Key Investors in IPOs: Information, Value-Add, Laddering or Cronyism?

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Abstract

We identify a group of institutional investors who persistently report holdings of the most underpriced IPOs. As a group, their holdings are the most significant determinant of IPO underpricing. The majority of key investors appear to be rewarded for information production, but a minority are more likely associated with laddering. We find no evidence that key investor participation is motivated by underwriters' earning kickbacks. However, key investors only receive a small portion of the economic benefits of underpricing. Equivalent benefits accrue to new funds, lending support to agency-based explanations for underpricing.

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Introduction

Investors who participate in initial public offerings (IPOs) often benefit from significant underpricing. The existing theoretical literature proposes a number of explanations for this generosity towards investors, including theories based on information revelation and production (Benveniste and Spindt, 1989; Sherman and Titman, 2002), optimal post-IPO ownership structure (Brennan and Franks, 1997; Stoughton and Zechner, 1998), and agency concerns (Loughran and Ritter, 2004; Aggarwal et al., 2002), particularly laddering (Hao, 2007). However, surprisingly little empirical attention has been paid to which institutional investors are most associated with underpriced IPOs. We fill this gap by identifying key institutional investors who were strongly associated with significantly underpriced past offerings and studying their relation to underpricing in future offerings. We find support for both information-based and laddering theories of IPO underpricing related to key investor participation. However, the value of underpricing that can be attributed to key investors is a small portion of the total money left on the table in IPOs, suggesting that other motivations, particularly agency concerns, affect the extent of underpricing.

Focusing on investors most associated with underpricing provides a new means of testing a variety of explanations for underpricing. It is not clear *ex-ante* whether a group of investors will persistently be associated with the most underpriced offerings. However, the existence of such a group, whose behaviors, characteristics and associations could be measured, could provide valuable new insight into long-standing debates.

We first identify a group of investors, termed key investors, that are associated with significantly underpriced IPOs. Using investors' 13F filings to proxy for IPO participation, we rank investors according to the frequency of their participation in IPOs that experienced abnormal underpricing over the prior year. Key investors are those in the top 10% of this ranking. Our measure statistically identifies a group of investors that often hold

significantly underpriced shares shortly after IPOs. Furthermore, the measure is persistent. Over one-third of key investors are still classified as key investors in the following year and the measure is persistent for 10 years, suggesting that key investors have traits leading to frequent participation in highly-underpriced IPOs.

While 13F holdings have been used in prior studies (Reuter, 2006; Binay et al., 2007), we conduct a variety of tests to justify using 13F holdings as a proxy for key investor participation in IPOs. First, we show that the number of key investors reporting holdings does not depend on the time between the IPO and the reporting date at the end of the quarter. If secondary-market buying were driving our identification of key investors, it is likely that the number of key investors would increase over time. Second, we show that secondary-market buying is not a profitable trading strategy, suggesting little motive for key investors to buy after IPOs. Third, we predict key investors' IPO participation using only investor and underwriter characteristics. While underwriter-investor relationships and investor traits likely influence IPO participation, it is less likely that these same factors influence secondary-market trading. Our predicted measure is highly correlated with realized key investor participation, consistent with the holdings data reflecting IPO participation. Finally, even if a key investor is identified due to secondary-market buying, he likely attempted to buy shares directly in the IPO. If this is the case, the key investor have participated in the IPO and may have influenced the offer price and resulting underpricing even without receiving an allocation.

Our main finding is that the number of key investors participating in an IPO is a significant determinant of underpricing. In a simple univariate regression, key investor participation explains over 30% of the variation in underpricing. Furthermore, in various specifications including control variables, a one-standard-deviation increase in key investor participation increases underpricing between 10% and 14%. Additionally, measures of underwriter quality are no longer significant in explaining underpricing when key investor participation is

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included. These results establish the importance of key investors in IPOs.

To establish a causal relation and validate our use of post-IPO holdings to proxy for IPO participation, we instrument for key investors' post-IPO holdings. Our instruments are expected post-IPO holdings of key investors and all investors. The expectations are formed based on a probit model estimated using only fund and underwriter characteristics, including past holdings. We show our instruments are relevant and argue that the exclusion requirement is met: expected holdings only impact underpricing through actual holdings. For instance, it is unlikely that a relationship between an underwriter and fund influences underpricing of an offering, except if that fund participates in the offering. Our instrumental variables analysis confirms our main result: key investors' participation is a major determinant of underpricing.

The relation between underpricing and offer price revisions helps us to distinguish agency-based explanations from other alternatives. Agency-based explanations do not predict positive offer price revisions which have been documented for IPOs overall (Hanley, 1993). We show that this positive relation is particularly strong for key investors: key investor participation is the most significant determinant of offer price revisions. This evidence is inconsistent with key investors' participation in highly underpriced IPOs being driven by agency concerns.

Several additional tests differentiate between information production and value-add theories versus laddering theory of underpricing. In support of information-based or value-add motivations for underpricing, we show that key investors' future trades predict the next quarters' abnormal returns. In particular, we divide key investors based on their propensities to flip positions, and show that this effect is particularly pronounced for non-flipping key investors. Participation of non-flipping key investors is most strongly associated with underpricing, suggesting this group is being compensated incrementally for revealing information prior to the IPO. Trades by flipping key investors show no return predictability. However, their participation is strongly associated with negative post-IPO return correlations—a pre-

diction of the laddering hypothesis. Together, these results suggest that key investors consist of two distinct groups.

Our evidence is consistent with key investor participation driving underpricing through information/value and laddering channels. However, aggregate participation statistics leave room for many alternative explanations for IPO underpricing. For example, key investors, who make up 10% of all investors and account for the majority of the relation between investor participation and underpricing, only account for 14% of reported holdings and 23% of the inferred money left on the table in IPOs. Similar economic benefits accrue to new funds, who actually report more holdings (16% versus 14%). Sizable benefits to new funds are consistent with underwriters' using allocation discretion to earn future business from new entrants to the market. Overall, these statistics are consistent with a significant part of the economic value of underpricing being unrelated to key investors' information production and value-creation for firms.

Our paper makes a number of contributions to the IPO literature. First, we show the importance of institutional investors to underpricing and offer price revisions. Field and Lowry (2009) and Chemmanur et al. (2010) distinguish between retail and institutional investors and document that high institutional ownership after the IPO is positively associated with post-IPO share price. Jenkinson and Jones (2004) and Cornelli and Goldreich (2001) study two samples of European IPOs with proprietary data on allocations granted by two different European investment banks and find mixed results. Cornelli and Goldreich (2001) documents that investors that submit informative bids are treated favorably by the underwriter, while Jenkinson and Jones (2004) find little evidence that informative bids are favored and suggest that underwriter tends to favor long-term investors in its allocations. Our evidence shows a casual channel from key investors to underpricing and supports information and value-based theories of underpricing.

We show that key investors persistently participate in highly underpriced IPOs. In the

context of IPOs, Sibo (2014) also studies the persistence of institutional investors' performance. He uses allocation data from 477 Chinese IPOs and finds that institutional investors that performed well in the past tend to perform well in the future. We also relate to a recent paper by Fjesme (2015) which finds that some institutional investors in Norwegian IPOs engage in post-IPO price support and that these investors are treated favorably in subsequent allocations. We find additional evidence consistent with the practice of laddering in IPOs, although only for a minority of key investors. We further validate using 13F holdings as a proxy for IPO participation. While used in prior studies (Binay et al., 2007; Reuter, 2006), we conduct additional tests of the proxy and an instrumental variables analysis. Our results are consistent with holdings' being a good proxy for participation and justify their continued use.

Finally, we contribute to a broader literature studying the effects of institutional investors on firms. We show that investors impact firms' IPOs through initial pricing and underpricing, and that the effects are likely related to information-production or value-adding activities such as monitoring, long-term holding or increasing price informativeness. An IPO is one example of a setting in which who owns a firm matters.

1 Exisiting theories and hypothesis development

A vast theoretical literature proposes several explanations for certain investors' favorable treatment in IPOs. For an overview of this literature, see Ritter and Welch (2002), Ljungqvist (2007) and Ritter (2011) among others. In this section, we review several theories and relate their predictions to key investors.

1.1 Information Asymmetry

A large class of explanations is based on the assumption that some investors have superior information about the firm going public. We refer to this broad class of explanations as information-based theories of IPOs. These theories commonly lead to several predictions. First, a key investor who is privately informed is more likely to buy IPO shares if his private information indicates firm value is high (Rock, 1986), hence participation of key investors in IPOs is positively correlated with firms' post-IPO share prices and underpricing. Second, underwriters deliberately underprice shares if key investors agree to participate and reveal their private information during bookbuilding (Benveniste and Spindt, 1989). Similarly, the underwriter may underprice shares in order to compensate key investors for costly information acquisition (Sherman and Titman, 2002). These theories predict:

Participation of key investors in IPOs is positively correlated with IPO underpricing.

