in IPOs with high initial returns in the future, supporting the idea that key investors play a role in IPO pricing.

3.3 Key Investors and IPO Firm Characteristics

We next test if publicly-observable characteristics enable key investors to choose the best IPOs. If key investors are attracted to IPOs with high initial returns, their participation may not be incrementally related to initial returns. To relate key investors' participation to initial returns, we must aggregate across the investors and key investors who report holdings in each IPO. As argued

[9] In subsequent analysis, we consider large and small key investors separately. Considered independently, both groups show strong persistence, with small key investors having larger point estimates of persistence.

before, while allocated shares should be particularly relevant, it is unclear whether reported shares are an accurate proxy due to noise or bias from post-IPO trading. Accordingly, we introduce two alternative proxies for key investors' participation in an IPO. First, we define *KeyInvPctShares* as the total number of shares reported held by key investors at the end of the quarter following the IPO divided by the number of shares reported held by all investors.

$$KeyInvPctShares = \frac{\sum_{k \in K} Shares_k}{\sum_{k \in L} Shares_k} \tag{5}$$

where K is the set of key investors who hold shares at the end of the first quarter following the IPO and L is the set of all investors who hold shares. Second, *NumKeyInvestors* counts the number of key investors who hold the firm's stock at the end of the first quarter following the IPO:

$$NumKeyInvestors = \sum_{k \in K} KeyInvestor_k. \tag{6}$$

We compare both aggregate proxies across our three different measures for classifying key investors. To make measures comparable, we consider $TotalMoneyLeft$ using a threshold of 10% and $MeanAbnormalReturn$ and $MedianAbnormalReturn$ using thresholds of 1%, such that each measure classifies approximately 10% of investors as key. In all specifications, we control for the demand from all investors by including the number of total investors, $NumInstInvestors$, who hold the firm's stock at the end of the first quarter following the IPO.

Panel A of Table 2 compares our three key investor classifications using *KeyInvPctShares* as the proxy for key investors' participation. To focus attention on comparing our alternative key investor classifications, all variables are standardized and the coefficients can be interpreted as the expected increase in initial return (in standard deviations, where one standard deviation is 43%) for a one-standard deviation increase in the independent variable. Additionally, in several specifications we have suppressed control variables common in the IPO literature (which are discussed shortly) and year fixed effects to simplify the comparison.

Columns (1), (3) and (5) provide univariate regression results using key investors' classifications based on our measures: $TotalMoneyLeft$, $MeanAbnormalReturn$ and $MedianAbnormalReturn$.

$KeyInvPctShares$ based on $MeanAbnormalReturn$ is highly statistically significant (t-stat of 17.6), gives an R^2 of over 9% and, economically, a one-standard deviation increase in the percentage of shares held by key investors is associated with 14% higher initial returns. $KeyInvPctShares$ based on $TotalMoneyLeft$ and $MedianInitialReturn$ give statistically significant results (t-stats of 11.4 and 14.9), but are much weaker both statistically (R^2 of 2.6% and 4.6%) and economically (associated with 7% and 9% higher initial returns). Columns (2), (4) and (6) show a similar pattern when including control variables and year fixed effects, although economic significance drops by almost two-thirds. Column (7) uses the three classifications simultaneously, showing that $KeyInvPctShares$ based on $MeanInitialReturn$ is the most statistically (t-stat of 5.2) and economically significant (associated with 5% higher initial returns). $KeyInvPctShares$ based on $TotalMoneyLeft$ is statistically significant as well (t-stat of 4.8), but is less economically significant (associated with 2% higher initial returns).

Panel B provides similar, but economically stronger results using $NumKeyInvestors$ to proxy for participation. Using $NumKeyInvestors$ based on $MeanInitialReturn$ is highly statistically significant (t-stat of 23.6), gives an R^2 of over 23%, and economically, a one-standard deviation increase in the number key investors is associated with 21% higher initial returns. Furthermore, even in the presence of control variables and year fixed effects, a one-standard deviation increase in $NumKeyInvestors$ is associated with 12% higher initial returns. As in Panel A, the alternative classifications yield statistically significant, although economically weaker results. Column (7) shows that using the three $NumKeyInvestors$ proxies together, only the proxy based on $MeanInitialReturn$ yields a significantly positive relation with initial returns (t-stat of 6.0). Most striking, the relation between initial returns and $NumKeyInvestors$ based on $TotalMoneyLeft$ is significantly negative (t-stat of -1.7).

Taken together, Panels A and B show that our $MeanInitialReturn$ performance measure classifies key investors most related to future initial returns. Moreover, $MeanInitialReturn$ leads to a significant portion of investors' being classified as key. As a result, we use $MeanInitialReturn$ to continue our analysis of key investors and their relations to future initial returns. Table 2 also implies that key investors are not simply attracted to firm and offer characteristics that are asso-

ciated with high initial returns. IPO participation by key investors is driven by other factors, such as investor characteristics or other information not commonly known at the time of the IPO.

Whereas Table 2 establishes our use of $MeanInitialReturn$ to determine key investors, it does not clarify the best proxy to aggregate key investors' participation in IPOs. Therefore, we run a horse race between $KeyInvPctShares$ and $NumKeyInvestors$. To establish a baseline for our results, we begin by regressing initial returns on common control variables from the IPO literature and year fixed effects.[10] Column (1) of Table 3 shows many results consistent with findings in the literature: initial returns are positively related to offer price revisions ($OfferPriceRevision$), the positive portion of offer price revisions ($PosPriceRevision$), initial returns of recent IPOs ($PriorMonthInitReturn$), recent market returns ($Prior15MktReturn$), the percentage of shares retained by pre-IPO owners ($Retention$), the underwriter's reputation for initial returns ($UnderwriterPremium$) and the price of the offering ($InvPrice$); and initial returns are negatively related to firm size ($LogSize$), firm age ($LogAge$), and the percentage of primary shares issued in the offering ($Expansion$).

Consistent with Table 2, Columns (2) and (3) of Table 3 illustrate that key investors' participation in IPOs is positively related to initial returns in the presence of common controls. The coefficients on both $KeyInvPctShares$ and $NumKeyInvestors$ are both strongly significant (t-stats of 7.7 and 10.2). We consider our two proxies of key investors' participation concurrently in Column (4). When combined in the same regression, $NumKeyInvestors$ remains significantly related to initial returns (t-stat of 7.8), and the coefficient is nearly unchanged (associated with 11% higher initial returns). However, the significance of $KeyInvPctShares$ drops significantly (t-stat of 2.2), and the economic magnitude is cut by over two-thirds (associated with 1% higher initial returns).

Statistically and economically, key investors are most strongly related to initial returns when classified based on our $MeanInitialReturn$ measure and when their participation is proxied by $NumKeyInvestors$. Whereas the number of shares allocated to investors should be economically meaningful from a theoretical perspective, the number of shares reported in 13F holdings does not

[10] Summary statistics are available in the Online Appendix.

appear to add initial-return-relevant information about key investors' participation.

4 What Makes Key Investors "Key"?

Having established the existence of key investors who persistently buy high-initial-return IPOs, we next consider why key investors' participation is related to high initial returns. Our analysis attempts to separate two broad but distinct explanations for key investors' roles in IPO pricing. The first relates to how underwriters can use their discretion in bookbuilding to benefit themselves and favored clients. For example, key investors may get access to high-initial-return IPOs in exchange for buying other services from underwriters (Reuter, 2006; Goldstein, Irvine and Puckett, 2011). In turn, earning kickbacks from favored investors gives underwriters incentives to earn additional revenue by more severely underpricing offerings. As a result, underwriters can use underpricing to price discriminate (Kang and Lowery, 2014) or in exchange for additional services such as analyst converage (Cliff and Denis, 2004; Loughran and Ritter, 2004). We refer to these and related hypotheses as favoritism-based explanations.

The second broad explanation considers that key investors may be well-informed or able to add value to firms. Beginning with Rock (1986) and Benveniste and Spindt (1989), many models have linked information asymmetry to high initial returns, predicting that informed investors will receive more allocations in IPOs with high initial returns. Similarly, many models have linked various value-adding activities to high initial returns. As examples, Mello and Parsons (1998) and Stoughton and Zechner (1998) propose investors add value through monitoring, Holmstrom and Tirole (1993) and Brown (2017) consider investors' impacts on firm value by increasing price informativeness, and Banerjee, Hansen and Hrnjić (2009) focuses on investors' long-term holding.[11] All of these theories commonly predict that key investors' participation in IPOs is positively correlated with initial returns, and importantly, most of the value-add theories rely on investors' being informed to some degree. As a result, most of our tests are not able to distinguish explicitly among the information and value-add theories. For brevity, we refer to these many hypotheses as information-

[11] Consistent with investors' adding value or identifying better firms, Allen, Jacob and Shaked (2017) document that post-IPO firm performance is positively associated with institutional ownership.

based explanations.

The following sections detail a series of tests designed to distinguish favoritism-based and information-based explanations for key investors' relation to high initial returns. We begin by considering key investors' characteristics.

4.1 Key Investor Characteristics

Table 4 shows summary statistics for key and non-key investors. Key investors' characteristics suggest that information may be important for their classification. To analyze the information-based explanation, we construct a measure of investors' specializations in particular industries based on reported 13F holdings. In each quarter, investors' reported holdings are divided into Fama-French 48 industries and industry weights are calculated for each investor.[12] Each investor's industry weights are then standardized by subtracting the mean weight and dividing by the standard deviation of weights for all investors reporting holdings in that quarter. The resulting variable, $IndustryBias$, will be positive for investors' having relatively large holdings in a particular industry. For each investor and year, we then average $IndustryBias$ over their reported holdings of IPOs, giving us a measure of how specialized the investors are in the industries of their IPO firms. Key investors overweight IPO firms' industries by about one-half of a standard deviation (0.51) in their portfolios, significantly more than non-key investors (0.30).

In addition to measuring the industry-concentration of investors, we also classify investors as *Specialists* in an industry if they hold more than the average investor's portfolio allocation in that industry. Thus, for each IPO, we can identify the IPO firm's industry, and compute the number of investors and key-investor specialists that report holdings of the firm's shares. 59% of key investors' reported holdings are specialist holdings, while only 50% are specialist holdings for non-key investors (as would be expected by chance). Key investors' higher degrees of specialization suggest information may play a significant role in their classification.

