

Investor Characteristics, Relationships, and IPO Allocations

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ABSTRACT

We examine the extent to which long-term investors are favored in IPO allocations by using data on first reported holding by an institutional investor at the end of the offering quarter as our proxy for the initial allocation that the institution received. Our results show that underwriters more frequently allocate shares and make larger allocations to investors who have a record of maintaining or even increasing their holdings of past IPO allocations. We examine several alternative measures of long-term investors with qualitatively identical results. In addition, we show that investors who specialize in subscribing to industry IPOs and those with whom underwriters have past IPO relationships also receive higher allocations. Our results support the view that a key objective of underwriters in share allocations is to direct allocations towards investors who are likely to be long-term holders of the stock.

JEL classification: G32, G24

Keywords: IPO allocations, institutional investors, relationships, industry focus, long-term holders.

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ABSTRACT

We examine the extent to which long-term investors are favored in IPO allocations by using data on first reported holding by an institutional investor at the end of the offering quarter as our proxy for the initial allocation that the institution received. Our results show that underwriters more frequently allocate shares and make larger allocations to investors who have a record of maintaining or even increasing their holdings of past IPO allocations. We examine several alternative measures of long-term investors with qualitatively identical results. In addition, we show that investors who specialize in subscribing to industry IPOs and those with whom underwriters have past IPO relationships also receive higher allocations. Our results support the view that a key objective of underwriters in share allocations is to direct allocations towards investors who are likely to be long-term holders of the stock.

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1. Introduction

In book-built initial public offerings (IPOs), underwriters have full discretion over the allocation of shares to investors. We ask how important are the characteristics of bidders in determining IPO allocations, and which investors underwriters prefer when they make allocations of shares in IPOs. Although the IPO literature finds that underwriters favor institutional investors, we know relatively little about what characteristics of investors matter in these IPO allocation decisions.

An emerging view of allocations is that underwriters favor long-term investors. Jenkinson and Jones (2004) state that “most investment banks when asked will claim that they are influenced by the ‘quality’ of the bidder ... When pressed to define a high-quality investor, many investment banks will relate quality to the probability of the investor being a longer-term holder of the stock.” Jenkinson and Jones’s later (2009) survey of institutional investors shows that being a long-term investor is a key factor in an underwriter’s allocation decisions.

Underwriters prefer long-term investors, since one of the main objectives in allocations is to minimize the costs of price support and aftermarket stabilization (see Aggarwal (2000), Aggarwal (2003), Jenkinson and Jones (2004), Griffin, Harris, and Topaloglu (2007)). Investors who flip their shares in the immediate aftermarket (“flippers”) depress the trading prices, which increase the costs of price support and aftermarket stabilization. Underwriters spend considerable resources in closely monitoring the trading activity of investors to whom they allocate shares. They discourage flipping through penalty bids or through exclusion in future IPOs. In a penalty

bid, the lead underwriter takes away the commission paid to a syndicate member for selling shares flipped by its customer.

Issuers also have a strong preference for buy-and-hold investors because these investors are better monitors. Several studies show that long-term investors more effectively monitor firms. For example, Gaspar, Massa, and Matos (2005) and Chen, Harford, and Li (2007) show that acquiring firms with short-term investors have significantly worse announcement returns and post-merger performance compared to acquirers with long-term investors.

In this paper, we examine the extent to which long-term investors are favored in IPO allocations for a large sample of U.S. IPOs by using data on first reported holding by an institutional investor at the end of the offering quarter as our proxy for the initial allocation that the institution received. We discuss the validity of this proxy for initial allocation in Section 3.1.

We construct what we believe is a new and different measure of long-term investor. We measure long-term holders of IPO stocks by tracking the trading of their previous IPO allocations during periods immediately following those IPOs. We consider long-term investors as those who have historically maintained or increased their shareholdings of the IPO in the period immediately following the listing. By contrast, flippers reduce their holdings of IPOs very quickly following listing. We test if the information contained in trading patterns of past IPO allocations affects future IPO allocations. Alternative measures of long-term investors yield identical results.

We also focus on two additional characteristics of investors: investors who have specialized in subscribing to industry IPOs in the recent past (industry-focused investors),

and investors who have subscribed to previous IPOs managed by the same underwriter (relationship investors). Industry-focused investors are often long-term holders of stocks and if underwriters and issuers prefer long-term investors, these investors will have a higher likelihood of receiving allocation of IPO shares. They may also be investors with value-relevant information, such as industry-wide information that is relevant to the pricing of IPOs. The traditional book-building theories suggest that underwriters strategically allocate shares to investors who provide information that is valuable in pricing IPOs (e.g., Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), and Sherman and Titman (2002)). The possibility that industry-focused investors may also be informed increases underwriter incentives to allocate shares to investors with industry experience. We measure industry focus of an investor by the frequency of investor participation in past IPOs in the same industry.

We also examine past IPO relationships of investors with the underwriters and how those relationships affect the likelihood of receiving allocations in future IPOs. By allocating shares to regular investors, underwriters minimize the cost of information production, i.e., expected underpricing (see Benveniste and Spindt (1989), and Sherman (2000)). Furthermore, repeated interactions with investors allow underwriters to distinguish investors who are likely to flip their shares from those who will hold them over longer-term. Moreover, relationships may indicate that underwriters and investors are in a repeat game, as argued by Gondat-Larralde and James (2008).

We present several key results in the paper. First, we show that investors perceived to be long-term investors have a significantly higher likelihood of receiving allocations, and the allocations are larger. Our results, based on a large sample of U.S. IPOs over a long

time-period period, confirm the findings of Jenkinson and Jones (2004), which use a proprietary ranking of investors for a small sample of European IPOs, and the survey findings of Jenkinson and Jones (2009). By contrast, we estimate our measures of long-term investors for large samples using ex ante publicly available information. We also show that higher long-term investor holding of shares is associated with less volatile post-IPO stock price.

Second, we find that investors who have participated in previous IPOs in the same industry have a higher likelihood of receiving allocations, and allocations to these investors are larger. Furthermore, the allocations to industry-focused investors increase with the relatedness of the IPO firm to the rest of the industry.

Third, our results show that underwriters more often allocate shares and make larger allocations to those investors who have participated in the underwriter's previous IPOs (relationship investors). Underwriter preference to allocate shares to relationship investors does not appear to be due to information considerations. Information theories predict that underwriters can cross-subsidize relationship investors for buying overpriced, low-quality IPOs by committing to selling them underpriced IPOs in the future. Therefore, allocations to regular investors should be less sensitive to underpricing. Our results however, suggest that allocations to regular investors are relatively *more* sensitive to underpricing.

In addition, we show that long-term investors have a much higher likelihood of receiving an IPO allocation if they have participated in previous IPOs made by the same underwriter. That is, the fact that an investor is a long-term investor and at the same time

has a relationship with the underwriter further increases the likelihood of the investor receiving allocations of future IPOs from the underwriter.

The paper is organized as follows. Section 2 reviews the existing literature. Section 3 describes the data and variables. Section 4 presents our main results. Section 5 provides results from robustness tests. Section 6 concludes the paper.

2. Prior Studies

There is an increasing interest in understanding the importance of investor characteristics in IPO allocation decisions. Much of the existing IPO literature focuses on allocations to institutional investors versus retail investors. The studies generally conclude that institutional investors (the so-called “strong hands”) receive a much larger fraction of IPO allocations of both hot and cold IPOs than do retail investors (Hanley and Wilhelm, 1995; Cornelli and Goldreich, 2001; Aggarwal, Prabhala and Puri, 2002; Ljungqvist and Wilhelm 2002; and Jenkinson and Jones, 2004). Institutions receive almost 65% to 70% of the total allocation of IPOs.