Information acquired through bookbuilding allows the underwriter to update the offer price. Because informed investors likely participate when they have good information, upward revisions are likely when key investors participate in the IPO:

Participation of key investors in IPOs is positively correlated with offer price revisions.

When key investors reveal information during bookbuilding it affects short-run performance (underpricing). On the one hand, if the information is not fully revealed or incorporated into the price initially, it can also affect the longer-term performance of shares in a similar manner. On the other hand, once information is fully incorporated it has no bearing on future performance. As a result:

Short-run and long-run stock performance should be non-negatively correlated.

Finally, if key investors possess superior information prior to an IPO, this advantage may persist (either via retained information or new information production) leading to informative

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post-IPO trades, especially relative to less-informed investors' trades.

Changes in post-IPO shareholdings by key investors should predict returns better than changes in shareholdings of non-key investors.

1.2   Value-Add

An alternative class of theories posits that key investors engage in value-adding activities. For instance, Mello and Parsons (1998) and Stoughton and Zechner (1998) propose that investors increase firm values through monitoring, and therefore these investors should receive favorable allocations and prices in an efficient IPO.[1] Along similar lines outside the IPO literature, Holmstrom and Tirole (1993) argues that investors can discipline management and increase firm value by collecting firm-specific information and trading on it, making the firm's price more informative. Alternatively, trading can improve firm value by improving future investment decisions as in Brown (2015). Banerjee et al. (2009) argues that underpricing may be used to secure valuable, long-term holding. All of these theories generate empirical predictions similar to those from information-based theories. We do not distinguish between information-based and value-add theories, and refer to them as information/value theories hereafter.

1.3   Laddering

The laddering theory is based on the idea that key investors may promise to buy shares in the secondary market in exchange for an allocation of underpriced shares. Hao (2007) argues that underwriters may favor institutional investors that engage in laddering in order to ease their own price-support activities. Such behavior generally creates upward pressure on shares

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[1]Zingales (1995) and Booth and Chua (1996) also present non-booking-building, value-maximization-based explanations for underpricing.

prices for some time after the IPO which is eventually reversed.[2] If key investors engage in laddering, their IPO participation can be associated with positive offer price revisions and positive first day returns, which are also predicted by information/value theories. The distinguishing feature of laddering is that the price effect is temporary. The short-term post-IPO returns should be positive due to post-IPO buying, while long-term returns should be negative as positions are unwound. When key investors sell their shares, the share price performance should deteriorate, and:

Post-IPO short-run and long-run performance of shares should be negatively correlated.

Lastly, if key investors do not possess superior information and instead engage in programmatic buying and selling via laddering, their trades should not predict share prices more than those of other investors:

Changes in post-IPO holdings of key investors should affect the share price to the same extent as changes in holdings of non-key investors.

1.4 Cronyism

There is a common argument in the IPO literature that key investors get special treatment in IPOs because they have a relationship with the underwriter.[3] For instance, underwriters may want to please key investors in hopes of securing future, unrelated business (i.e. earn kickbacks). In particular, new funds that have yet to establish business relationships may be particularly enticing to underwriters. In essence, repeated interaction of investors and underwriters give rise to an agency conflict, and allocations of underpriced IPO shares is one way for underwriters to reward regular clients. While many of the empirical implications are similar to those previously developed, we stress a few differences.[4]

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[2]Aggarwal (2000) finds price support activities by underwriters conclude within a month of the IPO for 93% of firms.

[3]For examples, see Reuter (2006), Ritter and Zhang (2007), Ritter (2011) and Kang and Lowery (2014)

[4]Laddering could be considered a form of cronyism, but we separate it due to its distinct predictions.

If key investors have no superior information, do not add value, and do not engage in laddering, their IPO participation should not be related to firm value. Yet, if the underwriter does underprice the shares to transfer rents to the key investors (and subsequently receive kickbacks), then the offer price should not be revised upward relative to the initial price range.

Participation of key investors in IPOs is non-positively correlated with offer price revisions.

If cronyism drives underpricing, then key investors likely lack information and their trades should not predict returns more than the trades of other investors:

Changes in post-IPO holdings of key investors should predict returns to the same extent as changes in holdings of non-key investors.

Table 1 summarizes the implications of the various theories. While information/value theories for underpricing are difficult to distinguish, we can test these together against laddering and cronyism alternative. For example, if key investors are associated with underpricing but not offer price revisions, then it is likely that cronyism drives key investors' participating in highly-underpriced IPOs. However, finding a positive associated among key investor participation, underpricing and offer price revisions does not imply cronyism is not contributing to underpricing. Rather, it would only suggest that cronyism is not likely to be the motivation leading to *key investors'* participating in highly-underpriced IPOs.

2 Data and Sample

We identify IPOs using 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 2011. As is common in the literature we exclude unit offerings, spinoffs,

Table 1: Emprical predictions of alternative IPO theories

Relationship	Information / Value-Add	Laddering	Cronyism
Underpricing and Key Investor Participation	+	+	+
Offer Price Revision and Key Investor Participation	+	+	0/-
Short and Long-Run Return Correlation	0	-	0
Predictive Power of Key Investors' Trades	+	0	0

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 owning shares in the first quarter after the IPO. Holdings data are from Thomson-Reuters 13F Institutional Holdings (13F) database. We supplement data from the SDC, CRSP and 13F databases from several sources. Consumer Price Index (CPI) data from the Bureau of Labor Statistics is used to adjust dollar values to year 2000 dollars. Founding dates, monthly underpricing and issuance activity, and underwriter rankings are taken from Jay Ritter's website.[5] The resulting sample includes 4,938 IPOs.

Lacking direct data on IPO allocations, we follow Binay et al. (2007) and Reuter (2006) and proxy for allocations using the first reported institutional holdings data after issuance. While using 13F holdings data to proxy for allocations has several shortcomings (limited and delayed reporting), several studies 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, Hanley and Wilhelm (1995) finds that the correlation between 13F holdings

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

data and actual allocations is 0.91. Using six of the IPOs with known allocations featured in Ritter and Zhang (2007), we find that 49% of funds holding shares at the end of the quarter received allocations. For key investors (defined shortly) 55% of holdings are associated with IPO allocations.

Our proxy for allocations helps to overcome one limitation in the IPO literature, but allows for alternative interpretations of our results. The limitation, which is common in the literature, relates to the limited availability of data on allocations in IPOs.[6] As the six IPOs with known allocations show, 13F data noisily identifies true allocations. While this may simply weaken the strength of our tests, it is also possible that this "noise" is important to our results. In fact, *a priori*, the role of investors buying into shares after the IPO may be as important for determining the offer price as the role of investors participating in the offering. In discussing our measure and results, we present evidence consistent with the noise interpretation and argue that using holdings does not bias our findings.

3   Key Investors

3.1   Measuring Key Investors

Key investors are those that are likely to influence price setting and allocations in IPOs. If such a group of investors exists, and has traits of particular value to firms or underwriters, it is likely that those investors will continue to influence pricing in future offerings. Therefore, we hypothesize that investors who have experienced the most abnormal underpricing in past offerings are likely to predict underpricing in future IPOs.

To construct our measure, we begin by calculating a rolling measure of abnormal underpricing in past IPOs as of each IPO's date. For each date, we consider IPOs over the past

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[6]Jenkinson and Jones (2004) and Cornelli and Goldreich (2001) overcome this limitation by using detailed proprietary underwriters' data about bids and allocations. Both papers use European data and find mixed results.

year, excluding any funds that did not have at least 4 allocations. Abnormal underpricing is equal to the realized underpricing less the average underpricing in that month. For each fund, we adjust average abnormal underpricing by multiplying each average by the square root of the number of IPOs a fund participated in over the period. The scaled average provides a ranking mechanism based on the measure's precision. For example, a fund with 100 allocations and average abnormal underpricing of 5% is more reliably a key investor than a fund with 10 allocations and a slightly higher average abnormal underpricing (of say 6%). Importantly, 5% average abnormal underpricing can be a stronger signal of true abnormal underpricing than a value of 6% which is associated with fewer observations.[7]

Our key investor measure is based on ranking funds by adjusted abnormal underpricing. The top 10% of funds are termed key investors and $KeyInvestor = 1$. This process is repeated for each IPO date in the sample, allowing rankings and key investor status to change over time. Finally, for each IPO we count the number of key investors who hold the firm's stock at the end of the first quarter following the IPO.

$$NumKeyInvestors = \sum_{k \in K} KeyInvestor_k \tag{1}$$

where K is the set of investors who hold shares at the end of the first quarter following the IPO. $NumKeyInvestors$ is our main independent variable in the tests that follow.