Key investors' characteristics provide mixed evidence regarding favoritism-based explanations. Key investors are larger and older than non-key investors. Larger and older investors likely have

[12] Classification data are available at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/.

more established lines of business which may provide valuable avenues for providing kickbacks to underwriters, for example, through trading commissions. However, key and non-key investors turnover their portfolios similarly, as measured by Cella, Ellul and Giannetti (2013)'s portfolio *Churn*, inconsistent with trading volume providing a kickback channel from key investors to underwriters.

Key investors also have stronger relationships with underwriters, although stronger relationships are not clear evidence of favoritism. For each underwriter key investors are associated with, they report holding more of each underwriter's IPOs than non-key investors (2.8 IPOs per underwriter per year versus 2.1). However, key investors report more holdings per year (40 versus 16) from a more diverse group of underwriters — 14 different underwriters per year versus 7 per year for non-key investors. To examine the importance of underwriter-investor relationships, we construct a measure of how often investors have reported holdings in a particular underwriter's recent offerings. We consider an investor as *Underwriter-Related* if the investor reported holdings in at least 2 of the underwriter's last 10 IPOs (within the last 5 years).[13] Key investors are *Underwriter-Related* in 63% of their reported holdings, while non-key investors are *Underwriter-Related* in only 49% of their reported holdings. While this does appear to suggest that key investors may be determined by underwriter-relationships, it is important to remember that investors that report more allocations are more likely to meet the definition of *Underwriter-Related*, so further tests are needed to determine how underwriter relationships affect key investor classification.

Several other statistics are worth mentioning. Key investors tend to hold IPOs for less time and hedge funds are slightly under-represented in the key investor population.[14] Key investors are more tilted towards tech-firms (52% versus 40%) and VC-backed firms (52% versus 42%). Key investors also report holdings in IPOs with higher initial returns, which is expected given our persistence results and the positive relation between initial returns and $NumKeyInvestors$. In particular, the holdings-weighted average initial return for key investors is 47%, while it is only 29% for non-key investors.[15]

[13] A similar measure is used in Gondat-Larralde and James (2008).

[14] We use the hedge fund classifications introduced in Agarwal, Fos and Jiang (2013) and Agarwal et al. (2013).

[15] Because more holdings are reported in IPOs with higher initial returns, these holdings-weighted averages exceed the equal-weighted average initial return of 20%.

To further understand what makes investors key, Table 5 summarizes the most common key investors, showing that a broad range of investor types and sizes are represented. For example, Essex Investment Management Company, a hedge fund and the most frequent key investor (key in 17 years), manages a little over $1 billion in assets, whereas Fidelity is classified as a key investor in five years and manages over $670 billion.[16] In general, the investors represented are heterogeneous, including some of the largest and most prominent investors and banks, but also insurance companies and many smaller and lesser-known investors. Interestingly, the larger key investors are more likely to be *Underwriter-Related*, while the smaller key investors are more likely to be *Specialists*.

Motivated by the heterogeneity of the top key investors, we examine the characteristics of large and small key investors separately. Each year, we split key investors into above and below median based on assets under management. The right-most columns of Table 4 show the differences between the two groups. Unsurprisingly, large key investors are much bigger than small key investors. However, the difference in size is striking — $60.3 billion versus $2.4 billion. The large key investors are also substantially older. Small key investors appear to be more active, having higher portfolio turnover (*Churn*) and holding their reported IPO holdings for less time. Furthermore, small key investors appear to be more specialized — on average, their portfolios have one-half of a standard deviation more concentration in IPO firms' industries. Finally, large key investors tend to have more underwriter relationships. While this may suggest stronger ties between underwriters and large key investors, stronger relationships are expected as large key investors average almost twice as many reported IPO holdings per year.

4.2 Key investors appear to be informed

The following tests consider several alternative explanations for key investors' relations to initial returns. The results are consistent with key investors' information playing an important role in IPO pricing. We first examine sub-groups of key investors and their relations to initial returns, and then consider key investors' importance in information-sensitive IPOs.

[16] Dollar figures are based on reported 13F holdings.

4.2.1 Small and specialist key investors, but not underwriter-related key investors, are more related to initial returns

Large investors, with correspondingly large fees paid to investment banks, may benefit from favoritism or use their bargaining power to secure only the most underpriced offerings. If favoritism or bargaining power is driving the positive relation between initial returns and key investor participation, then it is likely that large investors will be responsible for the majority of the relation. Column (1) of Table 6 provides our baseline results using $NumKeyInvestors$, and Column (2) splits $NumKeyInvestors$ into $NumLargeKeyInv$ and $NumSmallKeyInv$.[17] The regressions results show that both large and small key investors show significant relations between initial returns and their participation. The coefficient estimate is larger for small key investors (0.024 versus 0.014), suggesting that favoritism and bargaining power are not the primary drivers of our results.[18]

Splitting key investors by underwriter-relationships allows us to further test the favoritism-based explanation. Underwriters may allocate the offerings that are expected to experience high initial returns to favored clients. To test how underwriter relationships affect classification, we split $NumKeyInvestors$ into $NumUWRelatedKeyInv$ and $NumNonRelatedKeyInv$. Column (3) of Table 6 shows that initial returns are positively related to both types of key investors' participation. The coefficient estimates are very close (0.015 versus 0.016), suggesting that underwriter relationships are not the primary driver of the relation between key investors' participation and initial returns.

Finally, to test the importance of information reflected in industry specialization, we split $NumKeyInvestors$ into $NumSpecialistKeyInv$ and $NumNonSpecialistKeyInv$. If investors possess superior information about IPO firms, it seems likely that they do so in industries in which they specialize.[19] Therefore, if information is driving the relation between key investors' participation and initial returns, then this relation is likely stronger when those key investors are more specialized in the IPO firm's industry. Column (4) of Table 6 shows that specialized key investors' participation more positively relates to initial returns than non-specialist key investors'

[17] Summary statistics on the number of key investors in each sub-group are provided in the Online Appendix.

[18] Results for even smaller key investors with less than $1 billion under management confirm this finding.

[19] Kacperczyk, Sialm and Zheng (2005) shows that investors concentrate their holdings in industries in which they have informational advantages.

participation. The coefficient estimate on $NumSpecialistKeyInv$ (0.024) is three times larger than that for $NumNonSpecialistKeyInv$ (0.008) and the difference is statistically significant. Economically, a one-standard deviation increase in $NumSpecialistKeyInv$ (about 4 specialist key investors) is associated with 10% higher initial returns, while a one-standard deviation increase in $NumNonSpecialistKeyInv$ (about 3 non-specialist key investors) is associated with only 2% higher initial returns. These findings are consistent with key investors' industry expertise, and likely superior information about IPO firms, driving initial returns.

4.2.2 Key investors matter more for hard-to-value firms

If key investors are providing valuable information in IPOs, it is likely that such information is more valuable in some IPOs than others. If this is the case, key investors' presence should matter relatively more in IPOs with more uncertain valuations. In general, growth options are more difficult to value than assets-in-place, so we measure firms based on the percentage of their value attributable to growth options. We predict that the relation between key investors' participation and initial returns will be stronger for those firms whose values are more predominantly driven by growth options. We follow Benveniste et al. (2003) in using the present value of growth options, $PVGO$, as a measure of valuation uncertainty.

$$PVGO = \frac{E[P] - EPS/R}{E[P]} \tag{7}$$

where $E[P]$ is the midpoint of the offer price filing range and EPS/R is the present value of the issuing firm's current earnings at the time of the IPO discounted at the industry cost of capital. The lower the value of $PVGO$, the less speculative the offering. In our sample, the mean $PVGO$ is 0.79, so 79% of the average company's offer price reflects future growth-option value.

We test whether key investors are more important for pricing in hard-to-value IPOs by interacting key investors' participation with $PVGO$ and a dummy variable, $NegEarnings$, indicating whether the firm had negative earnings prior to the IPO (which is consistent with higher growth-option value). We expect the interaction terms to be positive for $PVGO$ and $NegEarnings$. Columns (1) and (2) in Table 7 display the results. As predicted, firms' having more of their value

in growth options display a stronger relation between key investors' participation and initial return, as do firms' with negative earnings. This evidence is again consistent with key investors' having information which affects IPO pricing.

4.3 Additional tests support information-based theories

Information-based and favoritism-based theories of IPO pricing often give similar predictions relating key investors' participation to initial returns. However, predictions differ in several key ways. To further distinguish between the theories, we test: (i) the shape of the relation between key investors' participation and initial returns; (ii) the importance of the expected and unexpected components of key investors' participation; and (iii) the relation between key investors' participation and offer price revisions.

4.3.1 Many key investors participate in IPOs with high initial returns

Information-based theories predict a convex relation between key investors' participation and initial returns, while favoritism-based theories suggest a concave relation. In Sherman and Titman (2002), an underwriter compensates investors for costly information production by lowering the offer price and generating a high initial return by underpricing. To maximize mechanism efficiency, the underwriter concentrates underpricing in offerings where virtually all investors report good information. This results in a skewed distribution of underpricing and initial returns, "with a few hot issues having enormous price jumps."[20] This suggests a convex, non-linear relation between key investor' participation and initial returns, with extreme initial returns occurring when large numbers of key investors report holding shares.

Favoritism-based explanations suggest that underwriters would favor a small number of trusted key investors in IPOs. Limiting the number of investors minimizes potential public relations risks associated with kickbacks, and allows underwriters to concentrate on investors who do substantial business with the underwriter, possibly maximizing the return of kickbacks. Thus, if key investors are important due to their ability to return kickbacks to the underwriter, this would lead to a

[20]Sherman and Titman (2002) pg. 16. Liu et al. (2015) generates similar predictions.

concave relation between the number of key investors participating and initial returns. As a third possibility, information-based and favoritism-based motivations may both drive key investors' participation, resulting in no distinguishable shape in the relation.

To test for the shape of the relation, in addition to the standard linear term we include the squared number of key investors, $NumKeyInvestors^2$. Column (3) of Table 7 shows that the coefficient on the squared term is significantly positive, confirming a convex, non-linear relation between key investors' participation and initial returns. Figure 1(a) is also consistent with this finding, showing a convex shape and average initial returns over 100% for IPOs with the most key investor participation. While the convex relation does not rule out other theories, it provides support for key investors' being informed, and the lack of a concave relation casts doubt on favoritism-based motivations for key investors' participation in IPOs.

