The Role of Institutional Investors in Initial Public Offerings

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In this article, we use a large sample of transaction-level institutional trading data to analyze the role of institutional investors in initial public offerings (IPOs). The theoretical literature on IPOs has long argued that institutional investors possess private information about IPOs and that underpricing is a mechanism for compensating them to reveal this private information. We study whether institutions indeed have private information about IPOs, retain their information advantage in post-IPO trading, and are able to realize significant profits from their participation in IPOs. We also study institutional IPO allocations and allocation sales to analyze whether institutions play an important role in supporting IPOs in the aftermarket and are rewarded by underwriters for playing such a role. We find that institutions sell 70.2% of their IPO allocations in the first year, fully realize the "money left on the table," and do not dissipate these profits in post-IPO trading. Further, institutions hold allocations in IPOs with weaker post-issue demand for a longer period, and they are rewarded for this by underwriters with more IPO allocations. Finally, institutional trading has predictive power for long-run IPO performance, especially in IPOs in which they received allocations; however, this predictive power decays over time. Overall, our results suggest that institutional investors possess significant private information about IPOs, play an important supportive role in the IPO aftermarket, and receive considerable compensation for their participation in IPOs. (*JEL* G32, G14, G24)

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1. Introduction

Starting with the Rock (1986) model, institutional investors have played an important role in the theoretical literature on the pricing and allocation of initial public offerings (IPOs). Rock (1986) argues that these institutional investors with private information about the true long-run value of the shares of firms going public bid only on undervalued shares, leaving retail investors with a disproportionate share of overvalued IPOs. Thus, in the Rock (1986) setting, IPO underpricing is a mechanism to mitigate the adverse selection faced by retail investors, ensuring that they do not withdraw from the IPO market. A second strand of the literature is the bookbuilding literature (e.g., Benveniste and Spindt 1989), which builds on the Rock (1986) assumption of informed institutional investors, and argues that the IPO bookbuilding process is a mechanism for extracting information from these institutional investors in order to use it to price shares in the IPO at the appropriate level. In their setting, underpricing is a means of compensating these institutional investors for truthfully revealing all value-relevant information useful in pricing shares in the IPO. A third strand of the literature (e.g., Chemmanur 1993) views underpricing as a way of inducing information production by institutional and other investors about the firm going public. This information is reflected in the secondary market price of the firm's equity as a result of post-IPO trading by these informed investors, moving it closer to the firm's intrinsic value.[1]

Motivated by the above theoretical literature, in this article we address the following empirical questions for the first time in the literature. First, do institutional investors really have private information about IPOs? Further, if indeed they possess private information, is all their value-relevant information incorporated into the IPO offer price, or are institutional investors left with residual information that they can profitably use in post-IPO trading? Second, are institutional investors able to realize significant profits from their participation in IPOs, thus getting compensated for the role they play in the IPO process, as postulated by the bookbuilding literature? While it has been documented (see, e.g., Aggarwal, Prabhala, and Puri 2002; Hanley and Wilhelm 1995) that institutional investors receive significant allocations in underpriced IPOs (where a considerable amount of money is "left on the table"), the ability of institutions to fully realize this money left on the table has not been studied. A related question is whether, even if institutions realize superior profits from selling their IPO allocations, they dissipate these profits (partially or fully) in post-IPO trading.[2]

[1] See Ritter and Welch (2002) for an excellent review of related theoretical and empirical literature on IPOs.

[2] This question has become particularly important in light of allegations of "laddering," where institutions precommit to the underwriter to buy additional shares of equity in IPO firms in the secondary market, in exchange for receiving larger IPO allocations in these firms (see, e.g., Susan Pulliam and Randall Smith, "Trade-offs: Seeking IPO shares, investors offer to buy more in after-market," *Wall Street Journal*, December 6, 2000). In their theoretical model, Fulghieri and Spiegel (1993) argue that investment banks may use share allocations in

Third, how do institutions sell their IPO share allocations? While the selling of IPO allocations by institutions in the short run has been studied (e.g., Aggarwal 2003; Boehmer, Boehmer, and Fishe 2006), institutional selling of allocations beyond the immediate post-IPO period has not been analyzed. An interesting new hypothesis that we are able to test here is regarding the interaction between underwriters and institutional investors in IPOs. In particular, we study whether institutions play an important role in supporting IPOs in the aftermarket by holding those IPOs with weaker post-issue demand for a longer period, and whether underwriters in turn reward institutions that play such a supporting role by giving them larger allocations in the IPOs underwritten by them. Underwriters may find it advantageous to develop such an implicit arrangement with institutional investors, since they not only have to purchase and sell the shares of the firm going public in the IPO but, in most cases, also have to make a market in the firm's equity once trading begins in the secondary market (see, e.g., Ellis, Michaely, and O'Hara 2000). Underwriters may be particularly concerned about investors in IPOs with weaker post-issue demand selling their shares into an aftermarket with few buyers, thereby pushing down the price.[3]

Finally, our institutional trading data allow us to examine how institutions trade the shares of IPO firms differently from those in seasoned firms. In particular, do institutions hold shares in IPOs for a longer or a shorter period than in seasoned firms? Are the amounts invested by institutions in the two kinds of stock significantly different from each other? Answering the above questions allows us to determine the point of time after the IPO at which recent IPOs become seasoned stocks from an institutional investors' perspective.