Table 2 shows that our key investor measure is persistent. Over one-third of key investors at the beginning of one year are classified as key investors at the beginning of the following year. This is a significant portion as random assignment would suggest only 10% persistence. Furthermore, this persistence continues for 10 years. In each subsequent year, the excess proportion of original key investors classified as key investors remains significant.

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[7]Alternatively, using a non-scaled average of abnormal underpricing gives similar, but weaker, results. Without scaling, our key investor measure is less persistent and includes many more small funds with few subsequent allocations.

To distinguish among the information/value theories and laddering, we develop several other measures of investors' past behaviors. While we cannot directly observe monitoring, we can observe investors' long-term holding behavior. Using IPOs completed between 4 and 7 quarter prior (to allow time to observe post-IPO behavior), we compute $Held$ as the proportion of IPOs in which an investor held shares in the fourth quarter following the IPO. Investors are then ranked quarterly based on $Held$, and those in the top third are classified as $Holders$.

We separately analyze investors' past information production as in Brown (2015). Investors are considered to have produced information, $Produced = 1$, following an IPO if they increased their quarterly-position by at least 50% within the first year after the IPO. Using IPOs between 4 and 7 quarters prior, the top third of information-producers are classified as $Producers$. $Holders$ and $Producers$ have considerable overlap, as over 50% of each are jointly-classified. Additionally, the aggregated measures for key investors, $TotalKeyHolders$ and $TotalKeyProducers$ are over 95% correlated.

We measure flipping activity based on the frequency with which investors sell all of their holdings by the end of the second quarter following the IPO. $Flipped$ is equal to the proportion of an investor's IPOs in which the investor reports holdings in the IPO stock at the end of the first quarter, but reports no holdings at the end of the second quarter. Investors are ranked based on $Flipped$ and those in the top third are $Flippers$.

Table 3 shows summary statistics of key and non-key investors. Key investors are larger and older than non-key investors, and more actively churn their portfolios. There are no significant differences in investors' average behaviors regarding long-term holding, flipping or information production. Key investors skew towards higher information production (but not significantly so), and relatively few are classified as $Flippers$. Finally, hedge funds are under-represented in the key investor population.[8]

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[8]We use the classifications introduced in Agarwal et al. (2013a) and Agarwal et al. (2013b).

Table 4 summarizes the most common key investors throughout our sample period (measured at the beginning of each year). For comparison, the bottom of Table 4 shows similar summary statistics for Blackrock, Vanguard and Fidelity, three of the biggest fund families. The summary statistics indicate that most key investors receive many allocations and that a broad range of fund sizes are included as key investors. For example, Essex Investment Management Company, the most frequent key investor, manages a little over $1 billion in assets, while Janus Capital Corporation is ranked fourth and manages over $90 billion. In general, the key investors we identify are not the largest or most prominent funds, nor are they predominantly hedge funds.

KeyInvestor is based on all IPOs prior to the IPO of interest. While the allocations in prior IPOs have been determined at the time of measurement, the holdings data is not yet public. To ensure that measurement timing is not driving our results, we use two alternative measures. First, we generate our measure at the end of each quarter, and use the prior quarter's measure for each IPO. Second, we use the same quarterly data, but we only use a measure when it would have been publicly available. This accounts for the 45-day reporting delay in 13F filings. For example, for an IPO occurring on February 10th, we use holdings data from Oct 31st of the prior year. However, for an IPO occurring on February 20th, we use holdings data from December 31st (which would have been made available around February 15th). Using either of these alternative methodologies provides similar results to those presented.

3.2 13F Holdings as a Proxy for Allocations

Using 13F holdings data as a proxy for allocations may bias our key investor measure. For example, key investors may actually be buying hot IPOs in the secondary market and holding them at the end of the quarter. While we cannot rule out this and other possibilities, we present a number of tests that are consistent with holdings aligning well with actual

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allocations. We begin by comparing a limited sample of actual allocations to 13F holdings.

Ritter and Zhang (2007) analyze allocations data from 11 IPOs acquired through a Freedom of Information Act request.[9] Using the overlap between their allocations data and our sample, we compare 6 IPOs' actual allocations to reported 13F holdings at the end of the quarter. Table 5 provides summary statistics. Many allocations were made to individuals or foreign holders who do not report in 13F holdings. Despite this, 48% (64%) of the allocations (shares) match to funds that report in the 13F holdings data. However, only 19% (9.3% of all allocations) of those matches were also reported as holdings in the 13F data. The other 81% had apparently sold their shares by the end of the quarter. Selling is particularly prominent for new investors: key investors retain 39% of their allocations, non-key investors retain 20%, and new investors retain only 5%.

Another source of mis-attribution comes from funds that buy after the IPO and do not receive allocations. In the 6 IPOs, 45% of key investor allocations are added after the IPO, while 47% of total allocations are added after the IPO. For new investors, the vast majority (73%) are added after the IPO. While based on a small sample, this data suggests that we underestimate the number of each type of investor. Combining the measurement errors due to flipping and secondary-marketing buying, 13F holdings data underestimates the number of key investors by 30%, the number of non-key investors by 62% and the number of new investors by 83%. However, the correlations between the 13F holdings and actual allocations are high. For all investors over the 6 IPOs, the series are 95% correlated. For key investors, the series are 76% correlated. These strong correlations suggests 13F holdings are picking up meaningful variation in investors' and key investors' allocations.

The allocations data also shows that key investors receive more shares and tend to buy additional shares after the IPO. Key investors on average receive 100K shares, while non-key investors receive 45K shares and new investors receive 20K shares. Both key and non-key

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

investors tend to add to their positions after the IPO, doubling their holdings by the end of the year. New investors do the opposite, selling almost half of their holdings by the end of the quarter. New funds' flipping behaviors are consistent with underwiters transferring rents to new investors in order to gain future business.

While our comparison suggests 13F holdings are a good proxy for allocations, several alternative explanations may result in key investors' being associated with underpriced IPOs. It is possible that holdings reflect systematic, secondary-market purchases of IPOs, particularly of hot IPOs. If key investors engage in this behavior, they would be associated with substantial underpricing due to their propensity to buy very underpriced stocks after the IPO and hold them until at least the end of the quarter. To test this possibility, 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. Therefore, if post-IPO buying is driving holdings, we would expect higher number of investors and key investors for earlier IPOs. Table 6 shows that the total number of investors increases with the number of days remaining in the quarter, but the number of key investors decreases slightly. This is inconsistent with key investors' identification being due to post-IPO buying of hot IPOs. However, it does not rule out the possibility as key investors may be purchasing 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 reflect allocations rather than post-IPO buying.

Another concern is that key investors receive more allocations than we have identified, but they tend to sell their less-underpriced allocations and are misidentified as key investors. Table 7 suggests that this is not the case by dividing the analysis of Table 6 into quantiles based on underpricing. Rather than selling the least underpriced IPOs, key investors tend to sell the most underpriced IPOs. Conversely, other investors are more attracted to under-

priced IPOs as their numbers increase most sharply for the highest quartile of underpricing. While not conclusive, the evidence is again supportive of holdings reflecting allocations.

An alternative test is to consider the profitability of a trading strategy that buys on the first-day of an IPO (at the close) and holds until the end of the quarter. If this is profitable, then key investors may simply be those who engage in this post-IPO, buy-and-hold strategy. Column (1) of Table 8 shows that such a strategy is not profitable. Column (2) shows that conditioning on underpricing does not improve the strategy's profitability. While the strategy is not profitable, suggesting it is not motivating holdings, returns through the end of the first quarter are higher when firms have more key investor participation. This suggests that key investors buy shares in the weeks after the IPO, consistent with the evidence from actual allocations in Table 5 that shows that key investors increase their positions by over 120% between the IPO and the end of the quarter.

We may be failing to identify the most important key investors if they flip their most underpriced IPOs before the end of the quarter, leaving them identified as non-key investors. If this is the case, then in future IPOs, those investors should be associated with even more underpricing if they are the true information providers. This would increase the effect for all investors and diminish the relative effect for key investors, biasing tests against finding a difference. Therefore, this source of bias does not challenge our conclusions.

In IPO allocations, underwriters often favor past participants and may be attracted to certain investors based on fund characteristics (Binay et al., 2007). However, these same traits are not likely to influence secondary-market purchase decisions. Given that post-IPO buying is not a profitable strategy, it seems unlikely that key investors are clustering secondary-market purchases with specific underwriters and thereby establishing "relationships" where none exist. Based on this intuition, if past relationships in the holdings data and fund characteristics predict future holdings, then this is consistent with those holdings reflecting allocations. To test this hypothesis, we follow Brown (2015) in estimating a probit

model of funds' end-of-quarter holdings. Using underwriter-investor relationship measures and fund-level controls, we estimate the probability that each investor reports holdings after each IPO. Table 9 reports marginal effects from the estimation results which are divided between new funds (who do not have history necessary for several variables) and established funds.