4.3.2 Unexpected key-investor participation is strongly related to initial returns

Favoritism-based theories suggest that underwriters form relationships with investors who return the economic benefits of underpricing to underwriters through other lines of business. If this effect drives key investors' roles in IPO pricing, then it is likely that underwriters who have more relationships with key investors would tend to underprice more. These same underwriters would also have higher expected key investor participation, and thus, expected key investor participation should be positively related to initial returns.

Alternatively, information-based theories suggest that underwriters reward investors who reveal good information with valuable allocations in that particular IPO. While an underwriter may have relationships with many key investors who could potentially provide valuable information, only those IPOs in which they receive good information will be substantially underpriced. Because we cannot condition on information revealed during bookbuilding in forming the expected number of key investors, the expected number of key investors should not necessarily relate to initial returns. However, the unexpected number of key investors should be related to the information revealed during bookbuilding, and thus, positively related to initial returns. Therefore, we expect that if key investors are involved in IPOs for favoritism-based motivations, then expected key-investor

participation will be more related to initial returns, whereas information-based motivations should lead to unexpected key investors' participation being more related to initial returns.

To separate key investors' participation into expected and unexpected components, we first estimate the probability with which investors report holdings in IPOs. To do so, we build a probit model in which the probability an investor reports shares after an IPO is a function of the investor's characteristics (e.g. size, age, and industry specializations), the underwriter's characteristics (e.g. underwriter rank and investor relationships) and the IPO firm's industry.[21] We also include $KeyInvestor$ and interaction terms with $KeyInvestor$. All explanatory variables are known prior to the IPO.

Results of our probit model estimation are available in the Online Appendix. As expected, key investors are more likely to report holdings of IPO firms. Underwriter relationships and investors' specializations are also both strong drivers of reported holdings. Using our probit estimates, we form expectations for the participation of all investors and key investors by summing individual investors' probabilities of reporting shares in each IPO. Because the expectations are formed using investor and underwriter data, as well as the IPO firm's industry, IPOs from the same underwriter, quarter and industry will have identical expected numbers of key investor and total investor participation. For the same reason, underwriters with more related key investors, and IPO firms in industries with more specialist key investors, will have higher expected numbers of key investors.

Columns (4) through (6) of Table 7 show that the *unexpected* portion of key investors' participation is more strongly related to initial returns than the *expected* portion. While both are statistically significant, the economic significance is over three times greater for the unexpected component (a one standard deviation increase is associated with 10% higher initial returns) relative to the expected component. This evidence is consistent with key investors' information driving their relation to IPO pricing.

[21] Alternatively, using a linear probability model results in similar conclusions to those presented.

4.3.3 Underwriters revise offer prices upwards when key investors participate

To further distinguish between favoritism-based and information-based motivations, we consider the relation between key investors' participation and offer price revisions. If information learned from key investors during the bookbuilding process does lead to the relation between their participation and high initial returns, then it is also likely that offer prices are revised upwards when more key investors participate in an IPO. In a typical information theory of book-building, if investors provide positive information and order many shares, the offer price is revised upwards. Thus, if key investors are informed, we predicts a positive relation between offer price revisions and key investors' participation.

Alternatively, were initial returns entirely motivated by underwriters' favoring some investors, it is likely that key investors would be associated with less positive or even negative revisions as underwriters would set offer prices lower to transfer more rents to those investors (and subsequently recapture those rents through other lines of business). While that broadly applies to favoritism explanations, it is important to note that laddering (i.e., illegal price support) can generate the opposite prediction. As shown by Hao (2007), laddering can be associated with positive offer price revisions and positive initial returns. As a result, offer price revisions provide a weaker test to distinguish between favoritism-based and information-based explanations.

Table 8 shows that $NumKeyInvestors$ is positively related to offer price revisions, and is the most important explanatory variable for offer price revisions when including standard IPO controls. While this result is consistent with information-based motivations for key investors' participation in IPOs, it is also possible that laddering motivations are an important component.

To assess which explanation is more plausible, we analyze how sub-groups of key investors are related to initial returns. First, we split $NumKeyInvestors$ into $NumLargeKeyInv$ and $NumSmallKeyInv$ as large investors may be better able to provide laddering-related price support after the IPO. Second, to test the importance of underwriter relationships in determining key investors (which would likely be related to laddering), we split $NumKeyInvestors$ into $NumUWRelatedKeyInv$ and $NumNonRelatedKeyInv$. Finally, to test the importance of information (which is likely related to industry specialization), we split $NumKeyInvestors$ into

$NumSpecialistKeyInv$ and $NumNonSpecialistKeyInv$.

Columns (2), (3) and (4) of Table 8 show the relations between offer price revisions and our large-versus-small, related-versus-unrelated, and specialist-versus-non-specialist subsets of key investors. Small key investors', unrelated key investors' and specialist key investors' participation are each more associated with offer price revisions than their counterparts' participation. The largest difference is between specialist and non-specialist key investors, suggesting that the information from specialist key investors is driving price revisions and subsequent initial returns. That large and related key investors' participation are less strongly related to initial returns makes laddering a less plausible explanation. However, it is interesting that the coefficient for underwriter-related key investors is smaller than for non-related key investors. This may suggest that underwriters attempt to lower the prices for those investors, possibly to enhance the value of kickbacks. Given that the overall relation between underwriter-related key investors' participation and offer price revisions is still significantly positive, this would likely be a small effect. Overall, our results best support information-based theories for key investors' post-IPO holdings.[22]

5 Alternative Explanations and Robustness

We analyze and discuss several robustness checks and alternative explanations for our findings. While we cannot rule them out conclusively, a lack of support for alternatives indirectly supports our main results.

5.1 Post-IPO buying is unlikely to explain our findings

We do not observe directly the participation of investors in an IPO. Instead, we assume that investors participated in an IPO if they reported holding shares at the end of the quarter in which the IPO took place. The delay between the date of the IPO and the reporting date allows for the possibility that investors did not participate in the IPO, but rather bought shares well after the IPO. Several tests suggest that post-IPO buying is unlikely to be the main reason for the observed

[22] Bubna and Prabhala (2011) and Ljungqvist and Wilhelm (2002) also provide evidence consistent with investors' receiving rewards for information revelation during book-building, while Chiang, Qian and Sherman (2010) show sophisticated investors earn better returns in auctioned IPOs.

relation between key investors' participation and initial returns.

First, we consider the possibility that the relation between key investors' participation and initial returns is due to key investors' systematically buying high-initial-return IPOs to window dress their holdings. Doing so may lead a fund's investors to believe the fund has access to IPOs and lead to increased inflows. While this is certainly a possibility, that offer price revisions are sensitive to key investors' participation suggests involvement in the price setting process. However, it also suggests that if key investors are simply window dressing, they are not just buying the highest initial return IPOs. Instead, they are buying high-initial-return IPOs that also have high offer price revisions. Given the strong relation between offer price revisions and initial returns, the relation between key investors' participation and offer price revisions may be driven by initial returns. To test this possibility, in Column (5) of Table 8, we include initial returns in the regression. While initial returns are not known at the time of offer price revisions, including initial returns allows us to isolate the relation between key investors' participation and offer price revisions that is orthogonal to initial returns. The results show that the coefficient estimate on $NumKeyInvestors$ remains strong statistically and economically (the point estimate is reduced by only 30% and the t-stat is 12.3). For window-dressing to be driving our results, key investors must be conditioning their post-IPO buying on both initial returns and the orthogonal portion of offer price revisions. While possible, we view this explanation as less likely than our information-based interpretation.

Our second test considers how key investors' participation relates to the timing of IPOs within a quarter. If key investors engage in post-IPO buying more so than non-key investors, they could be associated with substantial initial returns due to their propensity to buy high-initial-return stocks after the IPO and hold them until at least the end of the quarter. To test for differential holdings patterns, we examine the relation between the number of investors and key investors holding shares at the end of the quarter and the time period between the IPO and the end of the quarter. IPOs that occur earlier in the quarter have more time for investors to purchase shares in the secondary market. Not only do investors have more time to purchase those stocks, but those stocks' prices are also more likely to stabilize prior to the end of the quarter. Given the volatile nature of IPO stocks' prices, and the delay between the end of the quarter and the release of the 13F holdings

data (typically 45 days), investors will face greater risk by window-dressing with IPOs that occur closer to the end of the quarter. Therefore, if key investors' post-IPO buying is driving our results, we would expect higher numbers of key investors (relative to non-key investors) for IPOs earlier in the quarter.

In the Online Appendix, we show that the number of key investors does increase with the number of days remaining in the quarter. However, the number of key investors does not increase faster than the number of total investors. In fact, the coefficient estimates suggest that non-key investors increase more quickly than key investors. This is inconsistent with key investors' classification being due to post-IPO buying in the weeks after hot IPOs. However, it does not rule out the possibility that key investors buy on the first day of the IPO, making within-quarter timing irrelevant. Given our complimentary evidence, we believe it is more likely that key investors' holdings predominantly reflect IPO participation rather than strictly post-IPO buying.

Several other points are worth making. First, some degree of post-IPO buying is consistent with our view that holdings reflect IPO participation. A priori, the role of investors buying shares after the IPO may be as important for determining the offer price and initial return as the role of investors receiving allocations. For example, investors buying after the IPO may have unsuccessfully attempted to buy shares in the IPO, communicating their willingness to buy shares to the underwriter. That expression of interest reflects active participation in the IPO regardless of actual allocations.

Second, we may be failing to classify some key investors if they sell high-initial-return IPOs before the end of the quarter, leaving them classified as non-key investors. This could increase the relation between all investors' participation and initial returns, and diminish the relative effect for key investors, biasing our tests against finding differences. Therefore, this source of bias does not challenge our conclusions.

5.2 Key investors' importance is consistent across time

The internet bubble period experienced extreme initial returns, and many studies found evidence of behaviors, often illegal, that pumped up initial returns to benefit underwriters and their clients

(Ritter, 2011). To rule out that such behaviors are driving our results, we analyze the relation between key investors' participation and initial returns across several time periods. Columns (1) through (3) of Table 9 shows results for before the bubble (1985 - 1997), during the bubble (1998-2000) and after the bubble (2001 - 2014). The results indicate that the internet bubble is not driving our results. While the point estimate on the coefficient for $NumKeyInvestors$ during the bubble period is larger than those before or after the bubble period (0.012 before, 0.017 during and 0.010 after), the differences are not statistically significant. However, the coefficient on total investor participation, $NumInstInvestors$, increases over ten times during the bubble period (0.001 before, 0.015 during and 0.001 after), and the differences are statistically significant. These differences are consistent with the extreme initial returns observed during the bubble period. Overall, these results show that key investors' participation has been consistently related to initial returns over thirty years and multiple market conditions.