We answer the above questions in reverse order, and organize our empirical analysis into four parts. First, we study the pattern of institutional sales of their IPO allocations over the long run post-IPO. We test the implications of the hypothesis discussed earlier—namely, that underwriters penalize those institutions that flip cold IPOs by giving them smaller IPO allocations. Here we also compare institutional trading in IPOs with that in the equity of a matched sample of seasoned firms. Second, we analyze the realized profitability of these institutional IPO allocation sales. This allows us to assess the extent of compensation that institutions actually receive for their participation in IPOs. Third, we examine the profitability of post-IPO institutional trading

underpriced IPOs to reward institutional investors in return for fees from other (non-underwriting) businesses. See also Loughran and Ritter (2002) for a similar argument.

[3] Analyzing the institutional selling of allocations is also important from the point of view of establishing the amount of profits realized by institutions from their participation in IPOs. In particular, while institutional investors can fully realize all the money left on the table if they are able to sell their entire IPO allocation at the first-day closing price, it is well known that underwriters actively discourage them from doing so using various mechanisms; for example, penalty bids or reducing future IPO allocations (Ritter and Welch 2002; Loughran and Ritter 2004). Clearly, if institutions cannot sell their allocations immediately after the IPO, then their realized profits may be significantly lower than the money left on the table, since IPOs underperform in the long run (see, e.g., Ritter 1991; Ritter and Welch 2002).

(i.e., profits from buying and selling shares in the secondary market alone). Fourth and finally, we analyze the relation between institutional trading and subsequent long-run IPO performance. The latter two parts of our study allow us to answer the questions discussed earlier regarding the nature of the private information held by institutional investors.

We make use of a large sample of proprietary transaction-level institutional trading data to answer the above questions. Our sample includes transactions from January 1999 to December 2004 originated from 419 different institutions with total annualized principal traded of $4.4 trillion. For an average IPO, our sample institutions collectively account for 11.2% of total trading volume reported in the Center for Research in Security Prices (CRSP) within the first year post-IPO. With this dataset, we are able to track institutional trading in 909 IPOs from January 1999 to December 2003 for one full year post-IPO. We identify IPO allocation sales and separate institutional IPO trading into two categories—namely, institutional IPO allocation sales and post-IPO institutional trading. This allows us to analyze them separately. Further, in order to infer institutional IPO allocations, we identify a subset of our sample institutions by matching with the Spectrum quarterly institutional holdings data.[4] For these identified institutions, we are able to compute their IPO allocations by combining our institutional trading data with quarterly holdings data reported by them. Therefore, we use the subsample of these identified institutions to study the long-run pattern and realized profitability of institutional IPO allocation sales (the first and second parts discussed above) and use all our sample institutions to study the profitability of post-IPO institutional trading and the predictability of institutional trading in IPOs (the third and fourth parts discussed above).

We present a number of new results on IPOs and institutional trading. In the first part of our analysis, we document the pattern of institutional IPO allocation sales over the long run post-IPO. We find that flipping during the first two trading days post-IPO constitutes 21.8% of their IPO allocations, similar to the findings in the prior literature. We present the first evidence in the literature on how institutions sell their IPO allocations in the long run. Within the first year, institutions sell 70.2% of their IPO allocations. In other words, institutions continue to sell significant portions of their IPO allocations beyond the immediate post-IPO period. Institutional IPO allocation sales drop sharply after month 1, and there is no spike in month 2, after underwriters stop monitoring investors' flipping activities, which usually occurs at the end of month 1. We interpret this result as evidence that underwriters' monitoring mechanism for flipping does not appear to be very binding for institutions. However, the

[4] Though the number of identified institutions is relatively small, they are larger on average and collectively account for 8.7% of total trading volume reported in CRSP within the first year post-IPO. In other words, these 48 identified institutions account for 77.7% (8.7% / 11.2%) of trading in IPOs done by all our 419 sample institutions. Therefore, we do not lose much information by conducting our study of IPO allocations and allocation sales using the subsample of these 48 identified institutions.

fact that institutions are able to sell a significant portion of their allocations in the first month post-IPO may also be because institutions are able to hide their allocation sales by splitting their orders; we also find that institutions split their orders to a greater extent in the first month of trading post-IPO. Institutions hold their IPO allocations for 9.65 months on average. We find that institutions sell hotter (more underpriced) IPOs, IPOs with high pre-issue demand, younger IPOs, high-tech IPOs, IPOs with lockup provisions, and IPOs with poorer long-run performance faster.