The results demonstrate the importance of underwriter-investor relationships in determining holdings. Interacting with the underwriter once or multiple times within the underwriters' last 10 IPOs leads to much higher probabilities of holdings, particularly for established funds.[10] Larger, older and more-frequently trading funds are also more likely to report holdings, as are key investors. Flippers are less likely to receive allocations, while key investors who are long-term holders are relatively likely to report holdings. This is consistent with underwriters' having distinct motivations for providing certain investors with allocations. Overall, that past holdings and fund characteristics predict investors' future holdings is consistent with allocations driving end-of-quarter holdings.

As a final test of holdings' ability to proxy for allocations, we compare expected levels of investor and key investor participation (based on the probit analysis) to realized levels. If holdings proxy for allocations, then we would expect a positive relation between the expected and realized levels of participation. However, if secondary-market buying is driving holdings, no particular relationship is expected. We construct expectations using the probit estimation to form predicted probabilities of receiving allocations for each investor in each IPO. These probabilities are summed for each IPO, with separate sums for all investors and for key investors, giving $E[NumInstInvestors]$ and $E[NumKeyInvestors]$. The predicted values are correlated 61% and 55% with realized values. Regressing the realized values on predicted values also gives coefficient estimates near one and R^2 values of 37% and 30%, indicating that the constructed estimates are good predictors of the realized values. Altogether, the

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

evidence is consistent with 13F holdings data reflecting allocations.

4   Empirical Results

4.1   Underpricing

Table 10 shows our main result: $NumKeyInvestors$ is a first-order determinant of IPO underpricing.[11] Column (1) highlights that $NumKeyInvestors$, by itself, explains over 30% of underpricing variation. In the univariate regression, a one-standard deviation increase in $NumKeyInvestors$ is associated with 20% higher underpricing. Column (2) provides a baseline regression using control variables common to the IPO literature, and Column (3) adds $NumKeyInvestors$ alongside those controls. While economic significance is dampened (to 10%), a t-statistic of 14.3 demonstrates strong statistical significance. For comparison, only offer price revisions are associated with a higher t-statistic (16.1). Comparing Columns (2) and (3) highlights an additional finding: including key investor participation removes the significance of underwriter measures. In particular, $UnderwriterRank$ (Carter and Manaster, 1990; Carter et al., 1998) and $UWpremium$ (Hoberg, 2007) both lose significance in explaining underpricing, suggesting that underwriters may be valuable in the IPO process because they connect firms with key institutional investors.

Columns (4), (5) and (6) show the incremental relation between underpricing and participation of sub-classifications of key investors. Key investor participation by flippers is associated with much less underpricing. This is suggestive of non-cronyism-based motivations being a primary driver of underpricing. Investors' long-term holding and information-production behaviors do not significantly relate to underpricing.

Following the tests of Hoberg (2007), we consider that key investor participation (and most other control variables) are known in advance of the final pricing of an offering. To

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[11]Our main result is robust to separate analysis of the periods 1985 - 1997, 1998 - 2000 and 2001 - 2011.

account for this, we orthogonalize offer price revisions, giving credit for any covariation to the other independent variables. Using the residuals from a regressions of offer price revisions on the other control independent variables, we repeat our analysis from Column (3). Column (6) shows $NumKeyInvestors$ is the most important determinant of underpricing, having a t-statistic of over 21. Economically, a one-standard deviation increase in $NumKeyInvestors$ is associated with 14% higher underpricing.

Our underpricing tests are broadly consistent with key investors being involved with either information production, value-add, cronyism, or all of the above. However, splitting the analysis based on investors' behaviors suggests that information-production and value-add activities do not differentially impact underpricing, and if anything, flipping behavior is less rewarded.

4.2 Instrumental Variables Analysis

While our earlier analyses suggest that holdings are a good proxy for allocations, we undertake an instrumental variables approach to further validate our findings. Our instruments are the expected participation of key investors and all investors in each IPO. As detailed earlier, the expected participation is calculated for each IPO using a probit analysis predicting reported holdings. Only fund characteristics and fund-underwriter relationships are used in that estimation, providing plausibility for the exclusion restriction. The exclusion restriction requires that the instrument (expected participation) influences the outcome (underpricing) only through the instrumented-variable (realized participation). This restriction could be violated, for example, if funds purchase secondary-market shares of the underpriced IPOs of underwriters with whom they have recently associated. In such a case, expected participation would be related to past secondary-market buying of underpriced IPOs, and the relation to future IPOs would be driven by similar buying.

If we had perfect identification of allocations, this would not be a concern. However, as we

proxy for allocations via holdings, we must argue that this is not a plausible scenario. First, the evidence is inconsistent with key investors' buying underpriced IPOs in the secondary market. Table 6 shows that key investor participation is not increasing in the number of days to the end of the quarter. Second, buying in the secondary market is not a profitable strategy (Table 8). Third, the constructed counter-example requires that key investor participation is clustered in time. Within our data, key investors on average use underwriters less than two times per year, which is inconsistent with clustered secondary-market buying of certain underwriters' offerings. Given the many requirements that would have to be met to invalidate the exclusion restriction, we believe expected participation is a valid instrument for realized participation of key investors and institutional investors overall.

Table 11 shows the first and second-stage estimations using expected values to instrument for $NumKeyInvestors$ and $NumInstInvestors$. The first-stage estimations are significant, passing the test for relevancy with a Cragg-Donald Wald F-statistic of 19.40 (Stock-Yogo 10% critical value of 7.03). Furthermore, the analysis confirms a positive and significant relation between $NumKeyInvestors$ and underpricing. While the coefficient is attenuated (0.019 vs. 0.027), it is still significant at the 1% threshold (the point-estimate of the $NumInstInvestors$ coefficient is positive but insignificant). Using only identification through funds' characteristics and relationships with underwriters, key investor participation is an economically and statistically significant determinant of underpricing. In addition to strengthening our underpricing results, this test further supports that holdings proxy for allocations.

4.3   Offer Price Revisions

Offer price revisions allow us to distinguish information/value explanations for underpricing from value-destroying, agency-based explanations. Were underpricing entirely motivated by agency-based explanations, it is likely that key investors would experience negative revisions as underwriters lower offer prices to transfer more rents to those investors (and subse-

quently recapture those rents through other lines of business). While that broadly applies to agency-based explanations, it is important to note that laddering can generate the opposite prediction. As shown by Hao (2007), laddering should be associated with positive offer price revisions and positive underpricing when underwriters do not receive kickbacks from investors. However, profit-sharing via kickbacks can motivate underwriters to lower offer prices as in other agency-based explanations. Therefore, we expect that non-agency-based motivations for underpricing lead to a positive relation between key investors and offer price revisions.

Table 12 shows that $NumKeyInvestors$ is positively related to offer price revisions. By itself, Column (1) shows that $NumKeyInvestors$ explains 32% of variation in offer price revisions. Column (2) provides a baseline specification with controls, and Column (3) shows that $NumKeyInvestors$ maintains as an important explanatory variable in the presence of controls. Notably, including $NumKeyInvestors$ increases the explanatory power of the regression by 4%. Columns (4), (5) and (6) split key investors by investors' behaviors. Neither flipping, information-production, nor holding is associated with either higher or lower offer price revisions.

The results for offer price revisions are consistent with an information-based motivation for key investors' post-IPO holdings.[12] Offer prices adjust to key investors' future holdings and key investors' holdings strongly correlate with realized underpricing. Bookbuilding and information-revelation theories of underpricing rely on well-informed investors, and our data is consistent with key investors' possessing information that is valuable to the pricing process. While these results are inconsistent with primarily agency-based motivations driving key investor allocations, they do not allow us to distinguish strongly between information production, value-add and laddering. The following tests further distinguish these competing

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[12]Bubna and Prabhala (2011), Chiang et al. (2010) and Ljungqvist and Wilhelm (2002) also provide evidence consistent with investors' receiving rewards for information revelation during bookbuilding.

hypotheses.

4.4 Post-IPO Abnormal Returns

The information-production hypothesis relies on key investors being informed prior to the IPO and being rewarded for revealing their information during bookbuilding. If key investors have valuable information, then it is likely they may continue to possess or generate information after the IPO. If this is the case, then their trading activity after the IPO may predict future returns. Finding a positive relation between future abnormal returns and trading would be consistent with the information-production hypothesis. A positive relation is also predicted by theories in which investors add value to the firm through their ownership. Whatever the value-proposition, investors' selling will be associated with the loss of value and possibly negative future returns.[13] While we cannot distinguish the information and value theories, the other hypotheses do predict abnormal returns following funds' trades.