5.3 Other explanations

Including controls for several post-IPO outcome variables allows us to cast doubt on other potential explanations. Both Booth and Chua (1996) and Ellul and Pagano (2006) link initial returns to secondary-market liquidity. Consistent with the argument in Ellul and Pagano (2006) that investors require a discount (underpricing) when anticipating an illiquid post-IPO market, Column (4) of Table 9 shows a positive relation between initial returns and post-IPO spreads (using the bid-ask spread measure from Corwin and Schultz (2012)). However, this relation does not remove the explanatory power of key investors' participation, suggesting that key investors' participation relates to IPO pricing directly and beyond its possible effect on post-IPO liquidity. Loughran and Ritter (2004) propose that firms accept underpricing in exchange for analyst coverage. Our results may be explained by key investors' being favored by underwriters in offerings where analyst coverage is particularly desirable. We control for this possibility by counting the number of analysts covering firms at the end of their quiet-periods and one year after their IPOs. Columns (5) and (6) show that including measures of analyst coverage does not remove the explanatory power of key investors' participation for initial returns.

6 Conclusion

While the existence of high initial returns in IPOs has been long established, and the reasons for such underpricing have been extensively researched, the literature has not established which, if any, investors benefit most from high initial returns. We provide a measure to classify key investors who reported holdings in past high-initial-return IPOs, show that our measure is persistent, and find that key investors' participation in future IPOs is strongly related to initial returns. As such, we establish the existence of a group of key investors who persistently benefit from high initial returns in IPOs.

We further analyze why key investors are important to IPO pricing, providing insight into why key investors are associated with high-initial-return IPOs. Information-based explanations best explain the relation between key investors' participation and initial returns. Importantly, this suggests that information revealed through bookbuilding plays a large role in determining the extent of underpricing in a particular IPO, i.e., information explains a large portion of the cross-sectional dispersion in initial returns. Furthermore, our results emphasize that demand-side factors affect IPO pricing, highlighting an important role for institutional investors in primary markets.

7 New Evidence

In this section, we add several tests that aim at distinguishing the role of information and favoritism in IPO allocations and initial pricing of shares. First, we test whether key investors are informed based on their post-IPO returns and trading activity, and whether informed key investors' holdings are more associated with abnormal initial returns. Second, we use past brokerage commissions paid to underwriters by fund families to analyze whether key investors' performance is driven by favoritism.

7.1 Key investors outperform other institutional investors in post-IPO trading

If key investors' abilities to pick the best IPOs is due to their superior information, it is likely that their informational advantage over other investors continues in the post-IPO period. To test

this hypothesis, we analyze the quarterly changes in investors' reported holdings in the five years after the IPO and construct several measures of investors' performance. The first two measures are holding period returns. The simple holding period return is calculated from the end of the first quarter after the IPO, and continues until the investor sells their entire position (or the end of the fifth year). The simple holding period return does not account for changes in position over time. The second return is a position-weighted holding-period return. In each quarter, we use the prior quarter's change in position to adjust the weightings of a portfolio of the IPO stock and the market. Formally, we calculate the position-weighted holding period return as:

$$\prod_{t}^{T}[(1+\Delta Q_{t-1})(1+R_{IPO,t})-\Delta Q_{t-1}(1+R_{Mkt,t})] \tag{8}$$

in which ΔQ is the percentage change in shares held, $R_{IPO,t}$ is the IPO return, $R_{Mkt,t}$ is the CRSP value-weighted market return, and the product is taken over all quarters until shares held equal zero (and the final change of -100% is included).

Our tests show that key investors have higher holding periods returns than non-key investors. To formally test for performance differences, we average key and non-key investors' returns and holdings in each IPO. Table 10 shows that key investors average a 41% simple holding period return while non-key investors average 36%. Due to significant noise in returns, the means are not statistically different using a standard t-test. However, non-parametric tests of median differences (rank-sum and sign-rank) show that the return difference is significant at the 1% level. For position-weighted holding period returns, key investors earn 234% while non-key investors earn 70%. Again, a t-test shows the difference in means is not significant, but non-parametric tests show that the median return for key investors is significantly higher than non-key investors' median return. Both holding period return tests are consistent with the hypothesis that key investors are better informed about their IPO firms than non-key investors.

Next, we construct a measure of informed investors based on how often their trades predict future stock price movements. To do so, we first measure whether an investor increased or decreased her position in the prior quarter. If the investor increased her position in the prior quarter, and the IPO stock's return exceeds the market return over the subsequent period (from one to four

quarters), then we consider the investor's trade to be correct. However, if the market return exceeds the IPO stock's return over that period, the investor's trade is incorrect. After position decreases, correct trades forecast the IPO stock's return lagging the market return. We aggregate key and non-key investors' trades in each IPO, and compare the percentage correct between the two groups.

The bottom half of Table 10 shows that key investors' trades significantly outperform non-key investors' trades. Looking at one-quarter ahead returns, key investors are correct 53.9% of the time, relative to 52.6% for non-key investors. Key investors' outperformance monotonically grows to 56.4% versus 53.8% at the four-quarter horizon. The differences are statistically significant at the 1% level in 11 of the 12 tests (mean, rank-sum and sign-rank tests at one, two, three and four quarter horizons).

Finally, we aggregate each investor's correct trades across all of their IPOs. We then classify investors as informed by comparing their percentage of correct trades to a simple binomial distribution whose mean is equal to the average percentage of correct trades across all investors. Informed investors are defined as those whose trades correct the highest percentage of the time. Specifically, for informed investors it is less than 1% likely that their trades to predict future price movements by chance. We then split key investors into informed versus uninformed groups. Column (2) of Table 11 shows that participation of informed key investors strongly relates to initial returns (3.1% higher initial returns per key investor), more so than for non-informed key investors (1.3% higher initial returns per key investor). This result suggests that informational advantages may explain a substantial part of key investors' persistent participation in IPOs with abnormal initial returns.

7.2 Do key investors gain by paying high commissions to underwriters?

IPOs are not the only business relationship institutional investors engage in with underwriters. Other lines of business with institutional investors may bring significant revenue to underwriters, and they in turn may allocate high initial return shares to the investors that pay high commissions to them. For instance, Reuter (2006) has documented that brokerage commissions paid by mutual fund families to underwriters help investors to acquire underpriced IPOs. Using the same data

as Reuter (2006), we test whether these commissions can explain key investors' participation in the most underpiced IPOs. Note that our sample size is reduced considerably for these tests, as our sample only extends from 1997 through 2002 and we only include investors for which we have commission data.

First, we compute total commissions paid over the prior year by each fund manager to each IPO underwriter. We then estimate a probit model to determine how past commissions relate to the probability that a fund will report holding shares after the IPO. As can be seen in Column (1) of Table 12, the total commissions paid by an investor do increase the investor's probability of holding IPO shares. This result is consistent with the findings in Reuter (2006) and with other results providing evidence of quid pro quo relationships between investors and underwriters. However, Column (3) shows that commissions matter less for the holdings of key investors. This suggests that key investors gain less (at least in terms of IPO allocations) from paying high commissions to underwriters compared to average institutional investors.

Second, we consider whether the participation of key investors that also pay substantial commissions to underwriters is more related to initial returns than for non-commission paying key investors. If favoritism is driving key investors' holdings, then we would expect to see higher initial returns related to the participation of high-commission key investors. To conduct the test, we first rank each investor-underwriter pair based on the commissions paid over the prior year. If an investor is in the top 10% of commissions paid to a particular underwriter in the past year, we consider the investor to be a *TopCommission* investor (for that underwriter). Our first test of high commission investors relates the number of *TopCommission* investors in each IPO to initial returns. Column (1) in Table 13 shows that participation by *TopCommission* investors is strongly related to initial returns. Again, this is consistent with past findings that quid pro quo arrangements matter for initial returns. However, Column (2) shows that *TopCommission* investors are really no different than average investors, as including the total number of investors removes all explanatory power for *TopCommission* investors. Furthermore, Columns (3) and (4) include key investors and *TopCommission* key investors, showing that *TopCommission* key investors' participation is less related to initial returns relative to non-*TopCommission* key investors' participation. In other words, it

appears unlikely that key investors' persistent purchases of IPOs with high initial returns is due to their being favored by underwriters as a payback for high brokerage commissions.

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Appendix: Variable Definitions

IPO Measures

BidAskSpread: Bid-ask spread estimator from Corwin and Schultz (2012), calculated using the first six-months of trading.

DaysToQuarterEnd: The number of days between the IPO and the last day of the quarter.

Expansion: The percentage of primary shares issued relative to the shares outstanding after the IPO, as first used in Liu et al. (2015).[23]

LogAge: Natural logarithm of the firm's age at the time of the IPO based on founding dates from the Field-Ritter dataset used in Field and Karpoff (2002) and Loughran and Ritter (2004).

LogProceeds: Natural logarithm of the total IPO proceeds adjusted to year 2005 dollars.

LogSize: Total dollar value of an investor's positions reported in the 13F filings data.

InitialNumAnalysts: Number of analysts issuing reports in the first month after the end of the quiet period.

InitialReturn: The return from the IPO offer price to the price at the end of the first day of trading.

InstPctShares: Total holdings of institutions in the first reporting quarter divided by the number of shares issued. A similar measure (using more precise allocations data) is used in Ljungqvist and Wilhelm (2002).

InversePrice: The inverse of the filing-range midpoint.

MoneyLeft: $SharesReported \times OfferPrice \times InitialReturn$. $OfferPrice$ is the final offering price and *SharesReported* is the number of shares reported by an investor in the 13F filings in the quarter following the IPO.

NegEarnings: An indicator equal to one if the firm reported negative pre-IPO earnings.

NumInstInvestors: The number of institutional investors who report holdings in an offering.

OfferPriceRevision: Percentage change from the midpoint of the first offer price range to the final offering price. The positive relationship between underpricing and offer price revisions was first documented by Hanley (1993).

OneYearNumAnalysts: Number of analysts issuing reports in the month one year after an IPO's issuance.

PosPriceRevision: The maximum of $OfferPriceRevision$ and zero.