Recently, the IPO literature has started to focus on understanding which institutional investors do underwriters favor in IPO allocations. Jenkinson and Jones (2004) use a proprietary ranking of investors (which presumably captures whether an investor is a flipper or a long-term investor) for a small sample of European IPOs and find that underwriters treat long-term investors more favorably in IPO allocations. Banerjee, Hansen, and Hrnjic (2009) find that reputable underwriters manage IPOs with more long-term investors and that these IPOs have higher price revisions and greater underpricing.

The existing studies also find that regular investors (investors who have previously participated in IPOs managed by the same underwriter) receive favorable allocations. The Cornelli and Goldreich (2001) and Jenkinson and Jones (2004) studies both present evidence that frequent bidders receive favorable allocations. Boehmer and Fishe (2004) and Binay, Gatchev, and Pirinsky (2007) provide additional evidence on the importance of relationship-based participation in IPOs. Boehmer and Fishe (2004) ask whether regular investors receive allocations in better-performing IPOs and if they help reduce underpricing. They show that underwriters favor regular institutional investors in more profitable offerings with more frequent but smaller allocations. Binay, Gatchev and Pirinsky (2007) show that relationship-based participation in an IPO increases underpricing. They construct this measure at the IPO level, where they estimate for each IPO the excess probability of allocating the IPO shares to investors who have participated in IPOs of the same lead manager or underwriters.

Several commentators suggest that an investor's industry focus matters in allocation decisions. Industry-focused investors are often long-term holders of stocks. For example, Ritter (2002) states that “[I]n their pitches to issuers, underwriters frequently discuss their distribution strategy. They invariably talk about the institutional investors who are likely buy-and-hold investors that they will approach. For example, a healthcare company going public has as a natural buy-side clientele of mutual funds that already hold other healthcare companies.”

More recently, researchers have started to pay increasing attention to the quid pro quo view of allocations in which underwriters allocate underpriced shares to investors based on past and future commissions, or other trades (see Loughran and Ritter (2002, 2004)).

Investors who generate larger commission revenues are favored in allocations of deeply underpriced shares. Reuter (2006) tests the quid pro quo view and finds a strong positive correlation between brokerage commissions paid by mutual funds to a particular underwriter and their holdings of stock of a recently conducted IPO by that underwriter. Nimalendran, Ritter, and Zhang (2006) and Goldstein, Irvine, and Puckett (2008) find related evidence. We do not directly test the implications of the quid pro quo view, because of lack of data on brokerage relationships that exist between investors and investment banks.

3. Data and variables

We obtain our sample of U.S. IPOs for the period 1985-1999 from the Securities Data Corporation's (SDC) "New Issues Database." We fill in missing data on offer prices and shares offered, and correct offer dates by crosschecking the SDC data against Lexis/Nexis and the Securities and Exchange Commission's (SEC) Edgar database. We exclude equity carve-outs, filings by foreign-domiciled firms, IPOs with non-common shares, closed-end funds, REITs, IPOs with expected offer prices below \$5, and expected offering proceeds below \$1 million.

We require that IPOs be lead-managed by an underwriter listed in Table 1. These underwriters are among the most active debt and equity underwriters and have lead-managed at least 100 IPOs during our sample period. To construct this list, we begin with the list of most active underwriters in Ljungqvist, Marston, and Wilhelm (2006). Since banking industry has gone through substantial consolidation in the 1990s, we check various sources to compile merger histories of survivor banks and count the number of IPOs the banks or their predecessors lead managed. We drop three banks on the

Ljungqvist, Marston and Wilhelm list that have lead-managed fewer than 100 IPOs during our sample period. Column (1) of Table 1 lists the surviving banks at the end of 2000. In parentheses, we report the number of IPOs managed by the bank or its predecessor. Column (2) reports the effective date of bank mergers from Corwin and Schultz (2005). We supplement this information by reading business articles describing the mergers. All of the underwriters have a Carter-Manaster reputation rank of eight or higher.

The final sample comprises 2,557 IPOs during 1985-1999. The mean offering value is \$59.6 million (the median is \$37.4 million). The average underpricing is 23.6% (the median is 8.8%). About 41% of the IPOs are in technology industries, i.e., they belong to 3-digit SIC codes 283, 357, 366, 367, 381-384, or 737.

3.1 Reported holding as a proxy for allocation

As noted earlier, we use the first reported holding by an institutional investor at the end of the offering quarter as our proxy for the initial allocation that the institution received. Actual allocations are not publicly available so many of the previous studies use the reported holdings in the first quarter after the IPO to proxy for initial allocations.¹

Following earlier studies, we use the institutional holdings at least one month after the IPO. We find that institutional holdings for IPOs in the last month of a quarter are significantly lower than for IPOs in other months. Banerjee, Hansen and Hrnjic (2009) suggest that there may be a time lag in the reporting of holdings. Therefore, for IPOs in the last month of a quarter, we collect the institutional holdings in the next quarter.

¹ See, for example, Field and Lowry (2009), Boehmer, Boehmer and Fishe (2006), Banerjee, Hansen and Hrnjic (2006), Reuter (2006), and Ritter and Zhang (2007).

During our sample period, all institutional investors with more than \$100 million of securities under discretionary management file quarterly 13(f) reports, in which they list their common stock positions greater than 10,000 shares or \$200,000 in market value.

We obtain this 13(f) institutional ownership data from the CDA/Spectrum. Based on their ownership of shares in the offering quarter, we identify as “active” IPO investors those institutional investors that invest in at least 100 IPOs during the sample period. This selection procedure generates a list of 160 active IPO investors.

For each IPO, all active institutional investors that report holdings on CDA/Spectrum in the quarter of the IPO represent potential investors. A typical IPO has about 132 such potential institutional investors. Of these, a typical IPO has only about 17 active institutions actually receiving allocations (i.e., 11.7% of total institutions present at the time of offering) resulting in 40,887 allocations in 2,557 IPOs during 1985-1999. The 40,887 IPO allocations to active institutional investors represent 69% of all reported holdings of shares in the CDA/Spectrum for the IPOs in our sample, indicating that IPO investments by active investors capture a substantial portion of overall institutional investor allocations in IPOs. Conditional on the allocation, the average active institutional investor in an IPO holds 138.2 thousand shares (with a value of \$2.07 million based on the offer price), or about 3.2% of IPO shares offered. Taken together, these figures indicate that active investors hold about 53.7% of the shares in a typical IPO.

Studies that examine actual allocation data generally conclude that the first reported 13(f) holding is a reasonable instrument for institutional allocation. Hanley and Wilhelm (1995) report a 0.91 correlation between allocations and post-IPO reported holdings of institutional investors. Ritter and Zhang (2007) report significant correlations between the

initial allocations and actual reported holdings on the Spectrum database in 11 IPOs underwritten by Salomon Brothers/CitiGroup between June 1997 and January 2000.

One concern with the use of reported holdings is that aftermarket trading before the first filing of the 13(f) report could cause reported holdings at the end of the quarter to differ from the allocation. If institutional investors sell some of their allocation in the aftermarket or purchase additional shares in the first quarter, then their allocations will be different from their first reported holding. We expect this bias to be less severe if we use an indicator variable that captures whether institutions receive any allocations of IPO shares. For this indicator variable to be biased, investors must either flip all their shares in the immediate aftermarket or buy shares when allocated zero shares in the IPO before their first reporting date. Since book runners actively discourage flipping, it is unlikely that investors will immediately flip all their shares. It is also unlikely that investors who receive zero allocations will build a position in the stock immediately after issuance, because investors like to maintain a certain minimum holding in any stock (see Zhang (2004) and Ritter and Zhang (2007)) and it is costly to establish a large position without an initial allocation.