To test for informed trading, we regress quarterly returns on investors' net trading in the prior quarter. Specifically, we measure the change in the number of investors (key and otherwise) who own the stock at the end of the quarter.[14] As no more investors receive allocations, the change in investors will be non-positive. Therefore, we expect that those firms who are sold by the most investors in the prior quarter will have worse abnormal returns going forward. Furthmore, we expect key investors' selling to be incrementally informative, so more sales by key investors are likely to lead to worse returns. We measure abnormal returns using cumulative abnormal returns and buy-and-hold abnormal returns using either a market-model or a four-factor model for risk-adjustment. Table 13 presents the results.

Panels A and B of Table 13 show results using different measurements of abnormal returns. The results are generally consistent in the panels, so we focus on the results in

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[13]The timing of the negative returns depends on when markets learn about value-adding investors' selling.

[14]Sias et al. (2006) shows that the change in number of institutions holding a stock are more related to contemporaneous returns than changes in the fraction of shares held by those institutions.

Panel A. Column (1) shows that overall institutional selling is predictive of future abnormal returns, although the economic significance is small. For each investor who sells, the following quarter's return falls by 10 bps. Column (2) shows that the effect is concentrated with key investors, where per-investor-selling lowers quarterly returns by 110 bps. When key investors' selling is taken into account, other investors' selling is no longer predictive of returns. Columns (3), (4) and (5) further divide key investors based on flipping, holding and information-producing behaviors. Only non-flippers selling is informative, decreasing future returns by 220 bps. Long-term holders' and information producers' selling has marginally more significant predictive power than short-term holders. Column (6) shows a simultaneous estimation with *Flippers*, *Holders* and *Producers* together, and the results are consistent with both long-term holders' and information producers' trades being informed. Given the significant overlap between *Holders* and *Producers*, and the similarity in coefficients, we cannot distinguish between informed trades or value-loss associated with valued investors selling their positions. Overall, the evidence is consistent with information/value motivations for key investors' allocations. Key investors' selling appears informative – especially those key investors who do not typically flip allocations.

4.5   Laddering

Post-IPO return patterns distinguish the laddering hypothesis from other hypotheses. In the laddering hypothesis, investors commit to purchase additional shares following the IPO as a condition for receiving an underpriced allocation. Therefore, laddering induces additional buying soon after the IPO, which is likely to add upward pressure on the price. However, after the underwriter's price support activities have ceased, investors can typically sell their entire position. This creates negative price pressure and laddering results in price reversion (negative correlation) in the months following the IPO.

To test for price reversion, we regress second-quarter returns on the return earned from

the first-day close of the IPO to the end of that quarter. If laddering is a major motivation for key allocations, then we would expect to see a negative relation between these returns – particularly for IPOs with high key investor participation. To further refine our prediction, we also use our classification of flippers and non-flippers. As laddering likely leads to selling by the end of the second quarter following the IPO, we compare those key investors who are *Flippers* to other key investors. We expect that any evidence of laddering will be strongest in the flipping sub-sample of key investors.

Table 14 shows the relation between quarterly returns for a number of different sample splits. First, Panel A shows that overall, there is a negative relation between quarterly returns. As predicted by Hao (2007), this relation is also stronger for the most underpriced IPOs. Panel B shows that key investors appear to be more associated with the negative relation than investors generally. While splitting on above- or below-median participation for either key investor or overall investor participation separates positive and negative relation IPOs, the gap is wider for key investors. Panel C performs a two-way split, dividing IPOs into four groups based on above- or below-median key investor participation, and at the same time above- or below-median overall investor participation. As suggested in Panel B, key investors effectively split the sample between negative and positive relations, while overall investors do not. This is consistent with key investors being involved in laddering. Finally, Panel D splits only key investor participation by key investors' classifications as flippers or non-flippers. Whenever key-investor flippers participation is switched from below- to above-median, the relation flips from positive to negative. The evidence is consistent with key-investor flippers' being the driver of the negative return relation.

Combined with the evidence in Table 13, our findings suggest there exist two distinct groups of key investors. While non-flippers are associated with informed trading and more underpricing, flippers are associated with return reversals and less underpricing. The next section examines the economic significance of these two groups, as well as key investors

compared to other investors.

4.6 Economic Significance

The results of Tables 10 and 12 show the importance of key investors for both underpricing and offer price revisions. Consistent with underpricing compensating information revelation or value creation, key investors' participation is more strongly related to underpricing and offer price revisions than non-key investors' participation. This is consistent with a small number of investors providing the majority of the pricing information and creating the link between offer price revisions and underpricing.

While key investors account for the vast majority of price discovery, Table 15 estimates that only 23% of the economic benefit from receiving underpriced shares goes to this group of investors. Similar economic benefits accrue to new funds, who actually report more holdings (16% versus 14%). Among key investors, flippers receive on average more underpriced offerings, but report fewer holdings and shares held. However, their propensity to flip shares suggests that their reported holdings and share holdings likely understate true allocations. The evidence supports a number of non-information-based motivations for underpricing, as underwriters could simply increase key investors' share allocations and decrease underpricing accordingly.[15]

5 Conclusion

We identify key investors based on their past IPO participation and show that their participation in future IPOs is highly predictive of underpricing and offer price revisions. A majority of key investors are likely compensated for information production or value-adding

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[15]Many studies find that underpricing benefits underwriters and investors at the expense of firms. Evidence consistent with this view is provided in Goldstein et al. (2011), Nimalendran et al. (2007), Reuter (2006), Ritter and Zhang (2007), among others.

activities, and a minority are likely compensated for laddering. However, a great deal of investors' benefits from underpricing accrue to non-key investors, leaving room for alternative theories of IPO underpricing. Underwriters' using underpriced allocations to elicit other business is particularly plausible given the large economic benefits that accrue to new funds and those funds' tendencies to flip allocations.

Our analysis highlights the importance of a small group of institutional investors to the IPO process. These investors appear to aid in the price-formation process during and after the IPO, and may be beneficial to firms as part of their continuing ownership structure. Future research may identify other ways in which specific institutional investors add value to firms.

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Appendix: Variable Definitions

AUM: Total dollar value of a fund's positions reported in the 13F filings data.

Churn: Measure of trading activity calculated following Yan and Zhang (2009).

ConcurrentIPOs: Number of IPOs issued in the same month as the IPO, as used in Ibbotson et al. (1975).

ConcurrentUnderpricing: Average underpricing of IPOs issued in the same month as the IPO, as used in Ibbotson et al. (1975).

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

Flipper: An indicator equal to one if an investor is in the top third of investors in the past year based on selling allocations in the quarter following the IPO.

FundAge: Number of years a fund has reported in the 13F filings data, starting in 1980.

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).

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

Holder: An indicator equal to one if an investor is in the top third of investors in the past year based on holding IPOs through the end of the fourth quarter following the IPO.

InvPrice: The inverse of the filing-range midpoint.

AvgIPOHoldTime: The average number of quarters before a fund reports no holdings in a firm for which it reported holdings in the quarter following the IPO.

KeyInvestor: An indicator variable equal to one if a fund is in the top 10% of abnormal underpricing for funds over the past three years and participated in at least 10 IPOs over that time period.

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

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

MoneyLeft: *Shares* × *OfferPrice* × *Underpricing*

MultipleTimesRelationship: An indicator variable equal to one if an investor participated in more than one of an underwriter's last ten offerings.

NumInstInvestors: The number of institutional investors participating in an offering.

E[*NumInstInvestors*]: The estimated number of institutional investors participating in an offering based on a probit estimation of allocation probabilities.

$\widehat{NumInstInvestors}$: Instrumented version of *NumInstInvestors*.

NumKeyInvestors: The number of institutional investors participating in an offering with *KeyInvestor* = 1.

$\widehat{NumKeyInvestors}$: Instrumented version of *NumKeyInvestors*.

E[*NumKeyInvestors*]: The estimated number of key institutional investors participating in an offering based on a probit estimation of allocation probabilities.

NumKeyFlippers: The number of key investors participating in an offering who are also classified as *Flippers*.

NumKeyHolders: The number of key investors participating in an offering who are also classified as *Holders*.

NumKeyProducers: The number of key investors participating in an offering who are also classified as *Producers*.

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).

OneTimeRelationship: An indicator variable equal to one if an investor participated in at least one of an underwriter's last ten offerings.

OPR − Residuals: The unexplained portion of offer price revision when regressing offer

price revision on the other independent variables used to predict *Underpricing*.

Overhang: Shares held by the firm's initial investors divided by the shares issued in the IPO. Bradley and Jordan (2002) documents the importance of this measure.

PercentInst: 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).

Proceeds: Natural logarithm of the total IPO proceeds adjusted to year 2000 dollars.

Producer: An indicator equal to one if an investor is in the top third of investors in the past year based on significant position increases in the three quarters following the IPO.