PriorMktReturn: Market return (CRSP value-weighted return) over the 15 trading days prior to the issue date.

PriorMktStdDev: Standard deviation of market returns (CRSP value-weighted returns) over the 15 trading days prior to the issue date.

[23] *Overhang*, which is shares held by the firm's initial investors divided by the shares issued in the IPO, represents a combination of *Expansion* and *Retention*. Using *Overhang*, which was first documented in Bradley and Jordan (2002), as an alternative does not change our results.

PriorMonthNumIPOs: Number of IPOs issued in the month prior to the IPO.
PriorMonthInitialReturn: Average initial return of IPOs issued in month prior to the IPO.
PVGO: The present value of growth options, a measure of valuation uncertainty used in Benveniste et al. (2003). For details see equation (7) in the main text.
Retention: The percentage of pre-IPO shares retained by the pre-IPO sharesholders, as first used in Liu et al. (2015).
TechFirm: Indicator variable equal to one if the firm's SIC code is in a technology sector as defined by Cliff and Denis (2004).
UnderwriterRank: Carter–Manaster rank originated in Carter and Manaster (1990), and further updated in Carter, Dark and Singh (1998) and Loughran and Ritter (2004). The data are taken from Jay Ritter's website.
UnderwriterPremium: Average abnormal underpricing for an underwriter over the five years preceding an IPO. This measure was first used by Hoberg (2007) as *UnderwriterPersistence*.
$VC - Backed$: Indicator variable equal to one if the firm is backed by a venture capital firm.

Investor Characteristics

AUM: Total dollar value of an investor's positions reported in the 13F filings data (in 2005 dollars).
Churn: Measure of trading activity calculated following Cella, Ellul and Giannetti (2013).
FundAge: Number of quarters an investor has reported in the 13F filings data, starting in 1980.
IndustryBias: A standardized measure of an investor's concentration of holdings within an industry. Values above zero reflect overweighting relative to the average investor.
IPOHoldTime: The number of quarters before an investor reports no holdings in a firm for which it reported holdings in the quarter following the IPO.
NumPositions: The total number of positions reported in the 13F filings data.
OneTimeRelationship: An indicator variable equal to one if an investor reported holdings in at least 1 of an underwriter's last 10 IPOs (within the last 5 years).
Specialist: An indicator variable equal to one if an investor has a higher portfolio weight in the IPO firm's industry than the average investor in the same quarter, i.e., $IndustryBias > 0$.
$Underwriter - Related$: An indicator variable equal to one if an investor reported holdings in at least 2 of an underwriter's last 10 IPOs (within the last 5 years).

Key Investor Measures

ExpectedNumInstInvestors: The estimated number of institutional investors participating in an offering based on a probit estimation of allocation probabilities.
ExpectedNumKeyInvestors: The estimated number of key institutional investors participating in an offering based on a probit estimation of allocation probabilities.

$KeyInvestor$: An indicator variable equal to one if an investor reported holdings over the last year representing statistically significant total money left on the table or average initial returns (depending on which definition is used). From Table 7 onward, $MeanAbnormalReturn$ is used to define key investors.
$KeyInvPctShares$: The total number of shares key investors report holding at the end of the quarter following an IPO, divided by the number of shares reported by all investors.
$NumKeyInvestors$: The number of key ($KeyInvestor = 1$) investors who report holdings in an offering.
$NumKeyInvestors^2$: The squared number of key ($KeyInvestor = 1$) investors who report holdings in an offering.
$NumLargeKeyInv$: The number of key ($KeyInvestor = 1$) investors with above median AUM (calculated each quarter) who report holdings in an offering.
$NumSmallKeyInv$: The number of key ($KeyInvestor = 1$) investors with below median AUM (calculated each quarter) who report holdings in an offering.
$NumKeySpecialistInv$: The number of *Specialist* key ($KeyInvestor = 1$) investors who report holdings in an offering.
$NumKeyNonSpecialistInv$: The number of key ($KeyInvestor = 1$) investors who report holdings in an offering who are not a *Specialist*.
$NumKeyUWRelatedInv$: The number of $Underwriter-Related$ key ($KeyInvestor = 1$) investors who report holdings in an offering.
$NumKeyNonRelatedInv$: The number of key ($KeyInvestor = 1$) investors who report holdings in an offering who are not $Underwriter - Related$.
$UnexpectedNumInstInvestors$: $NumInstInvestors$ - $ExpectedNumInstInvestors$.
$UnexpectedNumKeyInvestors$: $NumKeyInvestors$ - $ExpectedNumKeyInvestors$.

Table 1: Persistence of Key Investors. The first three rows use our measure of key investors based on $TotalMoneyLeft$, while the following two sets of rows use our measures based on $MeanAbnormalReturn$ and $MedianAbnormalReturn$. The second column shows the percentage of investor-year observations classified as key investors for each definition. The remaining columns track the number of years since an investor was classified as a key investor, and show the percentage of initial key investors still classified as key investors in that year. The expectation under a lack of persistence is equal to the overall percentage of key investors in the population, which is given in the second column.

		% Key Inv Retaining Classification After X Years									
Key Investor Measure	% of Investors	1	2	3	4	5	6	7	8	9	10
p-value($TotalMoneyLeft$) $< 1\%$	1	22	13	21	9	15	13	6	4	7	6
p-value($TotalMoneyLeft$) $< 5\%$	6	33	33	27	26	28	25	23	21	21	19
p-value($TotalMoneyLeft$) $< 10\%$	11	45	42	38	38	37	35	34	32	32	34
p-value($MeanAbnormalReturn$) $< 1\%$	11	39	27	28	29	25	26	24	21	19	19
p-value($MeanAbnormalReturn$) $< 5\%$	21	47	38	38	38	36	35	37	34	33	35
p-value($MedianAbnormalReturn$) $< 1\%$	10	34	28	24	22	22	22	23	20	18	17
p-value($MedianAbnormalReturn$) $< 5\%$	21	43	38	36	36	34	33	35	32	32	33

Table 2: Comparing measures of key investors' relations to initial returns. *SharesKey* abbreviates *PctKeyInvShares* and *NumKey* abbreviates *NumKeyInvestors*. All variables are standardized to enhance comparability. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

Panel A

	InitialReturn						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SharesKey:TotalMoneyLeft	0.166***	0.081***					0.058***
	(11.391)	(6.629)					(4.797)
SharesKey:MeanInitialReturn			0.315***	0.123***			0.109***
			(17.629)	(7.711)			(5.242)
SharesKey:MedianInitialReturn					0.221***	0.069***	-0.004
					(14.868)	(5.138)	(-0.254)
Year Dummies	No	Yes	No	Yes	No	Yes	Yes
Additional Controls	No	Yes	No	Yes	No	Yes	Yes
R^2	0.026	0.476	0.093	0.480	0.046	0.475	0.482
Observations	5,717	5,717	5,717	5,717	5,717	5,717	5,717

Panel B

	InitialReturn						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
NumKey:TotalMoneyLeft	0.302***	0.021					-0.039*
	(20.646)	(0.960)					(-1.662)
NumKey:MeanInitialReturn			0.500***	0.287***			0.274***
			(23.649)	(10.188)			(6.024)
NumKey:MedianInitialReturn					0.515***	0.224***	0.028
					(25.386)	(9.103)	(0.702)
Year Dummies	No	Yes	No	Yes	No	Yes	Yes
Additional Controls	No	Yes	No	Yes	No	Yes	Yes
R^2	0.085	0.472	0.235	0.491	0.248	0.484	0.491
Observations	5,717	5,717	5,717	5,717	5,717	5,717	5,717

Table 3: Regressions of initial returns on the number of participating key investors and control variables common to the IPO literature. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	InitialReturn			
	(1)	(2)	(3)	(4)
KeyInvPctShares		0.187***		0.061**
		(7.711)		(2.195)
NumKeyInvestors			0.016***	0.015***
			(10.188)	(7.861)
NumInstInvestors	0.009***	0.008***	0.005***	0.005***
	(16.724)	(16.254)	(9.116)	(9.362)
OfferPriceRevision	0.222***	0.197***	0.184***	0.180***
	(7.705)	(6.926)	(6.391)	(6.313)
PosPriceRevision	0.718***	0.688***	0.624***	0.624***
	(9.363)	(8.935)	(8.100)	(8.109)
InstPctShares	-0.047***	-0.046***	-0.047***	-0.047***
	(-3.410)	(-3.327)	(-3.493)	(-3.459)
LogProceeds	-0.098***	-0.097***	-0.091***	-0.091***
	(-11.912)	(-11.859)	(-11.167)	(-11.218)
InversePrice	-1.331***	-1.272***	-1.196***	-1.191***
	(-7.148)	(-6.861)	(-6.558)	(-6.530)
Retention	0.071***	0.064***	0.049***	0.049***
	(3.784)	(3.478)	(2.659)	(2.674)
Expansion	-0.105***	-0.099***	-0.110***	-0.108***
	(-5.323)	(-5.074)	(-5.556)	(-5.455)
LogAge	-0.035***	-0.035***	-0.032***	-0.032***
	(-5.423)	(-5.321)	(-4.971)	(-4.981)
LogSize	-0.014***	-0.012***	-0.011***	-0.010***
	(-4.017)	(-3.365)	(-3.068)	(-2.966)
TechFirm	0.004	0.001	-0.001	-0.001
	(0.396)	(0.138)	(-0.068)	(-0.104)
VC-Backed	0.030***	0.028***	0.027***	0.027***
	(3.582)	(3.403)	(3.303)	(3.271)
UnderwriterRank	-0.004	-0.007**	-0.006**	-0.007**
	(-1.370)	(-2.236)	(-2.114)	(-2.338)
UnderwriterPremium	0.318***	0.293***	0.271***	0.268***
	(5.916)	(5.519)	(5.149)	(5.100)
Prior15MktReturn	0.710***	0.719***	0.698***	0.702***
	(4.520)	(4.616)	(4.522)	(4.548)
Prior15MktStdDev	1.155	1.060	1.025	1.008
	(0.726)	(0.676)	(0.661)	(0.651)
PriorMonthInitRet	0.190***	0.199***	0.178***	0.183***
	(3.395)	(3.611)	(3.285)	(3.375)
PriorMonthNumIPOs	-0.001*	-0.001**	-0.001***	-0.001***
	(-1.653)	(-2.084)	(-2.769)	(-2.792)
Year Dummies	Yes	Yes	Yes	Yes
R^2	0.472	0.480	0.491	0.492
Observations	5,717	5,717	5,717	5,717