Although our main tests focus on the indicator variable that takes a value of one if the investor reports holdings of IPO shares at the end of offering quarter, we also present results that explore the allocation size. The allocation size measures the number of shares held by the investor at the end of the offering quarter. The results from these two alternative definitions of allocations are qualitatively similar.

3.2 Long-term holders

We identify long-term holders of IPO stocks based on changes in holdings of an investor's previous IPO allocations. If an investor's holdings in previous IPOs decline in the quarter following the IPO, then we consider that this investor is more likely to be a flipper. By contrast, if the holdings do not change or increase, then the investor is more likely to be a long-term holder of the stock.

For each potential investor, k , we measure the fractional change in this investor's holdings between the offering quarter and the next quarter for all previous IPOs completed during quarters -5 to -2 relative to the IPO under consideration. From this calculation, we exclude IPOs for which the investor reports zero holdings in the offering quarter. We estimate the fractional change in holding, $FracCHG_{i,k}$, as the change in investor k 's holding in IPO i between the offering quarter and the next quarter, divided by the shares held in the offering quarter. For each investor in a given IPO, we value-weight the fractional changes in holdings of all previous IPO during quarters -5 to -2 as follows.

$$CHGHOLD = \sum_{i=1}^I \frac{V_{i,k}}{\sum_{i=1}^I V_{i,k}} \times FracCHG_{i,k}, \quad (1)$$

where $V_{i,k}$ is the value of shares held by investor k in IPO i 's offering quarter. A positive value for $CHGHOLD$ suggests that the investor increases his holdings of IPO shares in the quarter after the offering and thus is likely to be a long-term holder of the stock. A negative value for $CHGHOLD$ suggests that the investor reduces holdings of allocated shares after the IPO and so is more likely to be a flipper.

3.3 Industry focus

The second investor characteristic we examine is the industry-focus of the investors. We ask if underwriters are more likely to allocate shares to institutional investors who have participated in previous IPOs in the same industry.

We measure industry focus as the frequency of investor k 's participation in IPOs in the same industry in the 90-day period leading up to the IPO under consideration. Thus,

$$Industry\ Focus = \frac{1}{M} \sum_{i=1}^M D_i, \quad (2)$$

where M is the number of IPOs in the same industry in the last 90 days before the IPO under consideration, and D_i is equal to one if an investor holds shares in IPO i . We define industry by using the classification in Fama and French (1997). The variable takes a value between zero and one. Higher values reflect the investor's stronger IPO experience in the industry.

3.4 Measuring relationships

The third investor characteristics examined in the study is the IPO relationship of investors with the underwriters. We define IPO relationships by whether an investor has participated in previous IPOs managed by the same underwriter. For each IPO, we classify active institutions as having an IPO relationship with the underwriter if the institution received an allocation in a previous IPO managed by the same underwriter during the previous 90 days relative to the IPO under consideration. We measure the strength of the relationship by the frequency of the investor's participation in the underwriter's IPOs. Thus, we estimate *Relationship* for an investor, k , in an IPO, i , managed by underwriter, j , as:

$$Relationship = \frac{1}{L} \sum_{i=1}^L D_i, \quad (3)$$

where L is the total number of IPOs lead-managed by underwriter j (including its predecessors) in the previous 90 days, and D_i equals one if investor k holds shares in IPO i . The *Relationship* variable takes a value between zero and one, with higher values representing stronger ties between the underwriter and the investor. If the underwriter did not manage an IPO within 90 days before the IPO, i , the variable takes a value of zero.

Although we focus on a 90-day window to measure recent IPO relationships, our results are robust to extending this period to a one- or a two-year window. The results are also robust to measuring relationships over past the past 20 IPOs made by the same underwriter.

3.5 Control variables

3.5.1 Industry IPO volume

The industry IPO volume variable measures the IPO activity in the industry of an IPO. We measure this variable by the natural logarithm of one plus the number of IPOs the same industry during the past 90 days. We control for IPO activity in the same industry because investors may prefer investing in IPO shares of a particular industry when the industry is hot.

3.5.2 Offer size

We control for offer size, since previous research suggests that institutional holdings tend to cluster in larger offerings (Dor (2004)). Institutions prefer larger IPOs, which might reflect institutional preferences for more liquid companies (Field and Lowry (2009)).

3.5.3 Relative offer size

Absolute relative offer size is a measure of offering size disparity. We define disparity at the investor level as the absolute deviation of the difference between the size of the IPO under consideration and the average size of IPOs in which the investor participated in the last 90 days. If investors prefer offerings of certain sizes, then they are less likely to participate in IPOs with larger absolute relative offer sizes. A negative coefficient on absolute relative offer size suggests that investors prefer similar sized offerings. This choice could be due to investment styles of investors (see Cronqvist and Fahlenbrach (2009)).

4. Empirical results

4.1 Descriptive Statistics

Figure 1 plots the time-series distribution of the number of IPOs and the average institutional investor holding as a percentage of total shares offered. The IPO activity over time shows the cyclicity of the IPO market. However, the figure shows that the institutional investor holding steadily increases over time. Active investors' holdings of IPOs in the offering quarter increased from an average of 25.2% in 1985 to 63.9% in 1999. Most of this increase occurred during the 1980s. This dramatic increase in institutional ownership of IPOs mirrors the general trend in institutional ownership in equity markets documented by Gompers and Metrick (2001). These authors show that institutional investors have doubled their share in the common stock market from 1980 to 1996.

Figure 2 plots the time-series distribution of filing sizes and underpricing. Both filing size and underpricing exhibit cyclicity similar to that observed for the IPO activity in

Figure 1. The average underpricing shows a huge jump in the late 1990s, which is consistent with severe underpricing of IPOs during the technology bubble. Loughran and Ritter (2004) document similar facts.

Panel A of Table 2 provides the descriptive statistics for the key variables. On average, about 42 firms go public each quarter. The IPO activity within an industry is highly clustered in time. For each IPO, we count the number of IPOs in the same industry offered during the previous 90 days. The distribution of this variable is highly skewed, with a mean of about nine IPOs and a median of about three, suggesting that there is a significant amount of industry clustering in IPO activity. About 41.3% of the IPOs are in technology industries. The average filing size is \$59.6 million (in constant dollars). The average underpricing over the entire period is 24%; the median is 9%. As reported earlier, the aggregate allocation to active investors averages about 53.6%. Due to our focus on active investors, this percentage is smaller than typical aggregate allocation to institutional investors. Hanley and Wilhelm (1995) report that institutional investors receive, on average, about 70% of total shares offered in IPOs. About 11.7% of active institutional investors receive allocations in a typical IPO.

Panel B provides the mean and median values of investor characteristics at the IPO-investor level for investors who receive a share allocation in a given IPO and for those who do not. We also report test statistics for the differences between the two groups.

The long-term investor measure, *CHGHOLD* averages about -6.5% for investors who receive allocations compared to -9.4% for investors who do not. The medians tell a similar story, i.e., investors who receive allocations in an IPO sold significantly fewer of their IPO shares in past IPOs compared to those investors who do not receive allocations.

These differences are consistent with underwriters making fewer allocations to investors who have flipped a bigger fraction of their previous IPO allocation.

The industry focus of an investor also substantially increases the likelihood of the investor receiving an allocation of IPO shares. Investors with allocated IPO shares show a significantly higher participation (22.4%) in industry IPOs in the previous 90 days compared to those that do not receive allocations (8.2%).

The results on past IPO relationships of investors who receive allocations compared to those who do not show that on average, institutional investors who receive allocations in an IPO also received allocations in about 27% of the previous IPOs managed by the *same* underwriter. By contrast, investors who do not receive IPO allocations participated in only 8.8% of the previous IPOs managed by the same underwriter over the same period. The patterns are robust to our choice of time windows for which we measure relationships.