Our analysis of institutional IPO allocations and allocation sales finds considerable support for the hypothesis that institutions play an important role in supporting IPOs in the aftermarket and underwriters reward institutions who play such a supportive role with more IPO allocations. In particular, we find that institutions that hold their IPO allocations for a longer period are rewarded with more allocations. Further, when we decompose institutional IPO allocation holding periods into those in hot versus cold IPOs, we find that only institutional holding periods in cold IPOs matter in determining institutional IPO allocations. Our earlier finding that institutions hold their IPO allocations in colder IPOs for a longer period is also consistent with the above hypothesis.

Our analysis of institutional trading in IPO firm equity versus that in the equity of a matched sample of seasoned firms reveals that institutions trade much more actively in IPO stocks than in matched seasoned stocks (as measured by the turnover rate) in the immediate post-IPO period. However, institutional trading activity in IPO stocks declines gradually over time, until it becomes similar to that in seasoned stocks by the end of the seventh quarter post-IPO.

In the second part of our analysis, we study the *realized* profitability of institutional IPO allocation sales, using actual transaction prices and incorporating both trading commissions and implicit trading costs. We document that institutional IPO allocation sales are highly profitable and institutions fully realize the money left on the table for their IPO allocations, both before and after accounting for risk factors. Sample institutions were able to realize 73.7% in terms of raw returns and 67.0% in terms of abnormal returns on their IPO allocation sales. By selling their IPO allocations, sample institutions collectively made $10.3 billion in raw profits and $9.4 billion in abnormal profits.

In the third part of our analysis, we study the profitability of post-IPO trading by institutional investors. Post-IPO institutional trading outperforms a buy-and-hold investment strategy in IPOs, suggesting that institutions continue to possess private information about IPO firms even after the IPO. Institutions are able to outperform more when there is higher information asymmetry about the IPO firm—namely, in younger-firm IPOs and IPOs underwritten by less reputable investment banks. However, institutions' post-IPO trading does not outperform or underperform the market in general. When we split our sample

depending on whether or not an institution participated in the IPO allocation, we find that participating institutions outperform nonparticipating ones significantly in post-IPO trading. This is consistent with the information advantage of institutional investors arising primarily from their participation in the IPO allocation process.

In the fourth and final part of our analysis, we study the predictive power of institutional trading on subsequent long-run IPO performance. We document that institutional trading has predictive power for subsequent long-run IPO performance, even after controlling for publicly available information. When we separately examine trading by institutions that participate in an IPO's allocation with that by institutions that did not, we find that only trading by participating institutions has predictive power for subsequent long-run performance. This is again consistent with the information advantage of institutions arising primarily from their participation in the IPO allocation process. However, the predictive power decays over time, becoming insignificant after the initial three to four months. After a company goes public, it has to make a significant amount of information publicly available (e.g., audited financial statements), which reduces outsiders' cost of information production. Therefore, our results suggest that institutions have a greater information advantage over retail investors when the cost of producing information is higher—i.e., during the immediate post-IPO period. Institutions gradually lose their information advantage as more and more information about the IPO firm becomes publicly available.

Our article considerably enhances our understanding of the role of institutional investors in IPOs. Our results indicate that, consistent with information production theories, institutional investors are able to generate superior information about IPOs. We document that, as assumed by Rock (1986), institutional investors possess an information advantage over retail investors, enabling them to select better-performing IPOs. We further show that institutional investors are able to realize significant abnormal profits from IPO allocations. In particular, they are able to fully realize the money left on the table for their IPO allocations. We are also able to demonstrate that institutions play an important role in supporting IPOs in the aftermarket by holding allocations in IPOs with weaker post-issue demand for a longer period; underwriters, in turn, reward institutions that play such a supporting role by giving them more IPO allocations. Overall, we show that institutional investors receive considerable compensation for participating in IPOs, broadly consistent with the implications of bookbuilding theories (e.g., Benveniste and Spindt 1989).

The fact that institutional trading in the months after the IPO has predictive power for subsequent long-run IPO returns indicates that institutional investors retain a residual information advantage over retail investors even after the IPO. Thus, while underpricing indeed seems to be a way of compensating institutions for revealing their private information as predicted by bookbuilding theories, our results indicate that institutions do not reveal their entire private

information at the time of the IPO. Consistent with this, the post-IPO trading of institutions is able to outperform a naïve buy-and-hold strategy in IPOs, so that the superior profits institutions generate from their IPO allocation sales are not dissipated in post-IPO trading (allowing institutions to extract informational rents overall from investing in IPOs). Our findings that both the outperformance of post-IPO institutional trading and the predictive power of institutional trading for subsequent long-run returns arise primarily from their trading in IPOs in which they received allocations suggest that institutions' information advantage is due to their participation in the IPO bookbuilding process.

The remainder of this article is organized as follows. Section 2 briefly reviews related literature. Section 3 describes our sample and presents summary statistics. Section 4 presents our results on the pattern of institutional IPO allocations and allocation sales, and compares institutional trading in IPOs with that in matched seasoned stocks. Sections 5 and 6 present our results on the profitability of institutional IPO allocation sales and post-IPO trading, respectively. Section 7 presents our results on the relation between institutional trading and subsequent long-run IPO performance. Section 8 concludes.