Table 4: Investor Characteristics. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	All Investors			Key Investors Only		
	Non-Key	Key	Diffs	Large	Small	Diffs
Investor-Quarter Statistics:						
AUM (billions)	\$18.1	\$31.3	\$13.2***	\$60.3	\$2.4	\$57.9***
FundAge	2.8	3.1	0.3***	3.5	2.7	0.8***
Churn	0.363	0.358	-0.005	0.290	0.427	-0.137***
Average *IPOHoldTime*	7.652	7.265	-0.387***	9.053	5.209	3.844***
Percent Hedge Funds	21.8%	19.1%	-2.7%***	8.9%	29.4%	-20.5%***
Average *IndustryBias*	0.30	0.51	0.21***	0.20	0.83	-0.63***
Average Underwriter Participation	16.1%	17.4%	1.3%***	21.3%	13.5%	7.8%***
Average IPOs Per Year	15.8	40.2	24.4***	55.0	25.4	29.6***
Average IPOs Per Underwriter Per Year	2.1	2.8	0.7***	3.2	2.3	0.9***
Investor-Quarter Observations	25,313	3,113		1,554	1,559	
Allocation Statistics:						
Percent Tech Firms	39.9%	51.8%	11.9%***	50.2%	55.5%	5.3%***
Percent VC-Backed Firms	41.5%	52.3%	10.8%***	50.8%	55.7%	4.9%***
Percent *Specialist*	50.4%	58.7%	8.3%***	55.0%	67.0%	-12.0%***
Percent *Underwriter − Related*	49.2%	63.0%	13.8%***	69.1%	49.0%	20.1%***
Mean Initial Return	29.1%	47.4%	18.3%***	47.0%	48.2%	1.2%
Std. Dev. Initial Return	56.2%	73.7%		74.5%	71.7%	
Number of Allocations	100,977	27,029		18,797	8,232	

Table 5: Key investor summary data. Investors are ranked based on the number of years, at the beginning of which, they are identified as being a key investor. AUM represents the most recent (within our sample) assets under management (in 2005 dollars) based on reported 13F holdings. Percent *Specialist* is the percentage of allocations in which the key investor over-weights the IPO firm's industry, i.e. $IndustryBias > 0$. Percent $UW - Related$ is the percentage of allocations in which the key investor has participated in at least two of that underwriter's last ten offerings. Only investors identified as key investors for at least 5 years are listed.

Investor Name	Num Years $KeyInv = 1$	Num Years	Num Alloc	AUM (billions)	Percent *Specialist*	Percent $UW - Related$
Most Frequent Key Investors:						
ESSEX INVESTMENT MANAGEMENT CO	17	29	1254	$0.6	73%	71%
PROVIDENT INV COUNSEL	11	23	700	$2.2	74%	54%
JANUS CAPITAL CORP	11	27	913	$97.9	72%	62%
DRIEHAUS CAPITAL MANAGEMENT, I	11	21	342	$2.4	71%	34%
DENVER INVESTMENT ADVR LLC	10	16	867	$3.2	79%	78%
GILDER GAGNON HOWE & CO LLC	10	15	312	$7.1	67%	56%
TCW ASSET MANAGEMENT COMPANY	10	26	973	$23.1	64%	63%
TURNER INVESTMENT PARTNERS, IN	9	21	672	$3.5	77%	62%
DUNCAN-HURST CAP MGMT	8	16	640	$0.6	83%	58%
LORD ABBETT & CO	8	24	476	$39.7	32%	53%
FRANKLIN RESOURCES INC	8	20	757	$194.7	32%	65%
WADDELL & REED FINANCIAL, INC.	8	26	629	$61.2	66%	47%
BRINSON PARTNERS INC	8	20	267	$86.6	52%	45%
PUTNAM INVESTMENT MANAGEMENT	7	29	1429	$39.8	63%	73%
MASS FINANCIAL SERV CO	7	29	1472	$166.1	67%	74%
R S INVESTMENT MGMT INC	7	22	634	$16.4	69%	57%
ALGER FRED MANAGEMENT	7	21	419	$18.3	76%	39%
BANKERS TR N Y CORP	7	27	1820	$103.1	33%	84%
BLACKROCK FINL MGMT (SSR&M)	7	20	1141	$17.4	63%	73%
AMERICAN EXP FINANCIAL ADVR	7	26	1138	$141.5	64%	71%
AMERICAN CENT COS	7	26	651	$78	67%	60%
AMERINDO INVESTMENT ADVR	7	10	150	$8.5	76%	33%
AXA FINANCIAL, INC.	7	30	1350	$128.5	49%	73%
LIBERTY RIDGE CAPITAL, INC.	7	16	361	$0.3	70%	45%
JUNDT ASSOCIATES INC.	6	15	178	$0.1	77%	36%
BAMCO INC	6	20	221	$17.2	66%	33%
INVESTMENT ADVISERS INC	6	19	451	$0.2	69%	44%
A I M MGMT GROUP INC	6	11	939	$60.6	76%	80%
FORTIS ADVISERS INC	6	9	254	$4.1	77%	43%
ARBOR CAPITAL MANAGEMENT, LLC	6	15	141	$0.9	72%	20%
NEXT CENTURY GR INVESTORS, LLC	6	11	120	$3.3	71%	37%
BERGER ASSOCIATES INC	5	10	358	$12.9	69%	44%
PNC BANK CORP	5	23	445	$48.5	15%	36%
FIDELITY MANAGEMENT & RESEARCH	5	23	2184	$670.9	54%	88%
STRONG CAPITAL MANAGEMENT, INC	5	19	880	$18.9	70%	63%
PRICE T ROWE ASSOCIATE	5	29	885	$424.8	63%	58%
CAPITAL RES & MGMT CO	5	15	171	$574.3	38%	24%
NICHOLAS-APPLEGATE CAP MGMT	5	17	1308	$15.9	77%	77%
AMERICAN FUND ADVISORS	5	16	281	$0	86%	36%
ABB INVESTMENT MGMT CORP	5	16	228	$0.7	78%	27%
PEQUOT CAPITAL MANAGEMENT INC.	5	10	287	$3.4	72%	55%

Table 6: Regressions of initial returns on key investors' and sub-groups of key investors' participation in IPOs. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	InitialReturn			
	(1)	(2)	(3)	(4)
NumKeyInvestors	0.016***			
	(10.188)			
NumLargeKeyInv		0.014***		
		(6.072)		
NumSmallKeyInv		0.024***		
		(7.053)		
NumKeyUWRelatedInv			0.015***	
			(7.623)	
NumKeyNonRelatedInv			0.016***	
			(6.090)	
NumKeySpecialistInv				0.024***
				(11.064)
NumKeyNonSpecialistInv				0.008***
				(3.124)
NumInstInvestors	0.005***	0.005***	0.005***	0.005***
	(9.116)	(8.926)	(9.600)	(9.186)
InstPctShares	-0.047***	-0.044***	-0.047***	-0.048***
	(-3.493)	(-3.262)	(-3.414)	(-3.579)
LogProceeds	-0.091***	-0.090***	-0.092***	-0.089***
	(-11.167)	(-11.136)	(-11.246)	(-11.091)
InversePrice	-1.196***	-1.174***	-1.211***	-1.154***
	(-6.558)	(-6.474)	(-6.620)	(-6.384)
Retention	0.049***	0.047***	0.050***	0.046**
	(2.659)	(2.584)	(2.723)	(2.512)
Expansion	-0.110***	-0.109***	-0.111***	-0.107***
	(-5.556)	(-5.498)	(-5.572)	(-5.386)
LogAge	-0.032***	-0.031***	-0.032***	-0.031***
	(-4.971)	(-4.882)	(-4.940)	(-4.920)
LogSize	-0.011***	-0.010***	-0.011***	-0.009***
	(-3.068)	(-2.935)	(-3.075)	(-2.612)
TechFirm	-0.001	-0.002	-0.000	-0.007
	(-0.068)	(-0.258)	(-0.027)	(-0.763)
VC-Backed	0.027***	0.026***	0.027***	0.027***
	(3.303)	(3.163)	(3.339)	(3.306)
UnderwriterRank	-0.006**	-0.007**	-0.006**	-0.007**
	(-2.114)	(-2.115)	(-2.069)	(-2.234)
UnderwriterPremium	0.271***	0.263***	0.277***	0.252***
	(5.149)	(5.032)	(5.399)	(4.814)
Prior15MktReturn	0.698***	0.709***	0.700***	0.720***
	(4.522)	(4.600)	(4.531)	(4.703)
Prior15MktStdDev	1.025	1.033	0.912	1.265
	(0.661)	(0.670)	(0.588)	(0.825)
PriorMonthInitRet	0.178***	0.190***	0.188***	0.182***
	(3.285)	(3.517)	(3.442)	(3.376)
PriorMonthNumIPOs	-0.001***	-0.001***	-0.001***	-0.001***
	(-2.769)	(-2.793)	(-2.744)	(-2.880)
OfferPriceRevision	0.184***	0.184***	0.186***	0.179***
	(6.391)	(6.382)	(6.424)	(6.298)
PosPriceRevision	0.624***	0.605***	0.632***	0.590***
	(8.100)	(7.807)	(8.180)	(7.646)
Year Dummies	Yes	Yes	Yes	Yes
R^2	0.491	0.493	0.489	0.498
Observations	5,717	5,717	5,717	5,717