In unreported results, we obtain similar results when we measure relationships during the last 360 days or the last 720 days, or in the past 20 deals. The differences in both means and medians are statistically significant at the 1% level. Further, they are consistent with the prediction that relationships matter in the allocation decisions of underwriters. The likelihood of an investor receiving IPO allocations is much higher if the he has an IPO relationship with the underwriter.

The last row of the table compares the log of the absolute relative offer size. We find that an investor is more likely to hold shares in an IPO whose filing size is close to the average filing size of other IPOs in which the investor participated. This suggests that investors have preferences for filing sizes.

4.2 Investor characteristics and the likelihood of allocation

Table 3 presents the probit estimates that relate allocations in IPOs to investor characteristics. The dependent variable is an indicator variable that takes a value of one if the investor received an allocation in the IPO, and zero otherwise. As noted above, we focus on three key institutional investor characteristics: long-term shareholder, industry focus, and the past IPO relationship with the underwriter. The regressions control for underpricing, industry IPO volume, log of absolute relative offer size, and log of offer size. The standard errors are heteroskedasticity-consistent and clustered at the IPO level.

In Table 3, Column (1) shows a positive and statistically significant coefficient on the *CHGHOLD* variable. The positive coefficient suggests that underwriters are more likely to allocate IPO shares to investors whose historical trading patterns for past IPO shares indicate that they have made fewer sales of previous IPO allocations.

The positive and statistically significant coefficient on the industry focus variable shows that underwriters also respond positively to the industry focus of institutional investors. Investors who have previously subscribed to IPOs in the same industry have a higher likelihood of receiving an allocation.

As argued earlier, the higher likelihood of IPO share allocations to industry-focused investors is consistent with both information theories and the underwriter preference for long-term holders. Investors with industry expertise are more likely to be buy-and-hold investors, and this may explain underwriters' preference for allocating shares to industry-focused investors. Alternatively, we can interpret this finding in the context of information theories, since the orders placed by investors who specialize in industry IPOs

may be more informative. The fact that industry-focused investors are more informed increases their likelihood of receiving IPO allocations.

The third investor characteristic is investors' past IPO relationships with underwriters. The positive and statistically significant coefficient on the relationship variable is consistent with our prediction that allocations to the investor are more likely if the investor has participated in previous IPOs managed by the underwriter. The greater the strength of the relationship between an investor and the underwriter, the higher is the likelihood of the investor receiving an IPO allocation.

The coefficient estimates on the control variables support our predictions. The negative coefficient on IPO volume suggests that in hot IPO markets, the likelihood of any particular institution receiving an allocation declines. During these periods, the intense competition among investors for IPO shares reduces the probability of an average investor getting an allocation. The log of absolute relative offer size is negative, suggesting that investors are less likely to hold shares in IPOs whose offer sizes deviate significantly from the average offer sizes of previous IPOs in which the investor participated. The positive coefficient on the natural logarithm of offer size suggests that institutions are more likely to receive allocations when offers are large.

Underwriters accumulate knowledge about an investor over multiple interactions with that investor, and it is likely that underwriters build relationships with long-term investors through repeated allocations. If knowledge about investors' past trading patterns helps underwriters discriminate between flippers and long-term investors, then they are more likely to allocate shares to those long-term investors with whom they have past IPO relationships.

To address the question of whether underwriters make greater allocations of IPO stocks to those investors with whom they have relationships, we use an additional interaction term between relationship and *CHGHOLD* variable and report these results in Table 3, Column (2). Consistent with a private information component in trading patterns of past IPOs, we find that the coefficient estimate on the interaction term between relationship and *CHGHOLD* is significantly positive, indicating that allocations are more likely when long-term investors have past IPO relationships with the underwriter.

Information theories predict that relationships with investors lower the costs of information production. These theories also predict that to generate stable purchases of stocks of different quality IPOs, underwriters will favor a regular clientele of investors in their allocation decisions. The argument, as in Benveniste and Spindt (1989), is that relationships between underwriters and regular investors smooth the demand for IPOs across both hot and cold periods. Thus, according to the book-building theory, allocations to investors with relationships to underwriters should be less sensitive to underpricing than are the allocations to investors with no relationships to underwriters.

The alternative view is that investors who frequently participate in IPOs managed by the underwriter have other brokerage relationships with the underwriter. If this is true, then the allocation likelihood would increase with underpricing for relationship investors. However, this interpretation is subject to the caveat that past IPO relationships with investors correlate with brokerage relationships. Further tests on these multiple views of the effect of relationships on allocation decisions are difficult because of lack of additional data on brokerage relationships.

To address the question of whether underwriters make greater allocations to relationship investors in IPOs that are more underpriced, we include an interaction term between the relationship variable and underpricing in the allocation regressions. The estimated coefficient on the interaction between underpricing and relationship is significantly positive, which is inconsistent with the book-building view of IPO allocations.

Investors' industry focus is likely to be more valuable in IPO allocations when the IPO firm exhibits greater relatedness with other firms in the industry. The relatedness of the IPO firm to other firms in the industry affects allocation decisions for two reasons. First, bids by industry-focused investors are more informative when the IPO firm and other firms are more closely related. The fact that industry-focused investors may also be more informed increases the likelihood of their receiving allocations in IPOs. Second, the closer the IPO firm is to other firms in the industry, the more likely it is that industry-focused investors will be buy-and-hold investors.

We measure industry relatedness by using the ex-post correlation between IPO returns and returns on a calendar-time, equally weighted portfolio of all other newly listed firms in the same industry as the IPO under consideration. The portfolio includes stocks that go public between day -252 and day -22 relative to the portfolio formation day.

Our first step is to obtain the model R^2 from a regression of IPO stock returns on the industry portfolio returns for the period beginning at offering day +22 and up to day +252. Our second step is to transform the R^2 to obtain the industry relatedness measure. We

define this measure as $\log \frac{R^2}{(1-R^2)}$. The measure captures the importance of industry-relevant information in stock prices compared to firm-specific information.

The regression estimates reported in Table 3, Column (2), include an interaction term between the industry focus of investors and the industry relatedness of the IPO. We find that this interaction is positive and statistically significant at the 0.1% level. This result suggests that allocations are indeed more sensitive to the industry focus of institutional investors when the IPO and other firms in the industry exhibit a high level of relatedness.

4.3 Investor characteristics and the size of the allocation

Table 4 presents results from Tobit models that examine the effect of investor characteristics on the size of the allocation. The dependent variable is the investor's holdings of IPO shares in the offering quarter, expressed as a fraction of the shares offered. The results from allocation size regressions are consistent with those in Table 3.

The results suggest that investors' holdings of IPO shares in the offering quarter are greater for longer-term investors. The industry focus variable also has a significant positive coefficient, which is consistent with larger allocations to investors who frequently participate in IPOs in the same industry. In addition, allocations to investors increase as the strength of the relationship between the investor and the underwriter increases.

Institutions receive larger allocations in underpriced IPOs. However, the sensitivity of allocation size to underpricing does not depend on the relationships that investors have with the underwriter. Similar to the results we reported earlier, we find that the effect of

industry focus on allocation size is greater when the IPO firm and other firms in the industry are closely related.

The signs and significance levels on coefficient estimates on other control variables are similar to those reported in Table 3. The allocation to any one particular institution gets smaller in hot IPO markets. Investors also have smaller holdings in IPOs whose offer sizes deviate from the average offer sizes of other IPOs in which they have recently participated. Finally, offer size positively affects allocation size.

5. Further Checks of Our Main Results

5.1 Aggregate institutional investment in IPOs

Here, we test the robustness of the results reported in Section 4 with data aggregated to the IPO level. We want to determine if aggregate institutional investor characteristics affect the allocations that they receive in IPOs.