2. Related Literature

Krigman, Shaw, and Womack (1999) show that first-day block sales can predict long-run IPO performance. Our result on the predictive power of the first two days of institutional trading is thus consistent with theirs. However, there are important differences between our study and that of Krigman, Shaw, and Womack (1999), and we extend their long-run post-IPO return predictability results in several directions. First, in addition to institutional trading immediately after IPOs, we study the predictive power of subsequent institutional trading (up to one year post-IPO), and find that institutions' predictive power early on diminishes over time. Second, unlike their study, which infers institutional flipping by identifying block sales in the Trade and Quote (TAQ) data, we use transaction-level institutional trading data that include the direction of each trade. It is widely known that the algorithm for inferring trade direction, while useful, is far from perfect. Third, we are able to study institutional trading even when their trades are not blocks, and we find that even trades from small institutions have some predictive power. This is especially relevant given recent developments in trading such as program trading and decimalization, which have caused dramatic reductions in institutional trade sizes. Fourth, instead of flipping alone, we study institutional net buying (buying minus selling) in IPOs and thus provide a more complete picture.[5]

[5] See also Field and Lowry (2005), who find, using quarterly institutional holdings data, that IPOs with higher institutional ownership soon after the offering date have better long-run returns. Our results suggest that one reason underlying this could be that institutions sell more IPOs with worse long-run performance and buy more IPOs with better long-run performance.

Aggarwal (2003) studies IPO allocation and immediate flipping over the first two days after the IPO.[6] Boehmer, Boehmer, and Fishe (2006) study the relation between IPO allocation, flipping, and long-run IPO performance. Ellis, Michaely, and O'Hara (2000) and Ellis (2006) study aftermarket trading by market makers in IPOs.[7] While these papers focus on trading in the immediate post-IPO period (flipping), we characterize the pattern of institutional IPO allocation sales over the long run.

3. Data and Summary Statistics

3.1 Institutional Trading Sample

We obtain proprietary transaction-level institutional trading data from the Abel/Noser Corporation, a leading execution quality measurement service provider for institutional investors. The data are similar in nature to those used by several other studies on institutional trading—for example, Keim and Madhavan (1995), Conrad, Johnson, and Wahal (2001), Jones and Lipson (2001), Irvine, Lipson, and Puckett (2007), Goldstein, Irvine, Kandel, and Wiener (2009), and Lipson and Puckett (2010).[8] This is the first article to use institutional trading data to study institutional investors' trading behavior in IPOs.

The data cover equity trading transactions by a large sample of institutions from January 1999 to December 2004. Institutions subscribe to Abel/Noser's services to monitor and potentially reduce their trading costs. Abel/Noser provides all its institutional trading data to us. There is no obvious reason that this sample would bias our inferences regarding the role of institutional investors in IPOs in any systematic way. For each transaction, the data include the date of the transaction, the stock traded (identified by both symbols and CUSIPs), the number of shares traded, the dollar principal traded, commissions paid by the institution, and whether it is a buy or sell by the institution. The data are provided to us under the condition that the names of all institutions are removed from the data. However, identification codes are provided enabling us to separately identify all institutions. Sample institutions are either investment managers or plan sponsors. Investment managers are mutual fund families such as Fidelity Investments, Putnam Investments, and Lazard Asset Management. Examples of pension plan sponsors include the California Public Employees' Retirement System (CalPERS), the Commonwealth of Virginia, and United Airlines.

[6] There is a significant literature on IPO share allocation; see, e.g., Cornelli and Goldreich (2001) and Ljungqvist and Wilhelm (2002), who study share allocation in bookbuilding IPOs.

[7] See also Griffin, Harris, and Topaloglu (2007), who study trading by clients through the lead underwriter immediately after an IPO, and investigate the reason for the predominance of buys over sells in such trading.

[8] The Abel/Noser Corporation has made their data available to us and other academic researchers. For example, Goldstein, Irvine, Kandel, and Wiener (2009) and Lipson and Puckett (2010) also use the Abel/Noser data. Other papers cited above use similar proprietary institutional trading data provided by the Plexus Consulting Group.

Since we continuously track post-IPO trading for one full year, an institution has to have trading data for at least 13 consecutive months in order to be included in our sample. For example, in order for an institution to be included for January 1999 IPOs, the institution needs to have some trading data (in any stock, not just IPOs) in every month from January 1999 to January 2000.[9] Also, sample institutions must have traded in at least one sample IPO within the first year post-IPO. Four hundred nineteen sample institutions satisfy the above criteria. The total annualized dollar principal traded is $4.4 trillion, the total annualized number of shares traded is 147.7 billion, and the total annualized commissions paid is $5.4 billion. For an average IPO, our sample institutions collectively account for 11.2% of total trading volume reported in CRSP within the first year post-IPO.