Table 7: Regressions of initial returns on key investors' participation in IPOs. Columns (1) and (2) include measures of valuation difficulty. Column (3) includes key investors' participation squared, and Columns (4) through (6) include expected and unexpected components of key investors' participation. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	InitialReturn					
	(1)	(2)	(3)	(4)	(5)	(6)
NumKeyInvestors	-0.000	0.009***	0.002			
	(-0.201)	(5.987)	(0.696)			
PVGO	-0.054***					
	(-5.991)					
PGVO × NumKeyInvestors	0.019***					
	(7.283)					
NegEarnings		-0.055***				
		(-5.907)				
NegEarnings × NumKeyInvestors		0.014***				
		(7.610)				
$NumKeyInvestors^2 \times 10^{-1}$			0.006***			
			(4.558)			
E[NumInstInvestors]				0.005***		0.010***
				(3.750)		(7.648)
E[NumKeyInvestors]				0.007*		0.006*
				(1.947)		(1.705)
UnexpectedNumInstInvestors					0.003***	0.004***
					(5.338)	(7.900)
UnexpectedNumKeyInvestors					0.020***	0.019***
					(11.271)	(10.846)
NumInstInvestors	0.005***	0.005***	0.005***			
	(9.537)	(9.427)	(9.480)			
InstPctShares	-0.050***	-0.053***	-0.038***	0.049***	-0.015	-0.047***
	(-3.702)	(-3.965)	(-2.802)	(3.764)	(-1.132)	(-3.487)
LogProceeds	-0.090***	-0.084***	-0.086***	-0.019***	-0.064***	-0.093***
	(-10.924)	(-10.146)	(-10.704)	(-2.656)	(-8.507)	(-11.351)
InversePrice	-1.182***	-1.080***	-1.196***	-1.378***	-0.911***	-1.247***
	(-6.495)	(-5.968)	(-6.621)	(-7.097)	(-5.025)	(-6.800)
Retention	0.047**	0.052***	0.043**	0.031*	0.054***	0.043**
	(2.572)	(2.860)	(2.337)	(1.705)	(2.932)	(2.361)
Expansion	-0.108***	-0.108***	-0.113***	-0.109***	-0.122***	-0.106***
	(-5.450)	(-5.563)	(-5.646)	(-5.542)	(-6.192)	(-5.370)
LogAge	-0.029***	-0.027***	-0.031***	-0.024***	-0.030***	-0.032***
	(-4.637)	(-4.243)	(-4.829)	(-3.743)	(-4.756)	(-5.029)
LogSize	-0.011***	-0.012***	-0.013***	-0.016***	-0.012***	-0.011***
	(-3.043)	(-3.316)	(-3.732)	(-4.351)	(-3.486)	(-3.130)
TechFirm	-0.001	0.002	-0.001	0.001	0.001	-0.002
	(-0.144)	(0.265)	(-0.133)	(0.148)	(0.134)	(-0.219)
VC-Backed	0.029***	0.025***	0.029***	0.030***	0.029***	0.027***
	(3.489)	(2.946)	(3.546)	(3.471)	(3.418)	(3.290)
UnderwriterRank	-0.007**	-0.006**	-0.004	-0.031***	0.017***	-0.017***
	(-2.165)	(-1.968)	(-1.177)	(-7.742)	(5.116)	(-4.744)
UnderwriterPremium	0.261***	0.259***	0.251***	0.281***	0.442***	0.242***
	(5.000)	(4.980)	(4.831)	(4.996)	(8.107)	(4.642)
Prior15MktReturn	0.711***	0.712***	0.702***	0.799***	0.695***	0.689***
	(4.662)	(4.714)	(4.560)	(4.790)	(4.345)	(4.448)
Prior15MktStdDev	1.178	1.464	1.184	0.616	1.186	1.059
	(0.770)	(0.965)	(0.774)	(0.371)	(0.745)	(0.681)
PriorMonthInitRet	0.166***	0.145***	0.159***	0.221***	0.175***	0.175***
	(3.093)	(2.743)	(2.998)	(3.743)	(3.151)	(3.259)
PriorMonthNumIPOs	-0.001***	-0.001***	-0.001***	-0.001***	-0.000	-0.001**
	(-2.843)	(-3.095)	(-2.591)	(-2.803)	(-0.830)	(-2.379)
OfferPriceRevision	0.188***	0.177***	0.226***	0.329***	0.195***	0.184***
	(6.541)	(6.178)	(7.905)	(11.012)	(6.693)	(6.394)
PosPriceRevision	0.615***	0.621***	0.608***	0.830***	0.636***	0.610***
	(7.988)	(8.096)	(7.876)	(10.484)	(8.112)	(7.927)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.496	0.503	0.496	0.428	0.474	0.494
Observations	5,717	5,717	5,717	5,717	5,717	5,717

Table 8: Regressions of offer price revisions on key investors' and sub-groups of key investors' participation in IPOs. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	OfferPriceRevision				
	(1)	(2)	(3)	(4)	(5)
NumKeyInvestors	0.010***				0.007***
	(16.574)				(12.270)
NumLargeKeyInv		0.006***			
		(7.953)			
NumSmallKeyInv		0.016***			
		(12.311)			
NumKeyUWRelatedInv			0.008***		
			(11.717)		
NumKeyNonRelatedInv			0.012***		
			(13.073)		
NumKeySpecialistInv				0.013***	
				(16.633)	
NumKeyNonSpecialistInv				0.005***	
				(5.112)	
NumInstInvestors	0.002***	0.002***	0.002***	0.002***	0.001***
	(7.348)	(7.416)	(7.374)	(7.643)	(4.235)
InstPctShares	-0.030***	-0.027***	-0.029***	-0.030***	-0.022***
	(-5.093)	(-4.589)	(-5.084)	(-5.169)	(-3.891)
LogProceeds	0.063***	0.063***	0.062***	0.063***	0.071***
	(14.018)	(14.136)	(13.803)	(14.076)	(16.003)
InversePrice	1.194***	1.204***	1.203***	1.204***	1.282***
	(12.714)	(12.858)	(12.810)	(12.822)	(13.998)
Retention	0.023*	0.023*	0.025*	0.023*	0.016
	(1.787)	(1.786)	(1.947)	(1.737)	(1.292)
Expansion	-0.077***	-0.075***	-0.078***	-0.074***	-0.058***
	(-6.878)	(-6.686)	(-6.973)	(-6.675)	(-5.572)
LogAge	-0.012***	-0.012***	-0.012***	-0.012***	-0.008**
	(-3.028)	(-2.901)	(-3.016)	(-2.956)	(-1.982)
LogSize	-0.021***	-0.021***	-0.021***	-0.020***	-0.018***
	(-11.868)	(-11.647)	(-11.584)	(-11.424)	(-10.683)
TechFirm	-0.007*	-0.009**	-0.007*	-0.011**	-0.008*
	(-1.695)	(-2.044)	(-1.689)	(-2.372)	(-1.732)
VC-Backed	0.003	0.001	0.003	0.002	-0.001
	(0.558)	(0.316)	(0.597)	(0.552)	(-0.316)
UnderwriterRank	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.788)	(-0.768)	(-0.365)	(-0.871)	(-0.365)
UnderwriterPremium	0.040**	0.035*	0.059***	0.031	0.005
	(2.010)	(1.764)	(2.873)	(1.589)	(0.252)
Prior15MktReturn	0.142**	0.150**	0.146**	0.151**	0.043
	(2.182)	(2.311)	(2.246)	(2.328)	(0.671)
Prior15MktStdDev	-3.037***	-3.009***	-3.106***	-2.902***	-3.026***
	(-3.719)	(-3.689)	(-3.776)	(-3.570)	(-3.834)
PriorMonthInitRet	0.126***	0.136***	0.133***	0.127***	0.097***
	(8.200)	(8.864)	(8.765)	(8.277)	(6.293)
PriorMonthNumIPOs	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(-6.003)	(-5.910)	(-5.955)	(-5.998)	(-4.874)
InitialReturn					0.120***
					(16.216)
Year Dummies	Yes	Yes	Yes	Yes	Yes
R^2	0.332	0.335	0.332	0.337	0.369
Observations	5,717	5,717	5,717	5,717	5,717

Table 9: Regressions of initial returns on key investors' participation in IPOs. Columns (1) through (3) split the analysis among time periods from 1985–1997, 1998–2000 and 2001–2014. Columns (4) through (6) include post-IPO outcome variables, bid-ask spread and analyst coverage, to the normal control variables. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	InitialReturn					
	(1) 1985-1997	(2) 1998 - 2000	(3) 2001-2015	(4) *BidAsk*	(5) *Analysts*	(6) *All*
NumKeyInvestors	0.012***	0.017***	0.010***	0.016***	0.015***	0.015***
	(8.880)	(3.976)	(5.556)	(9.548)	(7.276)	(7.179)
NumInstInvestors	0.001***	0.015***	0.001**	0.006***	0.005***	0.005***
	(2.678)	(7.983)	(2.510)	(8.893)	(6.555)	(6.555)
OfferPriceRevision	0.152***	0.501***	0.278***	0.176***	0.191***	0.240***
	(6.617)	(3.951)	(5.230)	(5.532)	(4.219)	(5.199)
PosPriceRevision	0.530***	0.725***	0.801***	0.608***	0.618***	0.586***
	(8.428)	(2.769)	(5.293)	(7.374)	(5.344)	(5.105)
InstPctShares	-0.025***	-0.165***	0.020	-0.054***	-0.067***	-0.060***
	(-2.660)	(-4.329)	(1.194)	(-3.569)	(-3.513)	(-3.200)
LogProceeds	-0.030***	-0.270***	-0.040***	-0.092***	-0.125***	-0.122***
	(-4.790)	(-9.795)	(-3.935)	(-9.920)	(-9.370)	(-9.281)
InversePrice	0.041	-4.447***	-0.668**	-1.448***	-1.565***	-1.926***
	(0.274)	(-5.728)	(-2.539)	(-6.976)	(-4.973)	(-5.925)
Retention	0.034**	-0.041	-0.034	0.062***	0.057**	0.042
	(2.224)	(-0.336)	(-0.937)	(2.869)	(2.121)	(1.597)
Expansion	-0.063***	-0.337***	-0.026	-0.126***	-0.101***	-0.087***
	(-3.818)	(-4.110)	(-0.905)	(-5.549)	(-3.470)	(-3.084)
LogAge	-0.011*	-0.180***	0.003	-0.032***	-0.030***	-0.026***
	(-1.950)	(-5.141)	(0.410)	(-4.468)	(-3.311)	(-3.026)
LogSize	-0.005*	-0.018	-0.011***	-0.002	-0.014***	-0.007
	(-1.772)	(-1.572)	(-2.586)	(-0.640)	(-2.828)	(-1.449)
TechFirm	0.005	0.024	-0.025*	0.001	0.003	-0.005
	(0.770)	(0.733)	(-1.812)	(0.050)	(0.195)	(-0.369)
VC-Backed	0.005	0.097***	0.040***	0.021**	0.018	0.012
	(0.787)	(2.915)	(2.710)	(2.521)	(1.542)	(0.969)
UnderwriterRank	-0.003	0.000	0.005	-0.009***	-0.007	-0.006
	(-1.403)	(0.028)	(1.112)	(-2.711)	(-1.435)	(-1.158)
UnderwriterPremium	0.155***	0.275*	0.083*	0.237***	0.272***	0.248***
	(2.843)	(1.920)	(1.917)	(4.126)	(4.283)	(3.895)
Prior15MktReturn	0.419***	1.206***	0.360*	0.656***	0.561**	0.547**
	(3.490)	(3.322)	(1.939)	(3.937)	(2.530)	(2.507)
Prior15MktStdDev	1.524	1.305	-0.262	1.607	1.478	1.946
	(1.289)	(0.265)	(-0.140)	(0.964)	(0.722)	(0.967)
PriorMonthInitRet	-0.019	0.065	0.008	0.159***	0.121*	0.108*
	(-0.344)	(1.018)	(0.113)	(2.855)	(1.875)	(1.719)
PriorMonthNumIPOs	-0.000**	-0.004***	0.000	-0.001***	-0.001**	-0.001***
	(-2.292)	(-4.020)	(0.419)	(-3.491)	(-2.342)	(-2.708)
BidAskSpread				3.266***		4.548***
				(6.894)		(5.737)
InitialNumAnalysts					-0.010**	-0.011**
					(-1.978)	(-2.185)
OneYearNumAnalysts					0.021***	0.021***
					(6.250)	(6.373)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.410	0.549	0.384	0.520	0.506	0.516
Observations	3,428	1,005	1,284	4,895	2,684	2,683