The dependent variable is the total allocation to active institutional investors. We define this variable as the sum of shares allocated to active investors divided by the number of shares offered. The independent variables are the three average investor characteristics, underpricing, the natural logarithm of one plus the number of IPOs in the industry, and the natural logarithm of the absolute deviation of the offer size of this IPO relative to average offer size of the other IPOs bought by the investor in the past 90 days. These variables help us to examine if institutions receive greater allocations in the aggregate when they, as a group, have stronger relationships with underwriters, greater industry focus, and when a greater fraction of them are long-term shareholders.

Column (1) of Table 5 shows that an underwriter allocates a larger fraction of an IPO to active institutional investors when the investors have more frequently participated in

previous IPOs managed by the underwriter. The total allocations to institutions increase as the industry focus of investors increases.

Column (2) includes the average change in holdings of previous IPOs of all active investors. The coefficient estimate on the average *CHGHOLD* variable is positive and significant at the 0.1% level, suggesting that investors as a group receive higher allocations if a greater proportion of long-term investors participate in the IPO.

The results presented in Table 5 suggest that the aggregate level of relationships of investors with underwriters in past IPOs, the average industry focus of investors in past IPOs, and the history of trading of past IPO shares strongly affects the allocations they receive in the current IPO. Other results show that higher expected underpricing increases share allocations to institutions. The coefficient on IPO volume is not statistically significant, suggesting that contemporaneous IPO activity in the industry does not affect allocations to institutions. Also consistent with earlier results, we find that institutions receive larger allocations in larger offers, but the difference in offer size of this IPO from the offer sizes of past subscriptions of investors reduces the proportion allocated to them.

5.2 Alternative long-term investor and relationship variables

We construct two alternative measures of long-term investors. The first alternative variable is *HOLDPRD*, which is the average number of quarters for which an investor held allocations of previous IPOs. We construct this measure for each potential investor in an IPO by tracking the investor's holdings of IPO stocks in previous offerings during the quarters -8 to -5. We then record the number of quarters for which the investor continued to report nonzero holdings of the IPO shares. The variable *HOLDPRD* is the average holding period of previous IPOs to which the investor subscribed during the

quarters -8 to -5. We recode holding periods longer than four quarters as four quarters. As with the previous measures, a higher value of *HOLDPRD* implies that the investor is a long-term holder.

Second, we consider the classification of institutional investors as reported in Bushee (1998, 2001).² Bushee (1998) classifies institutional investors based on their expected investment horizons as transient, dedicated, or quasi-indexers. According to Bushee (1998), transient investors “... are characterized as having high portfolio turnover and highly diversified portfolio holdings. These traits reflect the fact that transient institutions tend to be short-term focused investors whose interest in the firm’s stock is based on the likelihood of short-term trading profits.” Dedicated institutions “... are characterized by large average investments in portfolio firms and extremely low turnover, consistent with a ‘relationship investing’ role and a commitment to provide long-term capital.” Quasi-indexers “... are characterized by low turnover, but they tend to have diversified holdings, consistent with a passive, buy-and-hold strategy of investing portfolio funds in a broad set of firm” (Bushee (2001). Therefore, we construct an indicator variable that takes a value of one if the investor is a dedicated investor or a quasi-indexer (*DED_QIX*).

Table 6 reports the correlations among the three alternative measures of long-term investors. All three measures exhibit strong positive correlations. The correlation between *CHGHOLD* and *HOLDPRD* is 0.32 and it is statistically significant at the 1% level. Similarly, the correlation between *HOLDPRD* and *DED_QIX* is 0.29 and that between *CHGHOLD* and *DED_QIX* is 0.14. Both of these correlations are also significant at the 1% level.

² We thank Brian Bushee for generously providing this data to us.

We test the validity of the three long-term investor measures by examining the persistence in investor trading of IPO allocations across different IPOs over time. An investor who is classified as a long-term investor based on previous IPOs should either maintain or increase shareholdings in future IPOs or sell fewer shares relative to other investors.

Table 7 examines the IPO holdings of short-term and long-term investors in the subsequent four quarters following the IPO. We define short-term and long-term investors based on the three measures discussed above. Panel A divides the sample into those that are transient ($DED_QIX=0$) and those that are long-term investors ($DED_QIX=1$). Only investors who hold shares are included in the analysis. For these two sub-samples, we report the fraction of investors who report zero holdings of IPO shares at the end of each of four consecutive quarters following the IPO. The data suggest that a larger percentage of short-term investors report zero holdings of IPO shares in the quarters following the IPO as compared to long-term investors. For example, at the end of the fourth quarter, 65% of investors classified as transient have zero holdings of IPO shares versus 46% for investors classified as long-term. Panels B and C examine sub-samples of short- and long-term investors classified based on *CHGHOLD* and *HOLDPRD*. Both of these measures also yield qualitatively similar conclusions.

Table 8 provides a similar analysis as Table 7 but focuses on change in aggregate shareholdings from IPO quarter to next four quarters following the IPO. Once again, we find that short-term investors consistently show negative change in aggregate shareholdings consistent with sale of shareholdings that investors obtained in the IPO offering. By contrast, long-term investors small positive changes in shareholdings

suggesting that long-term investor do not change or slightly increase their holdings of IPO shares in the period subsequent to IPO offering.

Overall, we find a significant amount of persistence in investor trading of IPO holdings. The propensity of investors to hold shares in the current IPO to the next quarter depends largely on how they traded allocations of shares in past IPOs.

Table 9 replicates regression specification reported in Table 3 by replacing *CHGHOLD* with either *HOLDPRD* or *DED_QIX* as a measure of long-term investors. These changes yields virtually identical results compared to Table 3. We find that the likelihood of share allocation is higher for dedicated institutions and quasi-indexers relative to transient investors. The allocation likelihood also increases with the length of the investor's past IPO allocations (*HOLDPRD*). In unreported tests, we find that both alternative measures of long-term investors increase the size of the allocation to investors. The coefficient estimates on all remaining variables are similar to those observed in Table 3.

Our results thus far suggest that long-term investors hold IPO shares over longer time-periods. An implication of this finding is that post-IPO stock volatility should be lower the greater the fraction of IPO allocated to long-term investors. Table 10 examines if allocation of shares to long-term investors is associated with lower stock return volatility of newly listed shares. The dependent variable is the natural logarithm of post-IPO stock return volatility, measured using daily stock returns from day +22 to day +252. We expect a negative relation between the allocation to long-term investors and post-IPO stock return volatility, as fewer investors flip their shares for short-term profits. Consistent with our expectation, the results show that the allocation to long-term

investors (as measured by *HOLDPRD* and *DED_QIX*) indeed reduces stock return volatility. The estimate on *CHGHOLD* as a measure of long-term investor has the expected negative sign but it is statistically insignificant.

5.3 Measuring investor characteristics using a longer time-series

The results presented in Section 3 use investor characteristics that rely on shorter-term investor holdings data for past IPOs. We now ask whether our results differ if we construct these investor characteristics using data for longer periods.

To answer this question we construct these investor characteristics by using alternative time windows. We re-estimate the relationship and industry focus variables over longer time windows, such as a 360-day window and a 720-day window, relative to the IPO under consideration. We also re-estimate the relationship measure using information about the underwriter's past 20 deals. Doing so has the advantage of measuring relationships over a fixed number of deals instead of over a fixed period. In unreported results, we find that the effects of investor characteristics on allocations are qualitatively identical to those reported earlier.

6. Conclusion

There is a growing recognition in the IPO literature that factors that relate to the features of investors are more important than bid characteristics in determining allocations. In this paper, we test if allocations of shares in IPOs to institutional investors relate to their reputation as a long-term holder of the IPO shares, their participation in past IPOs managed by the same underwriter, and their participation in previous IPOs in the same industry.

We find that allocations are larger and significantly more likely when investors are long-term stockholders. In addition, industry focus, as measured by the investor's participation in previous IPOs in the same industry, also increases the likelihood of allocation. The more related the IPO firm is to its industry peers, the greater is this sensitivity of allocation to industry expertise.