3.2 Identifying Institutions and Their IPO Allocations

In order to infer institutional IPO allocations, we identify a subset of our sample institutions by matching with the Spectrum quarterly institutional holdings data. We first compute the change in the number of shares in each stock for each institution in the Spectrum quarterly institutional holdings data. We also compute the cumulative trading (buying minus selling) of each stock for each institution in our anonymous institutional trading data. We then identify our sample institutions by matching the two datasets based on quarterly holding changes and quarterly cumulative trading.[10] We are able to identify 48 institutions using this method.[11]

Though the number of identified institutions is relatively small, they are larger on average. For example, the average annualized dollar principal traded is $10.5 billion for all institutions and $52.6 billion for identified institutions. These identified institutions collectively account for 8.7% of total trading volume reported in CRSP within the first year post-IPO. In other words, these 48 identified institutions account for 77.7% (8.7% / 11.2%) of trading in IPOs done by all our 419 sample institutions. Therefore, we do not lose too much information by conducting our study of IPO allocations and allocation sales using the subsample of these 48 identified institutions.

For these identified institutions, we are able to compute their IPO allocations by combining our institutional trading data with quarterly holdings data

[9] This restriction is imposed so as to ensure data integrity. Conversations with our data provider reveal that most institutions provide their trading data to our data provider on a monthly basis. Sometimes, an institution may miss one or more months of data. Institutions may also come in or out of the trading data when they start or terminate our data provider's services.

[10] A similar matching procedure is employed by Hu, Ke, and Yu (2010).

[11] Please see Appendix A for details of the matching of the Abel/Noser database with the Spectrum 13f database and for some reasons why we are able to identify only a fraction of the institutions in the Abel/Noser database.

reported by them in the Spectrum 13f database. IPO allocation for a given institution is computed as the sum of the institution's holdings in the IPO firm in the first 13f filings following the IPO and the net sales by the institution in the IPO firm between the IPO date and the date of its first 13f filing following the IPO. We use the subsample of these identified institutions to study the pattern of institutional IPO allocations and the pattern and profitability of their IPO allocation sales.

3.3 IPO Sample

We first identify all IPOs conducted in the U.S. markets from January 1999 to December 2003 using the Securities Data Company (SDC) new issues database. This time period is chosen because the institutional trading data are from January 1999 to December 2004, and we track institutional IPO trading for one year post-IPO. We exclude certificates, ADRs, shares of beneficial interest, units, closed-end funds, REITs, IPOs with an offer price less than $5, and IPOs not found in CRSP. 990 IPOs satisfy the above criteria. We compute book equity for each IPO using COMPUSTAT data.[12] Eleven IPOs with missing book equity are excluded. Further, since we continuously track institutional IPO trading for one year post-IPO, we also exclude 45 IPOs that are delisted within the first year post-IPO in CRSP.

Our initial sample consists of 934 IPOs from January 1999 to December 2003. Summary statistics of these IPOs can be found in Table 1. The mean *IPO Initial Return*, measured from the offer price to the first-day closing price, is 54.9%. The total *Money Left on the Table*, defined as *Offer Proceeds* multiplied by *Initial Return*, is $51.93 billion. Table 1 also reports summary statistics of IPOs traded by all institutions and those traded by identified institutions. IPOs traded by all institutions are those traded by our 419 sample institutions within the first year post-IPO, and IPOs traded by identified institutions are those traded by our 48 identified institutions within the first year post-IPO. Of the IPOs, 909 out of 934 are traded by sample institutions, whereas 888 IPOs are traded by identified institutions. Since the subsamples of IPOs not traded by institutions are very small, compared with the initial sample IPOs, IPOs traded by all institutions and IPOs traded by identified institutions have very similar characteristics. Table 1 further partitions the 888 IPOs traded by identified institutions into hot versus cold IPOs using the median *Initial Return* of 25% as the cutoff. As expected, most *Money Left on the Table* comes from hot IPOs. Hot IPOs appear to have greater offer proceeds. The difference in offer proceeds between hot and cold IPOs is significant in the median tests. Hot IPOs also have worse long-run performance than cold IPOs (the differences in means are not statistically significant, but the differences in medians are).

[12] For a detailed definition of book equity, please see Ken French's website.

Table 1
Summary Statistics of IPO Sample

	Initial Sample IPOs	IPOs Traded by All Institutions	IPOs Traded by Identified Institutions			
			All IPOs	Hot IPOs	Cold IPOs	Test Equality
Number of IPOs	934	909	888	441	447	
Offer Price ($)						
Mean	14.69	14.87	15.01	16.68	13.37	(< 0.001) * **
Median	14.00	14.00	14.00	16.00	13.00	(< 0.001) * **
Shares Offered (million)						
Mean	7.16	7.31	7.41	5.78	9.02	(< 0.001) * **
Median	4.61	4.70	4.79	4.49	5.00	(< 0.001) * **
Total	6, 690.30	6, 643.13	6, 581.77	2, 549.66	4, 032.11	
Offer Proceeds ($ million)						
Mean	119.34	122.11	124.38	111.70	136.89	(0.170)
Median	65.42	67.20	68.06	72.00	61.60	(0.038) * *
Total	111, 461.80	111, 002.10	110, 448.82	49, 260.64	61, 188.18	
Initial Return (%)						
Mean	54.85	56.25	57.40	110.65	4.86	(< 0.001) * **
Median	23.29	24.43	25.00	76.67	3.13	(< 0.001) * **
Money Left on the Table ($ million)						
Mean	55.59	57.13	58.48	109.71	7.94	(< 0.001) * **
Median	16.50	18.65	19.81	61.19	1.69	(< 0.001) * **
Total	51, 925.71	51, 932.91	51, 928.01	48, 380.64	3, 547.37	
1-Year Raw Return (%)						
Mean	−8.69	−8.27	−7.78	−14.09	−1.55	(0.134)
Median	−41.36	−41.18	−40.69	−58.20	−24.94	(< 0.001) * **
1-Year Abnormal Return (%)						
Mean	−15.08	−14.65	−13.84	−18.81	−8.94	(0.208)
Median	−41.24	−40.68	−40.33	−48.30	−26.98	(< 0.001) * **