Q1Return: The return from the closing price on the first day to the last day of the quarter of the IPO.

Q2Return: The return from the closing price on the last day of the quarter of the IPO to the closing price on the last day of the following quarter.

Shares: The number of shares reported by a fund in the 13F filings in the quarter following the IPO (proxy for allocations).

TechFirm: Indicator variable equal to one if the firm's SIC code is in a technology sector as defined by Cliff and Denis (2004).

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

UnderwriterRank: Carter Manaster rank originated in Carter and Manaster (1990), and further updated in Carter et al. (1998) and Loughran and Ritter (2004). The data is taken from Jay Ritter's website.

UWshare: Market share of underwriters in past offerings.

UWpremium: 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.

Table 2: Persistence of Key Investors. Key investors are in the top 10% of funds based on the average abnormal underpricing (relative to monthly averages) of IPOs they have participated in over the past year. Columns track years since an investor was classified as a key investor, and the rows track the percentage of investors classified in each decile in subsequent years. A lack of persistence would imply 10% of investors in each decile-year. The percentages of key investors in each year are significantly different (p-values less than 1%) from 10% for all ten years after initial classification.

Decile Rank	Years Since Initial Classification as Key Investor									
	1	2	3	4	5	6	7	8	9	10
10 (Key Investor)	35	32	25	27	21	20	20	20	19	18
9	18	14	18	15	13	17	17	18	19	13
8	11	12	12	11	15	12	15	11	15	14
7	8	8	11	9	12	9	7	8	11	12
6	7	8	6	8	7	11	10	11	9	8
5	6	9	8	7	8	10	6	9	5	10
4	4	6	5	8	9	9	9	7	9	7
3	4	4	4	5	5	5	6	5	6	5
2	3	3	5	6	6	5	5	6	5	5
1	3	4	4	5	4	3	4	6	3	7
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 3: Fund Characteristics. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	Key Investors	Non-Key Investors	Differences
AUM (millions)	$17,660	$13,140	$4,520***
$FundAge$	42.8	40.3	2.4**
$Churn$	0.169	0.158	0.011**
Average $IPOHoldTime$	5.081	5.101	-0.02
Average $Held$	0.587	0.583	0.004
Average $Produced$	0.252	0.239	0.013
Average $Flipped$	0.201	0.207	-0.006
Percent $Holders$	30.8%	34.2%	-3.4%
Percent $Producers$	36.0%	33.2%	2.8%
Percent $Flippers$	26.3%	32.2%	-5.9%***
Percent Hedge Funds	17.6%	21.8%	-4.2%**
Observations	697	6,190	

Table 4: 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 assets under management. The final column, average percentile, gives the average value of the abnormal underpricing percentile calculated as of the beginning of each year. Only funds identified as key investors for at least 6 years are provided in the main body of the table. For reference, statistics for Blackrock, Fidelity and Vanguard are provided at the bottom of the table.

Fund Name	Num Years $KeyInvestor = 1$	Num Years in Sample	Number of Allocations	AUM (millions)	Average Percentile
Most Frequent Key Investors:					
ESSEX INVESTMENT MGMT CO	23	31	1233	$1,370	88%
PROVIDENT INVT COUNSEL	20	27	687	$3,390	89%
TURNER INVT PARTNERS INC	13	20	620	$15,800	78%
JANUS CAPITAL CORP.	13	26	854	$90,700	82%
TCW ASSET MGMT CO	13	28	955	$37,800	81%
IDS FINANCIAL SVCS. INC.	13	27	1180	$107,000	83%
LORD ABBETT & CO	12	27	474	$37,200	73%
GILDER GAGNON HOWE & CO LLC	12	13	255	$4,860	97%
DRIEHAUS CAPITAL MGMT	12	19	294	$2,660	85%
AMERINDO INVMT ADVISORS	11	14	173	$13,300	92%
MASSACHUSETTS FINL SERV	11	31	1509	$87,700	72%
DENVER INVT. ADVISORS	11	17	825	$4,130	86%
INVESTORS RESEARCH CORP	11	28	604	$45,800	76%
JUNDT/CAPEN ASSOCIATES	11	19	191	$161	81%
PUTNAM MANAGEMENT CO INC	10	31	1439	$58,100	77%
PILGRIM BAXTER HOYT GREG	10	23	383	$531	78%
PRICE T ROWE ASSOCIATE	10	29	878	$284,000	74%
BERGER ASSOCIATES INC	10	13	353	$6,690	92%
DUNCAN-HURST CAP MGMT	9	18	617	$639	80%
VAN WAGONER CAPITAL MGMT	8	12	223	$58	84%
LOOMIS SAYLES & COMPANY	8	27	402	$12,800	74%
ROCKEFELLER & COMPANY	8	27	625	$8,570	70%
G T CAPITAL MANAGEMENT	8	17	232	$3,270	67%
DREYFUS CORP	8	18	371	$4,180	71%
USAA INVESTMENT MGMT	7	22	747	$7,590	78%
HUSIC CAPITAL MGMT.	7	19	528	$604	70%
ALGER FRED MANAGEMENT	7	19	382	$12,500	83%
BARON CAPITAL INC	7	17	217	$15,200	68%
MACKAY SHIELDS FINL CORP	7	27	409	$8,480	69%
EATON&HOWARD VANCE SANDR	7	29	351	$30,900	69%
NEXT CENTURY GR INVESTORS, LLC	7	10	89	$1,700	82%
SIT INVESTMENT ASSOCS.	7	20	192	$2,250	71%
BANKERS TRUST NEW YORK	7	30	1803	$87,900	62%
INVESTMENT ADVISERS INC	7	21	432	$913	65%
STATE STREET RESR & MGMT	7	24	1097	$18,200	75%
OPPENHEIMER MGMT. CORP.	7	26	1112	$59,600	76%
PIMCO ADVISORS L P	6	17	418	$50,800	72%
CAVALRY ASSET MANAGEMENT L.P.	6	6	39	$1,010	94%
WADDELL & REED INC	6	26	595	$29,600	67%
FORTIS ADVISERS INC	6	12	238	$5,160	89%
BRINSON PARTNERS INC	6	19	236	$52,500	60%
ARBOR CAPITAL MGMT LLC	6	14	140	$1,140	77%
GEOCAPITAL CORPORATION	6	17	289	$3,250	67%
A I M MGMT GROUP INC.	6	15	939	$58,600	80%
PNC FINANCIAL CORP	6	29	447	$148,000	60%
Other Notable Investors:					
BLACKROCK, INC.	0	12	320	$704,000	64%
VANGUARD GROUP INC	3	15	1062	$458,000	78%
FIDELITY MGMT & RES CORP	1	21	2057	$449,000	81%

Table 5: Comparison of 13F holdings to actual allocations in 6 IPOs. Non-key investors are those in the bottom 90% of adjusted abnormal underpricing who have had at least 4 IPO allocations in the past year. New funds are those with fewer than 4 IPOs over the past year.

| | Investors | | | |
	Key	Non-Key	New	Total
Actual Allocations				1395
Matched to 13F Fund	80	459	132	671
Matched to 13F Holdings	31	93	6	130
13F Holdings				
Non-Allocations	25	83	16	124
Total Reported 13F Holdings	56	176	22	254
Correlations	76%	98%	76%	95%
Avg. Shares Received	100,319	45,074	20,265	
Avg. Post-IPO Trading	120%	98%	-47%	

Table 6: Relations between number of days from the IPO to the end of the quarter and the number of key investors and non-key investors reporting holdings in the 13F filings. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	(1) $NumKeyInvestors$	(2) $NumNonKeyInvestors$
$DaysToQuarterEnd$	-0.005***	0.058***
	(-2.715)	(7.059)
Constant	3.472***	37.663***
	(3.783)	(6.166)
Year Dummies	Yes	Yes
R^2	0.114	0.254
Observations	4,938	4,938

Table 7: Underpricing-quantile-based relations between the number of days from the IPO to the end of the quarter and the number of key investors and non-key investors reporting holdings in the 13F filings. Quantile (1) includes the least underpriced IPOs and four includes the most underpriced. Panel A shows relations for the number of key investors and Panel B shows relations for the number of non-key investors (those in the bottom 90% of adjusted abnormal underpricing who have had at least 4 IPO allocations in the past year). Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

Panel A

	$NumKeyInvestors$ by $Underpricing$ Quantiles			
	(1)	(2)	(3)	(4)
$DaysToQuarterEnd$	-0.002	0.001	-0.005	-0.010**
	(-1.192)	(0.416)	(-1.538)	(-2.438)
Constant	2.445***	-0.069	3.194***	4.140***
	(2.638)	(-0.416)	(2.994)	(4.753)
Year Dummies	Yes	Yes	Yes	Yes
R^2	0.054	0.087	0.062	0.121
Observations	1,228	1,072	1,294	1,344