We also examine the effect of past IPO relationships on allocations of future IPOs. Our results show that underwriters more frequently allocate IPO shares and make larger allocations to institutions that have past relationships with the underwriter. However, information considerations are unlikely to be guiding allocations, because prior relationships increase the likelihood of allocation of more underpriced shares. This finding is contrary to the prediction of traditional book-building models.

Overall, our findings that underwriters favor long-term holders of stocks present a different view of IPO allocations than in recent studies that emphasize the quid pro quo considerations in allocation decisions. An additional contribution of the paper is to construct and validate measures of long-term investors that reflect investors' record of holdings of past IPO allocations. The evidence suggests that these investors exhibit persistence in the length of time over which they hold their allocations of IPO shares in multiple IPOs. In addition, allocation of shares to long-term investors is associated with a significant reduction in post-IPO return volatility of firms.

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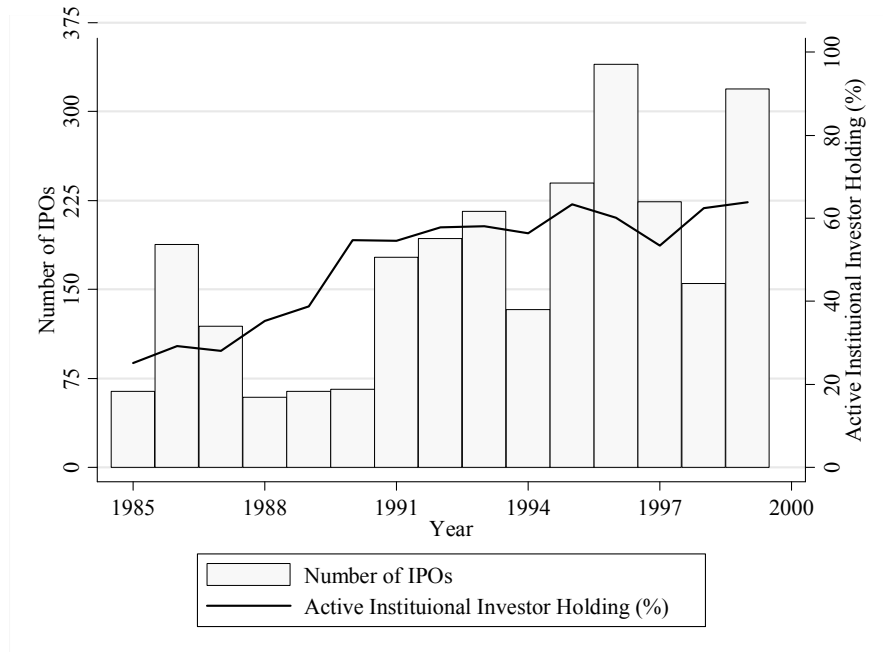


Fig. 1. Number of IPOs and active institutional investor holdings. The sample consists of 2,557 IPOs. *Filing size* is the size of offering implied by the proposed offer price and number of shares to be offered. We adjust offer price for inflation.

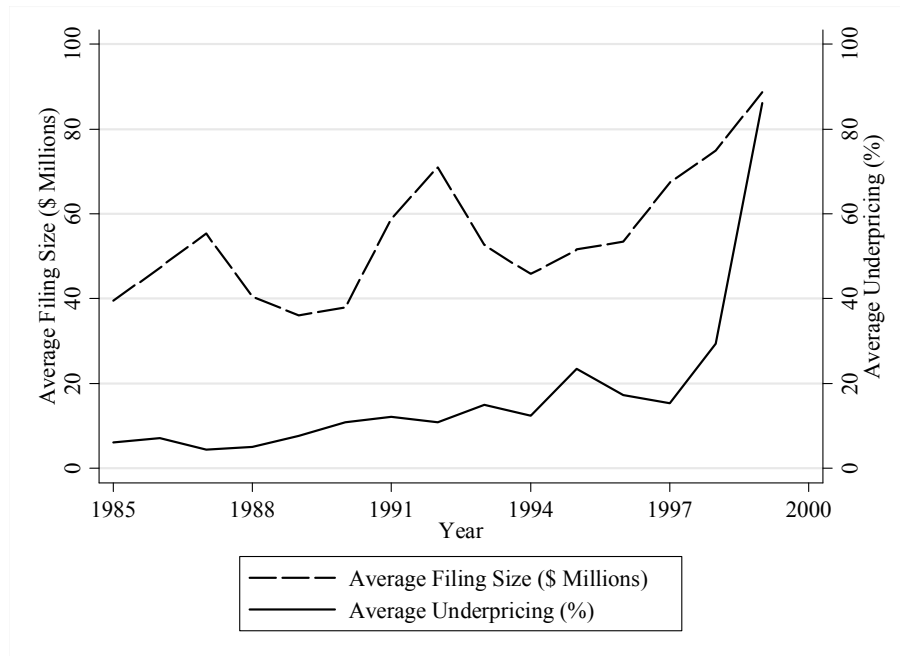


Fig. 2. Average filing size and average underpricing. *Underpricing* is the first-day return of IPO shares. *Active investor shareholding* is the number of shares held by active investors, divided by total shares offered.

Table 1
Major Bank Mergers in the Banking Industry

Surviving Bank	Effective date	Bidder	Target
(1)	(2)	(3)	(4)
Citigroup/Salomon Smith Barney (N=233)	19971128	Salomon Brothers	Smith Barney Inc
	19981008	Citicorp	Travelers / Salomon Smith Barney
	20000501	Citicorp / Salomon Smith Barney	Schroders-Worldwide Investment
Credit Suisse First Boston (N=286)	19881222	Credit Suisse	First Boston Corp
	20001103	Credit Suisse First Boston	Donaldson Lufkin & Jenrette
Lehman Brothers (N=133)			
Merrill Lynch & Co Inc (N=204)			
JP Morgan & Co (N=178)	19920326	Chemical Bank	Manufacturers Hanover Bank
	19960331	Chase Manhattan	Chemical Bank
	19991210	Chase Manhattan Corp	Hambrecht & Quist Group
	20001231	Chase Manhattan Corp	JP Morgan & Co
UBS Warburg (N=264)	19950131	PaineWebber	Kidder Peabody & Co Inc
	19950703	Swiss Bank Corp	SG Warburg Securities
	19970902	SBC Warburg (Swiss Bank Corp)	Dillon Read & Co
	19980629	Union Bank of Switzerland	Swiss Bank Corp
	20000612	PaineWebber Group, Inc	JC Bradford & Co
	20001103	UBS AG	Paine Webber Group, Inc
Deutsche Bank Securities (N=293)	19970902	Bankers Trust New York Corp	Alex Brown Inc
	19990604	Deutsche Bank AG	BT Alex Brown
Prudential Volpe (N=111)	19990731	Prudential Securities	Vector Securities Intl., Inc
	19991231	Prudential Securities	Volpe Brown Whelan & Co
Morgan Stanley Dean Witter (N=241)	19970531	Morgan Stanley Group, Inc	Dean Witter Discover & Co
Goldman Sachs & Co (N=193)			
Bear Stearns & Co Inc (N=94)			
Fleet/Boston Robertson Stephens (N=196)	19980202	Fleet Financial Group Inc	Quick & Reilly Group, Inc.
	19980901	BankBoston Corp	Robertson Stephens & Co
	19991001	Fleet Financial Group Inc	BankBoston Corp
Thomas Weisel Partners LLC (N=170)	19980921	Spun off from Montgomery Securities	

Notes: The table summarizes the major mergers and acquisitions in the banking industry. We select the sample banks by forming a union of two groups of banks: the sample of Ljungqvist, Marston, and Wilhelm (2006); and banks that act as the lead manager in at least 100 IPOs (including both completed and withdrawn). The first column shows the surviving banks as of the end of 2000, as well as the number of IPOs managed by it and its predecessors. The second column reports the effective dates of bank mergers obtained from Corwin and Schultz (2005), supplemented by other financial news sources. Columns (3) and (4) report the parties in a merger.