This table presents summary statistics of the IPO sample. Sample mean, median, and in some cases total are presented. Initial sample IPOs are those conducted in the U.S. markets from January 1999 through December 2003, identified using the Securities Data Company (SDC) data. Certificates, ADRs, shares of beneficial interest, units, closed-end funds, REITs, IPOs with an offer price less than $5, and IPOs not found in CRSP are excluded. Further, we exclude IPOs with missing book equity data in COMPUSTAT and IPOs that are delisted within the first year. *IPOs Traded by All (Identified) Institutions* refer to those traded by all (identified) sample institutions within the first year. *Shares Offered* and *Offer Proceeds* are those offered in the U.S. markets. *Initial Return* is the IPO return from the offer price to first-day closing price. *Money Left on the Table* is defined as *Offer Proceeds* multiplied by *Initial Return*. *1-Year Raw Return* is the raw buy-and-hold return measured from the closing price of the first trading day to trading day 252. *1-Year Abnormal Return* is the difference between *1-Year Raw Return* and the matched Fama/French 25 size and book-to-market portfolio buy-and-hold value-weighted return. We partition *IPOs Traded by Identified Institutions* into hot versus cold IPOs using the median *Initial Return*. The last column tests the significance of the differences in the means and medians between the two groups. *P*-values, which are in parentheses, are based on *t*-tests for the difference in means and the Mann-Whitney tests for the difference in medians. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Throughout this article, we examine hot versus cold IPOs for most of our results.

3.4 Identifying Institutional IPO Allocation Sales

In order to study the long-run pattern and realized profitability of institutional IPO allocation sales, we need an algorithm to separate an institution's allocation sales from its buying and selling of IPO shares in the secondary market post-IPO. Simply put, the basic idea behind our algorithm is that, at any point

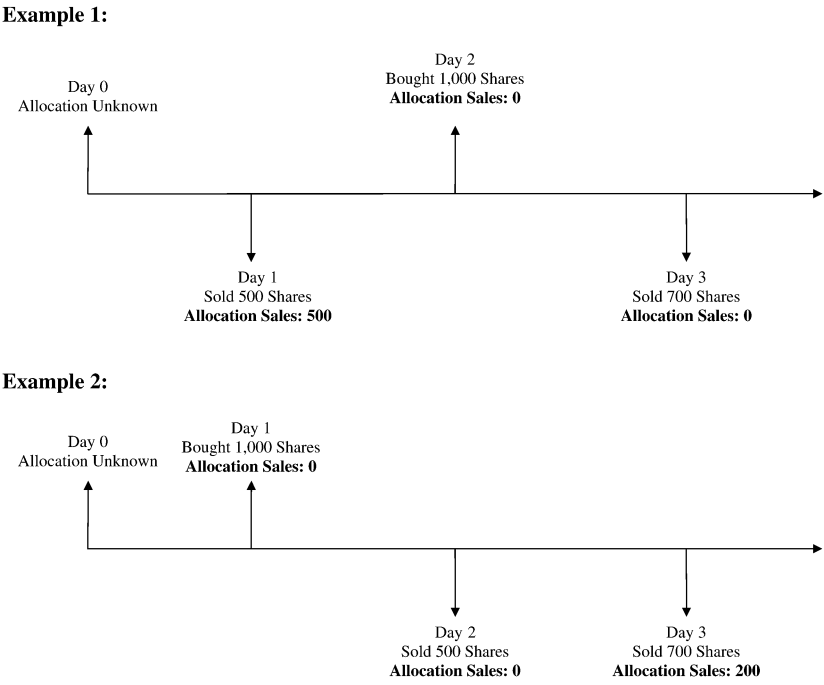

Figure 1
Numerical examples of algorithm for identifying institutional IPO allocation sales

of time post-IPO, when shares sold exceed shares bought until that time, these shares sold are classified as allocation sales. Figure 1 presents two simple numerical examples of our algorithm. Our algorithm is conservative in nature in that shares bought in the secondary market are used to offset shares sold first, so that only shares sold in excess of shares bought until that point in time are considered IPO allocation sales. This is consistent with the rules used by the Depository Trust Company's (DTC) IPO Tracking System. See Appendix B for details of this algorithm. By identifying IPO allocation sales, we effectively separate institutional IPO trading into two categories: IPO allocation sales and post-IPO trading. We then proceed to analyze them separately.