Panel B

	$NumNonKeyInvestors$ by $Underpricing$ Quantiles			
	(1)	(2)	(3)	(4)
$DaysToQuarterEnd$	0.040***	0.065***	0.061***	0.069***
	(3.011)	(3.896)	(3.643)	(4.404)
Constant	26.670***	15.319**	42.260***	65.026***
	(4.733)	(2.179)	(3.159)	(8.089)
Year Dummies	Yes	Yes	Yes	Yes
R^2	0.253	0.292	0.237	0.333
Observations	1,228	1,072	1,294	1,344

Table 8: First-quarter (from close-of-first-day to end-of-quarter) average-daily returns for IPO stocks. The average daily return is expressed as a percentage. The sample size is reduced due to a number of IPOs that occur on the last day of the quarter. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	% Return From First-Day Close To Quarter End				
	(1)	(2)	(3)	(4)	(5)
Underpricing		0.566			0.205
		(1.046)			(0.380)
NumInstInvestors			0.006		-0.009
			(1.061)		(-1.287)
NumKeyInvestors				0.069**	0.092**
				(2.011)	(2.021)
Constant	-0.294**	-0.325**	-0.541**	-0.513***	-0.196
	(-2.104)	(-2.424)	(-1.991)	(-2.900)	(-0.776)
Year Dummies	Yes	Yes	Yes	Yes	Yes
R^2	0.024	0.025	0.025	0.026	0.027
Observations	4,877	4,877	4,877	4,877	4,877

Table 9: Probit analysis predicting end-of-quarter holdings. Established funds are those having sufficient data over the last five years to calculate post-IPO buying, long-term holding and flipping measures. New funds are those with insufficient data history. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	(1) New Funds	(2) Established Funds
Churn	-0.000	0.010***
	(-1.428)	(4.727)
AUM	0.000***	0.000***
	(18.717)	(28.259)
FundAge	-0.000***	0.000***
	(-20.282)	(4.172)
NumPositions	0.000***	0.000***
	(36.880)	(45.337)
OneTimeRelationship	0.010***	0.052***
	(46.058)	(64.002)
MultipleTimesRelationship	0.019***	0.104***
	(51.971)	(90.829)
KeyInvestor	0.005***	0.031***
	(6.820)	(7.076)
KeyInv × Churn	0.006***	0.003
	(3.327)	(0.422)
KeyInv × AUM	-0.000***	-0.000**
	(-2.888)	(-2.427)
KeyInv × FundAge	-0.000	0.000
	(-0.775)	(0.337)
KeyInv × NumPositions	-0.000***	-0.000
	(-3.268)	(-1.456)
KeyInv × OneTimeRel	-0.002***	-0.001
	(-4.047)	(-0.650)
KeyInv × MultTimesRel	-0.005***	-0.002
	(-7.628)	(-0.994)
AvgPostIPOBuying		0.024***
		(14.694)
AvgLongHolder		-0.001
		(-0.726)
AvgFlipper		-0.003*
		(-1.645)
KeyInv × AvgLongHolder		0.012**
		(2.525)
KeyInv × AvgFlipper		-0.002
		(-0.335)
KeyInv × AvgPostIPOBuying		-0.036***
		(-7.823)
R^2		
Observations	3527396	1188442

Table 10: Regressions of underpricing 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.

				Underpricing			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
NumKeyInvestors	0.054***		0.027***	0.030***	0.027***	0.028***	0.038***
	(27.245)		(14.295)	(11.977)	(12.060)	(10.588)	(21.212)
NumKeyFlippers				-0.012**			
				(-2.079)			
NumKeyHolders					0.001		
					(0.174)		
NumKeyProducers						-0.002	
						(-0.400)	
LogAge		-0.015***	-0.012***	-0.012***	-0.012***	-0.012***	-0.019***
		(-4.857)	(-3.999)	(-4.041)	(-3.998)	(-4.017)	(-6.430)
LogSize		-0.083***	-0.068***	-0.067***	-0.068***	-0.068***	-0.107***
		(-9.839)	(-8.456)	(-8.386)	(-8.457)	(-8.456)	(-13.674)
VC-Backed		0.026***	0.015*	0.015*	0.015*	0.015*	0.018**
		(3.254)	(1.928)	(1.948)	(1.937)	(1.917)	(2.287)
TechFirm		0.021**	0.009	0.010	0.009	0.009	0.022**
		(2.371)	(1.033)	(1.098)	(1.038)	(1.020)	(2.563)
InvPrice		0.484***	0.629***	0.626***	0.627***	0.631***	-1.227***
		(2.672)	(3.607)	(3.591)	(3.597)	(3.621)	(-8.051)
Overhang		0.026***	0.024***	0.024***	0.024***	0.024***	0.026***
		(9.752)	(9.351)	(9.344)	(9.365)	(9.329)	(9.982)
UWpremium		0.094*	0.054	0.058	0.054	0.054	0.132***
		(1.822)	(1.091)	(1.158)	(1.085)	(1.094)	(2.660)
UnderwriterRank		0.008***	0.003	0.003	0.003	0.003	-0.012***
		(2.804)	(0.941)	(0.956)	(0.940)	(0.953)	(-3.903)
UWshare		0.132	0.127	0.120	0.128	0.127	0.251***
		(1.596)	(1.606)	(1.524)	(1.614)	(1.599)	(3.168)
ConcurrentIPOs		-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
		(-0.760)	(-1.414)	(-1.451)	(-1.422)	(-1.422)	(-1.073)
ConcurrentUnderpricing		0.004***	0.004***	0.004***	0.004***	0.004***	0.005***
		(6.838)	(6.412)	(6.410)	(6.440)	(6.399)	(8.796)
MarketReturn		4.966**	5.298**	5.378**	5.307**	5.276**	5.035**
		(2.102)	(2.293)	(2.332)	(2.302)	(2.284)	(2.179)
MarketStdDev		1.657	1.088	1.000	1.080	1.118	-0.645
		(1.095)	(0.736)	(0.675)	(0.731)	(0.758)	(-0.437)
PercentInst		-0.010	-0.022	-0.023	-0.022	-0.022	-0.093***
		(-0.524)	(-1.186)	(-1.244)	(-1.187)	(-1.183)	(-5.197)
NumInstInvestors		0.005***	0.002***	0.002***	0.002***	0.002***	0.003***
		(10.939)	(3.946)	(3.716)	(3.929)	(3.948)	(7.061)
OfferPriceRevision		0.732***	0.603***	0.604***	0.603***	0.603***	
		(19.863)	(16.055)	(16.100)	(16.049)	(16.045)	
OPR-Residuals							0.603***
							(16.055)
Year Dummies	No	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.302	0.558	0.583	0.584	0.583	0.583	0.583
Observations	4,938	4,938	4,938	4,938	4,938	4,938	4,938

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Table 11: Instrumental variables analysis using estimated investor participation based on underwriter-relationship and fund-specific information to instrument for realized investor participation. Variable definitions are provided in the appendix. Robust t-statistics are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% levels.

	First-Stage		Second-Stage
	(1) NumInstInvestors	(2) NumKeyInvestors	(3) Underpricing
LogAge	0.592***	-0.029	-0.014***
	(3.639)	(-0.790)	(-3.531)
LogSize	13.702***	1.138***	-0.103**
	(46.326)	(17.340)	(-2.152)
VC-Backed	0.996***	0.477***	0.013
	(2.617)	(5.644)	(1.466)
TechFirm	0.122	0.433***	0.012
	(0.320)	(5.101)	(1.388)
InvPrice	59.685***	1.550	0.479*
	(7.426)	(0.869)	(1.752)
Overhang	0.332***	0.103***	0.024***
	(3.616)	(5.050)	(10.270)
UWpremium	4.417**	0.280	0.050
	(2.298)	(0.657)	(1.111)
UnderwriterRank	-0.313**	0.089***	0.004
	(-2.201)	(2.808)	(1.224)
UWshare	-4.834	-0.548	0.122
	(-1.199)	(-0.613)	(1.543)
ConcurrentIPOs	-0.026*	-0.006**	-0.000
	(-1.865)	(-2.081)	(-1.215)
ConcurrentUnderpricing	0.006	0.005	0.004***
	(0.418)	(1.515)	(12.853)
MarketReturn	167.217*	29.326	4.814**
	(1.827)	(1.443)	(2.420)
MarketStdDev	61.414	26.131*	1.032
	(0.879)	(1.684)	(0.694)
OfferPriceRevision	26.164***	7.979***	0.583***
	(23.823)	(32.734)	(6.239)
E[NumInstInvestors]	0.292***	-0.089***	
	(4.973)	(-6.850)	
E[NumKeyInvestors]	-0.022	0.947***	
	(-0.091)	(17.195)	
$\widehat{NumInstInvestors}$			0.005
			(1.433)
$\widehat{NumKeyInvestors}$			0.019***
			(3.531)
Year Dummies	Yes	Yes	Yes
R^2	0.680	0.555	0.576
Observations	4,938	4,938	4,938

Table 12: Regressions of offer price revisions 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.