Table 2
Descriptive Statistics on IPO and Investor Characteristics

Panel A: Description of key IPO and investor characteristic variables

	N	Mean	10 th %ile	25 th %ile	Media n	75 th %ile	90 th %ile
Number of IPOs (by quarter)	60	42.2	10.5	20.0	41.0	59.5	84.0
Same-industry IPOs in past 90 days	2,557	8.6	0.0	1.0	3.0	8.0	27.0
Percent of IPOs in technology industries	2,557	41.3					
Underpricing (%)	2,519	23.6	-0.6	0.6	8.8	25.0	57.7
Filing size (\$ millions)	2,557	59.6	20.2	26.4	37.4	58.3	106.9
Percent of active investors with shares	2,557	11.7	3.5	6.3	10.3	15.7	22.2
Active investor shareholding (%)	2,557	53.6	15.8	31.9	51.2	69.6	87.6

Panel B: Tests for the difference in investor characteristics conditional on share allocation to investor

	Investors with allocated shares (N=40,887) (1)		Investors without allocated shares (N=302,684) (2)		(1)-(2) t-test on difference in mean	(1)-(2) z-test on difference in median
	Mean	Median	Mean	Median		
Relationship (%)	26.6	16.7	8.8	0.0	13.4***	140.4***
Industry focus (%)	22.4	9.1	8.2	0.0	12.1***	116.5***
CHGHOLD (%)	-6.5	-5.7	-9.4	-8.2	2.0**	18.4***
Ln Relative offer size	3.48	3.55	3.52	3.59	-2.1**	-6.1***

Notes: Our sample comprises 2,557 IPOs from 1985 to 1999. We infer initial allocations from Section 13(f) reported holdings by institutional investors at the end of the quarter in which IPO shares were offered. Panel A reports mean and median IPO and investor characteristics conditional on allocation. Panel B examine three investor characteristics: relationship, industry focus, and long-term IPO investor (*CHGHOLD*). The relationship variable measures the strength of an investor's IPO relationship with the underwriter as the frequency of the investor's participation in previous IPOs lead-managed by the underwriter in the previous 90 days. We measure the industry focus of an investor by the frequency of his participation in the same Fama-French industry IPOs in the previous 90 days. We identify long-term IPO investors by using a measure that reflects the historical holding patterns of allocated shares to investors in recent IPOs. The variable, *CHGHOLD*, measures if an investor increased or decreased holdings of shares in recent IPOs. For each potential investor, *k*, in a given IPO, we measure the fractional change in investor's holdings of shares between the offering quarter and the next quarter, for all previous IPOs, *I*, completed during quarters -5 to -2 relative to that particular IPO. We obtain summary statistics for each investor for a given IPO by value weighting the fractional changes in previous IPO holdings as follows,

$$CHGHOLD = \sum_{i=1}^I \frac{V_{i,k}}{\sum_{i=1}^I V_{i,k}} \times \text{FracCHG}_{i,k},$$

where $V_{i,k}$ is the value of shares held by investor *k* in IPO *i*'s offering quarter, and $\text{FracCHG}_{i,k}$ is the change in investor *k*'s holdings of IPO *i* between the offering quarter and the next quarter divided by the number of shares held in the offering quarter. We exclude IPOs for which the investor reports zero holdings in the offering quarter. The last two columns of Panel B report test statistics for the differences in mean and median investor characteristics across two groups of investors. The test statistics are corrected for clustering at the firm level. ***Significant at the 1% level. **Significant at the 5% level.

Table 3
Likelihood of Allocating Shares to Institutional Investors

	(1)	(2)
Relationship	1.004*** (0.020)	0.896*** (0.022)
Industry focus	0.854*** (0.025)	1.316*** (0.056)
CHGHOLD	0.051*** (0.007)	0.006 (0.008)
CHGHOLD \times Relationship		0.282*** (0.032)
Underpricing	0.173*** (0.020)	0.084*** (0.018)
Underpricing \times Relationship		0.244*** (0.044)
Industry relatedness		0.013*** (0.004)
Industry Focus \times Industry Relatedness		0.125*** (0.013)
IPO Volume	-0.029*** (0.006)	-0.046*** (0.006)
Log relative offer size	-0.058*** (0.004)	-0.056*** (0.004)
Log(offer size)	0.276*** (0.010)	0.277*** (0.009)
Constant	-2.220*** (0.040)	-2.139*** (0.043)
Pseudo R ²	0.104	0.111
N	277,696	266,660

Notes: In this table, the dependent variable is an indicator variable that is equal to one if an investor holds shares in an IPO at the end of the offering quarter, and zero otherwise. We measure *Relationship* and *Industry focus* over a 90-day window that ends on the offer date. IPO volume is the natural logarithm of (1+ the number of IPOs completed in the same industry). Offer size is the value of shares offered, equal to the number of shares offered (excluding over-allotments) times the offer price. Table 2 defines other variables. We report heteroskedasticity-consistent standard errors (clustered on deal id) in parentheses.
***Significant at the 0.1% level. **Significant at the 1% level.

Table 4
Allocation size

	(1)	(2)
Relationship	0.077 ^{***} (0.003)	0.075 ^{***} (0.003)
Industry focus	0.065 ^{***} (0.003)	0.094 ^{***} (0.005)
CHGHOLD	0.004 ^{***} (0.001)	0.002 ^{**} (0.001)
CHGHOLD× Relationship		0.008 ^{***} (0.002)
Underpricing	0.011 ^{***} (0.001)	0.008 ^{***} (0.001)
Underpricing× Relationship		0.002 (0.002)
Industry relatedness		0.001 ^{**} (0.000)
Industry focus× Industry relatedness		0.008 ^{***} (0.001)
IPO Volume	-0.003 ^{***} (0.000)	-0.004 ^{***} (0.000)
Log relative offer size	-0.005 ^{***} (0.000)	-0.005 ^{***} (0.000)
Log(offer size)	0.018 ^{***} (0.001)	0.018 ^{***} (0.001)
Constant	-0.180 ^{***} (0.008)	-0.174 ^{***} (0.009)
Pseudo R ²	0.284	0.299
N	277,696	266,660

Notes: The dependent variable is size of the allocation to an investor, which is equal to the shares of an IPO held by an investor at the end of the offering quarter divided by the number of shares offered. Tables 2 and 3 describe other variables. We report heteroskedasticity-consistent standard errors (clustered on deal id) in parentheses. ^{***}, ^{**}, ^{*}, and [#] denote significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

Table 5
Aggregate Institutional Investment in IPO

	(1)	(2)
Average Relationship	0.664 ^{***} (0.095)	0.660 ^{***} (0.095)
Average Industry focus	0.382 ^{**} (0.122)	0.380 ^{**} (0.121)
Average CHGHOLD		0.327 ^{***} (0.092)
Underpricing	0.055 ^{**} (0.019)	0.060 ^{**} (0.019)
IPO volume	0.004 (0.006)	0.002 (0.006)
Average Ln Relative offer size	-0.035 ^{***} (0.009)	-0.035 ^{***} (0.009)
Ln(Offer size)	0.053 ^{***} (0.008)	0.053 ^{***} (0.008)
Constant	0.315 ^{***} (0.033)	0.350 ^{***} (0.034)
Pseudo R-sq	0.250	0.262
N	2,519	2,519

Notes: The table presents Tobit models of the number of shares held by the active institutional investors as a percentage of number of shares offered on average investor characteristics and control variables. We average relationship, industry focus, and change in holding for individual investors to produce aggregate measures for an IPO. Tables 2 and 3 define the variables. We report robust standard errors corrected for heteroskedasticity in parentheses. ^{***}Significant at the 0.1% level. ^{**}Significant at the 1% level. ^{*}Significant at the 5% level.