4. The Pattern of Institutional IPO Allocation and Allocation Sales

In this section, we study the pattern of institutional IPO allocation and allocation sales. We then proceed to examine the determinants of institutional IPO allocation holding periods and institutional IPO allocations, and we also compare institutional trading in IPOs with that in a matched sample of seasoned stocks. As mentioned earlier, we use the subsample of identified institutions to analyze these questions.

4.1 The Pattern of Institutional IPO Allocations

Table 2 reports summary statistics of IPO allocations on the institution level. Table 2, Panel A, summarizes the number of allocations and the average size of an allocation that the average institution receives. Specifically, the average institution receives 101 allocations (out of 888 IPOs). The average size of an allocation for the average institution is $5.4 million and is almost 1% of the offering. Panel A further partitions the 888 IPOs into hot and cold IPOs. Perhaps not surprisingly, the average institution seems to participate more in hot IPOs. For the average institution, the probability of receiving an allocation is 15.9% in hot IPOs versus 8.7% in cold IPOs. The average size of an allocation in hot IPOs, however, appears smaller than that in cold IPOs. For example, the median allocation as a fraction of offer proceeds is 0.3% in hot IPOs, whereas that in cold ones is 0.6% (the difference is insignificant).

Panel B of Table 2 partitions the sample of identified institutions into quartiles based on the number of allocations they receive during the entire sample period. While the average institution in the top quartile participates in 345.3 IPOs, that in the bottom quartile participates in only 2.7 IPOs. Moreover, the average institution in the top quartile receives significantly larger allocations than that in the bottom quartile (1.5% of an offer and $13.8 million per allocation versus 0.3% and $0.9 million). Institutions that participate in more IPOs tend to be larger institutions. In particular, the annual dollar principal traded by the average institution in the top quartile is $140.1 billion, whereas that by the average institution in the bottom quartile is only $5.6 billion.

4.2 The Pattern of Institutional IPO Allocation Sales

Table 3 reports results on the pattern of IPO allocation sales by identified sample institutions. *Fraction of Offer* refers to IPO allocations received by identified sample institutions divided by total IPO offer proceeds. Note that our sample institutions are a subset of the universe of institutional investors. Our identified sample institutions receive 12.7% of allocations per IPO on average, higher than their trading in IPOs (8.7%, as mentioned earlier). They also receive higher allocations in hot IPOs (15.3% for hot IPOs versus 10.6% for cold IPOs). This is consistent with Aggarwal, Prabhala, and Puri (2002) and Hanley and Wilhelm (1995), who show that institutions receive higher IPO allocations than do retail investors, especially in hotter IPOs.

Table 3 divides the first year post-IPO into 13 trading periods. *First 2-Day* refers to the first two trading days post-IPO. Month 1 through Month 12 each have 21 trading days (Month 1 includes *First 2-Day*). Table 3 presents the percentage of IPO allocations sold during each trading period. Aggarwal (2003) analyzes the flipping in the first two days post-IPO and finds that institutions flip about 25.8% of shares allocated to them. She concludes that original investors hold on to their shares for the most part, and she conjectures that this may be due to the fact that underwriters actively monitor and discourage

Table 2
Summary Statistics of IPO Allocations on Institution Level

Panel A: IPO Allocations for Identified Institutions, Partitioned by Initial Return

	All IPOs	Hot IPOs	Cold IPOs	Test Equality
Number of IPOs	888	441	447	
Number of Allocations				
Mean	101	70	39	(0.128)
Median	20	10	12	(0.604)
Allocation Frequency (%)				
Mean	11.40	15.89	8.70	(0.121)
Median	2.25	2.27	2.68	(0.770)
Fraction of Offer (%)				
Mean	0.96	0.85	1.04	(0.481)
Median	0.46	0.31	0.64	(0.204)
Allocation Dollar Value ($ million)				
Mean	5.41	4.95	5.55	(0.816)
Median	1.31	0.61	1.57	(0.030) ∗ ∗

Panel B: IPO Allocations for Identified Institutions, Partitioned by Number of Allocations Received by Institutions

	Very Low # of Allocations	Low # of Allocations	High # of Allocations	Very High # of Allocations	Test Equality
Number of Allocations					
Mean	2.73	10.83	37.67	345.33	(0.001) ∗ ∗∗
Median	2.00	11.50	39.50	345.50	(< 0.001) ∗ ∗∗
Allocation Frequency (%)					
Mean	0.31	1.22	4.24	38.89	(< 0.001) ∗ ∗∗
Median	0.23	1.30	4.45	38.91	(< 0.001) ∗ ∗∗
Fraction of Offer (%)					
Mean	0.34	0.95	0.97	1.53	(0.034) ∗ ∗
Median	0.22	0.27	0.71	0.94	(0.015) ∗ ∗
Allocation Dollar Value ($ million)					
Mean	0.89	1.77	4.81	13.82	(0.031) ∗ ∗
Median	0.66	1.02	1.24	5.46	(0.002) ∗ ∗∗
Annual Dollar Principal Traded					
Mean	5,619.18	34,475.79	30,594.43	140,088.89	(0.062)∗
Median	1,919.47	5,728.07	14,343.51	29,200.51	(< 0.001) ∗ ∗∗