Table 10: Investors' Trading Performance. The table shows holding period returns and trade accuracy for key investors and non-key investors. Returns and accuracy are aggregated at the IPO level and the tests compare average returns and accuracy between the two groups of investors. t-statistics for differences in means are two-sided, and tests for median differences report two-sided z-scores (Sign-Rank) and two-sided p-values (Sign-Test). ***, **, * indicate significance at the 1%, 5% and 10% levels.

	Performance Measures		Tests for Differences		
	Key Investors	Non-Key Investors	t-stat	Sign-Rank	Sign-Test
Holding Period Returns:					
Simple IPO Average	41.0%	35.5%	1.030	8.078***	0.000***
Position-Weighted IPO Average	233.5%	69.5%	1.534	3.411***	0.000***
Trade Accuracy (by horizon):					
One Quarter	53.9%	52.6%	3.748***	3.234***	0.132
Two Quarters	54.9%	52.9%	5.572***	5.369***	0.001***
Three Quarters	55.9%	53.6%	6.523***	6.443***	0.000***
Four Quarters	56.4%	53.8%	7.258***	6.962***	0.000***

Table 11: Regressions of initial returns on informed key investors' participation in IPOs. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	InitialReturn	
	(1)	(2)
NumKeyInvestors	0.016***	
	(10.199)	
NumInformedKey		0.031***
		(7.375)
NumUninformedKey		0.013***
		(6.049)
NumInstInvestors	0.005***	0.005***
	(9.102)	(9.254)
OfferPriceRevision	0.184***	0.177***
	(6.399)	(6.144)
PosPriceRevision	0.626***	0.597***
	(8.118)	(7.708)
InstPctShares	-0.047***	-0.046***
	(-3.506)	(-3.397)
LogProceeds	-0.091***	-0.090***
	(-11.189)	(-11.133)
InversePrice	-1.194***	-1.168***
	(-6.540)	(-6.449)
Retention	0.048***	0.048***
	(2.642)	(2.604)
Expansion	-0.111***	-0.111***
	(-5.573)	(-5.599)
LogAge	-0.032***	-0.031***
	(-4.949)	(-4.885)
LogSize	-0.011***	-0.010***
	(-3.046)	(-2.909)
TechFirm	-0.000	-0.002
	(-0.048)	(-0.214)
VC-Backed	0.027***	0.027***
	(3.269)	(3.257)
UnderwriterRank	-0.007**	-0.008**
	(-2.145)	(-2.446)
UnderwriterPremium	0.270***	0.261***
	(5.108)	(4.982)
Prior15MktReturn	0.693***	0.688***
	(4.487)	(4.461)
Prior15MktStdDev	1.030	1.090
	(0.664)	(0.707)
PriorMonthInitRet	0.178***	0.180***
	(3.290)	(3.335)
PriorMonthNumIPOs	-0.001***	-0.001***
	(-2.782)	(-2.936)
Year Dummies	Yes	Yes
R^2	0.491	0.494
Observations	5,713	5,713

Table 12: Probit model predicting investors holdings in IPOs. Investor and underwriter characteristics are included as control variables, along with *TotalCommissions* to test whether commissions paid to the underwriter over the prior year influence reported holdings. Coefficients report marginal effects and ***, **, * indicate significance at the 1%, 5% and 10% levels.

	(1) *RecAllocation*	(2) RecAllocation	(3) RecAllocation
Churn	0.036***	0.030***	0.030***
	(9.905)	(6.930)	(6.932)
AUM	0.000***	0.000***	0.000***
	(13.263)	(11.858)	(11.063)
FundAge	0.003	0.010***	0.010***
	(1.600)	(4.808)	(4.870)
NumPositions	0.000***	0.000***	0.000***
	(23.150)	(20.012)	(20.031)
AvgPostIPOBuying	0.077***	0.105***	0.103***
	(5.749)	(6.962)	(6.791)
AvgIPOHoldTime	0.000**	0.000**	0.000***
	(2.524)	(2.509)	(2.580)
HedgeFund	-0.006**	-0.013***	-0.013***
	(-2.114)	(-4.091)	(-4.006)
UnderwriterRank	0.013***	0.012***	0.012***
	(8.672)	(8.040)	(7.972)
OneTimeRelationship	0.069***	0.070***	0.070***
	(21.239)	(19.061)	(19.043)
MultipleTimesRelationship	0.087***	0.084***	0.083***
	(30.674)	(26.944)	(26.885)
IndustryBias	0.033***	0.033***	0.033***
	(18.436)	(16.463)	(16.474)
TotalCommissions	0.000***	0.000***	0.000***
	(3.996)	(3.983)	(4.404)
KeyInvestor		0.077***	0.074***
		(4.292)	(4.089)
KeyInv × *Churn*		0.007	0.007
		(1.053)	(1.071)
KeyInv × *AUM*		-0.000***	-0.000**
		(-3.249)	(-1.986)
KeyInv × *FundAge*		-0.014***	-0.014***
		(-4.686)	(-4.745)
KeyInv × *NumPositions*		0.000***	0.000***
		(2.998)	(2.705)
KeyInv × *AvgPostIPOBuying*		-0.145***	-0.140***
		(-5.238)	(-5.012)
KeyInv × *AvgIPOHoldTime*		-0.000	-0.000
		(-0.710)	(-0.839)
KeyInv × *HedgeFund*		0.035***	0.035***
		(5.579)	(5.571)
KeyInv × *UnderwriterRank*		0.003*	0.003**
		(1.708)	(1.971)
KeyInv × *OneTimeRel*		-0.013*	-0.012*
		(-1.933)	(-1.913)
KeyInv × *MultipleTimesRel*		0.001	0.002
		(0.180)	(0.283)
KeyInv × *IndustryBias*		-0.003	-0.003
		(-0.931)	(-0.945)
KeyInv × *TotalCommissions*			-0.000**
			(-2.545)
Pseudo-R^2	0.1315	0.1337	0.1338
Observations	138,352	138,352	138,352

Table 13: Regressions of initial returns on high-commission investors' participation in IPOs. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	InitialReturn			
	(1)	(2)	(3)	(4)
NumTopCommissionInv	0.018***	-0.001	-0.000	-0.002
	(8.373)	(-0.290)	(-0.035)	(-0.401)
NumInstInvestors		0.031***	0.023***	0.024***
		(10.748)	(6.943)	(5.633)
NumKeyInvestors			0.021***	0.017*
			(4.449)	(1.819)
NumTopCommissionKeyInv				0.006
				(0.480)
InstPctShares	-0.070*	-0.237***	-0.236***	-0.236***
	(-1.736)	(-5.637)	(-5.610)	(-5.607)
LogProceeds	-0.104***	-0.211***	-0.209***	-0.209***
	(-4.836)	(-9.466)	(-9.383)	(-9.383)
InversePrice	-4.530***	-4.102***	-4.021***	-4.033***
	(-6.876)	(-6.603)	(-6.609)	(-6.599)
Retention	0.114	0.075	0.057	0.055
	(1.640)	(0.900)	(0.717)	(0.694)
Expansion	-0.289***	-0.252***	-0.252***	-0.253***
	(-4.711)	(-4.017)	(-4.051)	(-4.060)
LogAge	-0.123***	-0.140***	-0.139***	-0.139***
	(-5.491)	(-6.055)	(-6.011)	(-6.021)
LogSize	-0.025**	-0.024***	-0.020**	-0.021**
	(-2.526)	(-2.585)	(-2.209)	(-2.228)
TechFirm	0.033	0.030	0.032	0.031
	(1.161)	(1.174)	(1.248)	(1.201)
VC-Backed	0.093***	0.091***	0.092***	0.092***
	(3.581)	(3.757)	(3.795)	(3.820)
UnderwriterRank	0.015*	-0.002	-0.002	-0.002
	(1.854)	(-0.256)	(-0.212)	(-0.219)
UnderwriterPremium	0.432***	0.394***	0.337***	0.343***
	(3.639)	(3.448)	(2.965)	(3.026)
Prior15MktReturn	0.900***	0.694**	0.734**	0.729**
	(2.837)	(2.401)	(2.554)	(2.530)
Prior15MktStdDev	4.293	3.283	3.084	3.002
	(1.260)	(1.033)	(0.974)	(0.949)
PriorMonthInitRet	0.131*	0.111*	0.095	0.097
	(1.895)	(1.721)	(1.512)	(1.542)
PriorMonthNumIPOs	-0.003***	-0.003***	-0.003***	-0.003***
	(-2.897)	(-3.110)	(-3.751)	(-3.749)
OfferPriceRevision	0.604***	0.430***	0.398***	0.398***
	(6.155)	(4.519)	(4.191)	(4.183)
PosPriceRevision	0.919***	0.826***	0.809***	0.811***
	(4.148)	(3.905)	(3.855)	(3.866)
Year Dummies	Yes	Yes	Yes	Yes
R^2	0.465	0.524	0.533	0.533
Observations	1,404	1,404	1,404	1,404