Table 6
The correlations among different measures of long-term investors

	<i>DED_QIX</i>	<i>CHGHOLD</i>
<i>CHGHOLD</i>	0.14 ^{***}	
<i>HOLDPRD</i>	0.29 ^{***}	0.32 ^{***}

Notes: The table reports correlation coefficients among the four long-term investor variables at the IPO-investor level. *DED_QIX* is a dummy variable for dedicated investors or quasi-indexers as constructed by Bushee (2001). The variable, *CHGHOLD*, measures if an investor increased or decreased holdings of shares in recent IPOs. For each potential investor, *k*, in a given IPO, we measure the fractional change in investor's holdings of shares between the offering quarter and the next quarter, for all previous IPOs, *I*, completed during quarters -5 to -2 relative to that particular IPO. We obtain summary statistics for each investor for a given IPO by value weighting the fractional changes in previous IPO holdings as follows,

$$CHGHOLD = \sum_{i=1}^I \frac{V_{i,k}}{\sum_{i=1}^I V_{i,k}} \times \text{FracCHG}_{i,k},$$

where $V_{i,k}$ is the value of shares held by investor *k* in IPO *i*'s offering quarter, and $\text{FracCHG}_{i,k}$ is the change in investor *k*'s holdings of IPO *i* between the offering quarter and the next quarter divided by the number of shares held in the offering quarter. We exclude IPOs for which the investor reports zero holdings in the offering quarter. *HOLDPRD* measures investor *k*'s average holding period of IPOs offered during quarter -8 and quarter -5 relative to the IPO in concern. We assume a holding period longer than four quarters to be four.

Table 7
The aggregate trading behavior of institutional investors from quarter 0 to quarter 4

	$ALLsold_{i,1}$	$ALLsold_{i,2}$	$ALLsold_{i,3}$	$ALLsold_{i,4}$
<i>Panel A: Long-term investor based on DED_QIX</i>				
$DED_QIX = 0$	0.35	0.49	0.58	0.65
$DED_QIX = 1$	0.23	0.34	0.41	0.46
<i>Panel B: Long-term investor measure based on CHGHOLD</i>				
$CHGHOLD \leq 0$	0.31	0.45	0.53	0.59
$CHGHOLD > 0$	0.23	0.33	0.39	0.45
<i>Panel C: Long-term investor measure based on HOLDPRD</i>				
$HOLDPRD \leq 2$	0.35	0.49	0.58	0.64
$HOLDPRD > 2$	0.23	0.33	0.40	0.46

Notes: We classify investors as either long-term or short-term investors according to the three long-term investor measures. Only investors with a positive holding of IPO shares at the end of quarter 0 are included. An investor is classified as long-term investor if he has (1) $DED_QIX = 1$, (2) $CHGHOLD > 0$, or (3) $HOLDPRD > 2$. $ALLsold_{i,t}$ equals one if an investor i reports zero holdings of shares at quarter t . It is zero otherwise. We report averages.

Table 8
Percentage change in aggregate shareholdings of IPO holdings of active institutions investors from quarter 0 to quarter 4

Investor type	Long-term investor measure	$ChgShare_1$	$ChgShare_2$	$ChgShare_3$	$ChgShare_4$
Short-term	$DED_QIX=0$	-0.18	-0.23	-0.29	-0.35
Long-term	$DED_QIX=1$	-0.02	0.02	0.04	0.02
Short-term	$CHGHOLD \leq 0$	-0.14	-0.19	-0.24	-0.29
Long-term	$CHGHOLD > 0$	0.05	0.11	0.15	0.14
Short-term	$HOLDPRD \leq 2$	-0.19	-0.25	-0.30	-0.34
Long-term	$HOLDPRD > 2$	0.02	0.05	0.08	0.05

Notes: We aggregate holdings of IPO shares for each investor group classified by long-term investor measure. We then estimate $ChgShare_t$ as the percentage change in aggregate shareholdings from quarter 0 to quarter t . Thus, $ChgShare_t = (shares_t - shares_0)/shares_0$, where $shares_0$ is the number of shares held in quarter 0 and $shares_t$ is the number of shares held in quarter t . We winsorize the values at the 0.5th and 99.5th percentiles and report averages..

Table 9
The Effects of Alternative Measures of Long-term Investors on Allocation Decision

	(2)	(3)
Relationship	0.993*** (0.020)	1.002*** (0.020)
Industry focus	0.839*** (0.025)	0.852*** (0.025)
<i>HOLDPRD</i>	0.052*** (0.004)	
<i>DED_QIX</i>		0.053*** (0.007)
Underpricing	0.170*** (0.020)	0.174*** (0.020)
IPO volume	-0.028*** (0.006)	-0.028*** (0.006)
Log relative offer size	-0.056*** (0.004)	-0.058*** (0.004)
Log(offer size)	0.276*** (0.010)	0.276*** (0.010)
Constant	-2.334*** (0.041)	-2.257*** (0.040)
Pseudo R ²	0.104	0.105
N	267271	276605

Notes: In this table, the dependent variable is an indicator variable that is equal to one if an investor holds shares in an IPO at the end of the offering quarter, and zero otherwise. We measure *Relationship* and *Industry focus* by the frequency of investor participation in IPOs over a period that starts 90 days before the offer date and ends on the offer date. We use two alternative long-term investor measures. (1) *HOLDPRD*, measures investor *k*'s average holding period of IPOs offered during quarter -8 and quarter -5 relative to the IPO in concern. We assume a holding period longer than four quarters to be four. (2) *DED_QIX* is a dummy variable for dedicated investors or quasi-indexers as constructed by Bushee (2001). Relative offer size for investor *k* is the absolute value of the difference between the IPO size and investor *k*'s average deal size during the past 90 days. We winsorize this variable at the 0.5th and 99.5th percentiles. IPO volume is the natural logarithm of (1+ the number of IPOs completed in the same industry). Offer size is the value of shares offered, equal to the number of shares offered (excluding overallotments) times the offer price. Tables 2 and 3 define other variables. We report heteroskedasticity-consistent standard errors (clustered on deal id) in parentheses. ***Significant at the 0.1% level. **Significant at the 1% level.

Table 10
Allocation to long-term investors and post-IPO stock return volatility

	(1) Long-term investors DED_QIX = 1	(2) Long-term investors CHGHOLD > 0	(3) Long-term investors HOLDPRD > 2
Allocation to long-term investors	-0.076*** (0.028)	-0.035 (0.028)	-0.094*** (0.029)
Average underpricing in the offering month	0.666*** (0.029)	0.669*** (0.029)	0.664*** (0.029)
Log (1+number of IPOs in the offering month)	0.089*** (0.009)	0.088*** (0.009)	0.088*** (0.009)
Log (filing size)	-0.072*** (0.011)	-0.073*** (0.011)	-0.073*** (0.011)
Venture backed dummy	0.097*** (0.015)	0.098*** (0.015)	0.097*** (0.015)
Constant	-3.219*** (0.044)	-3.246*** (0.042)	-3.205*** (0.044)
Pseudo R-sq	0.447	0.446	0.448
N	2457	2457	2457

Note: The dependent variable is the natural logarithm of daily stock return volatility, measured from day +22 to day +252 post-IPO. We define allocation to long-term investors as the ratio of the number of shares allocated to long-term investors as a fraction of the total shares allocated to all “active” investors (estimated by holdings at the end of quarter 0). Industry dummies are included but not reported. *** Significant at the 1% level.