			OfferPriceRevision			
	(1)	(2)	(3)	(4)	(5)	(6)
NumKeyInvestors	0.030***		0.018***	0.017***	0.018***	0.019***
	(40.897)		(19.321)	(14.554)	(15.160)	(14.940)
NumKeyFlippers				0.002		
				(0.872)		
NumKeyHolders					0.001	
					(0.229)	
NumKeyProducers						-0.002
						(-0.788)
LogAge		-0.015***	-0.012***	-0.012***	-0.012***	-0.012***
		(-8.219)	(-6.733)	(-6.718)	(-6.738)	(-6.753)
LogSize		-0.081***	-0.064***	-0.064***	-0.064***	-0.064***
		(-18.747)	(-15.455)	(-15.458)	(-15.452)	(-15.444)
VC-Backed		0.013***	0.005	0.005	0.005	0.005
		(2.842)	(1.041)	(1.035)	(1.047)	(1.021)
TechFirm		0.033***	0.022***	0.022***	0.022***	0.022***
		(6.926)	(4.791)	(4.763)	(4.795)	(4.769)
InvPrice		-3.476***	-3.078***	-3.077***	-3.079***	-3.075***
		(-37.052)	(-34.182)	(-34.189)	(-34.208)	(-34.122)
Overhang		0.004***	0.003**	0.003**	0.003**	0.003**
		(3.374)	(2.243)	(2.252)	(2.236)	(2.270)
UWpremium		0.171***	0.129***	0.129***	0.129***	0.130***
		(6.901)	(5.553)	(5.530)	(5.539)	(5.557)
UnderwriterRank		-0.022***	-0.024***	-0.024***	-0.024***	-0.024***
		(-13.292)	(-14.941)	(-14.943)	(-14.941)	(-14.925)
UWshare		0.229***	0.206***	0.207***	0.206***	0.205***
		(4.643)	(4.427)	(4.448)	(4.431)	(4.420)
ConcurrentIPOs		0.000**	0.000	0.000	0.000	0.000
		(2.072)	(1.137)	(1.148)	(1.124)	(1.124)
ConcurrentUnderpricing		0.003***	0.002***	0.002***	0.002***	0.002***
		(11.423)	(9.933)	(9.931)	(9.895)	(9.928)
MarketReturn		-0.721	-0.436	-0.452	-0.430	-0.456
		(-0.604)	(-0.379)	(-0.392)	(-0.374)	(-0.395)
MarketStdDev		-2.727***	-2.873***	-2.855***	-2.878***	-2.845***
		(-3.017)	(-3.282)	(-3.257)	(-3.288)	(-3.258)
PercentInst		-0.120***	-0.118***	-0.118***	-0.118***	-0.118***
		(-13.011)	(-13.475)	(-13.454)	(-13.469)	(-13.473)
NumInstInvestors		0.005***	0.002***	0.002***	0.002***	0.002***
		(23.862)	(10.135)	(10.106)	(10.070)	(10.131)
Year Dummies	No	Yes	Yes	Yes	Yes	Yes
R^2	0.322	0.521	0.563	0.563	0.563	0.563
Observations	4,938	4,938	4,938	4,938	4,938	4,938

Table 13: 3-Month Abnormal Returns following quarterly 13F holdings changes. Panel A presents cumulative 4-factor abnormal returns and Panel B presents buy-and-hold 4-factor abnormal returns. ΔX measures the change in the number of investors of type X holding shares over the prior quarter. Returns do not incorporate reporting delays in 13F filings and instead take positions at the beginning of each quarter. 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

	Four-Factor CARs					
	(1)	(2)	(3)	(4)	(5)	(6)
Δ *NumInstInv*	0.001*	-0.001	-0.001	-0.001	-0.001	-0.001
	(1.939)	(-1.075)	(-1.216)	(-1.109)	(-0.901)	(-1.058)
Δ *NumKeyInv*		0.011***	0.022***	0.003	0.003	0.007
		(3.608)	(4.459)	(0.851)	(0.852)	(1.022)
Δ *NumKeyFlippers*			-0.019***			-0.012
			(-2.779)			(-1.637)
Δ *NumKeyHolders*				0.033***		0.023**
				(3.625)		(2.250)
Δ *NumKeyProducers*					0.026***	0.019**
					(3.218)	(2.229)
Observations	4,879	4,879	4,879	4,879	4,879	4,879

Panel B

	Four-Factor BHARs					
	(1)	(2)	(3)	(4)	(5)	(6)
Δ *NumInstInv*	0.001**	-0.001	-0.001	-0.001	-0.001	-0.001
	(2.074)	(-0.986)	(-1.081)	(-1.010)	(-0.857)	(-0.963)
Δ *NumKeyInv*		0.012***	0.019***	0.006	0.006	0.007
		(3.622)	(3.785)	(1.416)	(1.381)	(1.100)
Δ *NumKeyFlippers*			-0.013*			-0.008
			(-1.880)			(-1.031)
Δ *NumKeyHolders*				0.025***		0.017*
				(2.664)		(1.700)
Δ *NumKeyProducers*					0.020**	0.014*
					(2.376)	(1.657)
Observations	4,879	4,879	4,879	4,879	4,879	4,879

Table 14: Regressions of second-quarter returns on first-quarter returns (with adjustment). Panels A through D show simple univariate regressions of quarterly returns divided based on above- and below-median measures of investors. 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

	Overall		Underpricing	
	Full Sample *Q2Return*	Full Sample *Q2Return*	*Underpricing ≥ 6.7%* *Q2Return*	*Underpricing < 6.7%* *Q2Return*
Q1Return	-0.023** (-2.097)	-0.023** (-2.097)	-0.029** (-2.004)	-0.007 (-0.395)
Observations	4,904	4,904	2,624	2,280

Panel B

	Key Investors		Total Investors	
	NumKeyInvestors ≥ 2 *Q2Return*	*NumKeyInvestors < 2* *Q2Return*	*NumInstInvestors ≥ 17* *Q2Return*	*NumInstInvestors < 17* *Q2Return*
Q1Return	-0.040*** (-3.116)	0.051** (2.256)	-0.031** (-2.446)	0.014 (0.612)
Observations	3,058	1,846	2,838	2,066

Panel C

	Two-Way Split: Key Investors vs. Total Investors			
	NumKeyInvestors ≥ 2 & NumInstInvestors ≥ 17 *Q2Return*	*NumKeyInvestors < 2 & NumInstInvestors ≥ 17* *Q2Return*	*NumKeyInvestors ≥ 2 & NumInstInvestors < 17* *Q2Return*	*NumKeyInvestors < 2 & NumInstInvestors < 17* *Q2Return*
Q1Return	-0.039*** (-2.870)	0.076** (2.027)	-0.040 (-1.004)	0.043 (1.585)
Observations	2,474	364	584	1,482

Panel D

	Two-Way Split of Key Investors: Flippers vs. Non-Flippers			
	NumKeyNonFlippers ≥ 1 & NumKeyFlippers ≥ 1 *Q2Return*	*NumKeyNonFlippers < 1 & NumKeyFlippers ≥ 1* *Q2Return*	*NumKeyNonFlippers ≥ 1 & NumKeyFlippers < 1* *Q2Return*	*NumKeyNonFlippers < 1 & NumKeyFlippers < 1* *Q2Return*
Q1Return	-0.046*** (-2.945)	-0.125** (-2.200)	0.022 (0.978)	0.036 (1.385)
Observations	1,828	208	1,505	1,363

Table 15: Summary statistics of underpricing, end-of-quarter holdings (our proxy for allocations) and holdings-implied money left on the table to different classifications of investors. Key investors are in the top 10% of funds based on the average abnormal underpricing (relative to monthly averages) of IPOs they have participated in over the past year. Start-of-year measures are used to relate key investors from one year to the next. New funds are those with fewer than 4 IPOs over the past year.

| | Key Investors | | | Total Key | Non-Key | New |
	Flippers	Producers & Holders	Other	Investors	Investors	Investors
Average Underpricing	54%	47%	44%	47%	30%	21%
Average Shares Held	123,271	213,724	169,556	181,733	178,806	314,553
Average MoneyLeft	$910,222	$1,163,532	$1,387,790	$1,216,565	$587,642	$940,181
Observations	2,975	8,460	7,943	19,378	97,029	21,365
(percent)	2%	6%	6%	14%	70%	16%
Total Money Left ($B)	$2.7	$9.8	$11.0	$23.6	$57.0	$20.1
(percent)	3%	10%	11%	23%	57%	20%