This table presents summary statistics of IPO allocations on the institution level for identified institutions. Sample mean and median are presented. The sample of IPOs is restricted to those traded by identified institutions. Panel A partitions the IPO sample into hot and cold IPOs. Panel B partitions institutions into quartiles based on the number of allocations they receive during the sample period. The last column in each panel tests the significance of the differences in the means and medians between the two extreme groups (hot versus cold IPOs and top versus bottom quartile in number of allocations). *Number of Allocations* is the number of allocations an institution receives during the sample period from January 1999 through December 2003. *Allocation Frequency* is the frequency of allocations an institution receives during the same period. *Fraction of Offer* is the average relative size of an IPO allocation an institution receives, calculated as shares allocated divided by shares offered. *Allocation Dollar Value* is the average principal value of an institutional IPO allocation. *Annual Dollar Principal Traded* is the annualized dollar value of principal traded by institutions. *P*-values, which are in parentheses, are based on *t*-tests for the difference in means and the Mann-Whitney tests for the difference in medians. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

short-term flipping. We are able to shed additional light on this issue, since we study the pattern of IPO allocation sales in the long run after the IPO. A related question is whether (and to what extent) institutions are able to realize the *Money Left on the Table*, since it is also well known that IPOs tend to underperform in the long run (e.g., Ritter 1991; Ritter and Welch 2002). We answer this question in Section 5.

Table 3
Pattern of Institutional IPO Allocation Sales

	All IPOs				
	Mean	Median	Hot IPOs	Cold IPOs	Test Equality
Number of IPOs	888		441	447	
Fraction of Offer (%)	12.68	10.77	15.32	10.55	(0.001) * **
First 2-Day (%)	21.80	12.14	26.78	15.98	(0.004) * **
Month 1 (%)	33.39	27.45	38.93	26.91	(0.009) * **
Month 2 (%)	3.79	0.75	4.39	3.09	(0.140)
Month 3 (%)	3.11	0.31	3.12	3.08	(0.966)
Month 4 (%)	2.84	0.07	1.94	3.88	(0.143)
Month 5 (%)	2.29	0.01	2.04	2.58	(0.433)
Month 6 (%)	3.01	0.14	2.26	3.89	(0.075)*
Month 7 (%)	4.97	0.01	5.20	4.70	(0.881)
Month 8 (%)	3.83	0.00	2.85	4.98	(0.495)
Month 9 (%)	2.61	0.00	1.82	3.54	(0.091)*
Month 10 (%)	2.40	0.00	2.88	1.84	(0.332)
Month 11 (%)	4.83	0.00	5.75	3.76	(0.570)
Month 12 (%)	3.17	0.00	3.13	3.22	(0.931)
Total Year 1 (%)	70.24	83.01	74.31	65.47	(0.200)
Average Holding Period (months)	9.65	7.91	8.62	10.87	(0.083)*

This table presents results on the pattern of IPO allocation sales by identified sample institutions. We partition IPOs traded by identified institutions into hot and cold IPOs based on the median initial return. *Fraction of Offer* is IPO allocations received by identified sample institutions divided by total IPO offer proceeds. The first year (252 trading days) post-IPO is divided into 13 trading periods. *First 2-Day* refers to the first two trading days post-IPO. Month 1 through Month 12 each consist of 21 trading days (Month 1 includes *First 2-Day*). For each trading period, this table presents the dollar-value-weighted percentage of IPO allocations sold during that period. *Average Holding Period* is the value-weighted average number of trading days (divided by 21 to arrive at months) that sample institutions hold their IPO allocations. For residual allocations held at the end of the first year, we impute an additional holding period of one year by institutions, since the average holding period by institutions for common stocks is about one year (Investment Company Institute 2004). The last column tests the significance of the differences in the means, with *p*-values in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

We find that our sample institutions flip 21.8% of IPO allocations within the first two days post-IPO. Our results further suggest that institutions continue to sell significant portions of their IPO allocations after the immediate two days post-IPO: 48.4% for the rest of the first year (70.2% – 21.8%). Thus, at the end of the first year, institutions hold only 29.8% of their IPO allocations.

An interesting question is whether underwriters' mechanism for monitoring flipping activities is a binding constraint on institutions. If so, IPO allocation sales should be abnormally high in Month 2, because the practice is to track IPO flipping for 30 calendar days. However, we do not observe a spike in IPO allocation sales in Month 2. Allocation sales in Month 2 are much lower than in Month 1 and are similar to those in subsequent months. These findings, combined with the fact that the first two days represent the most intensive period for allocation sales, suggest that underwriters' mechanism for monitoring flipping may not be very binding for institutional investors. (See, however, our discussion below on the splitting of orders by institutions.) Table 3 further partitions the sample IPOs traded by identified institutions into hot versus cold IPOs. Hot IPO allocations are sold much faster than those of cold IPOs (26.8% versus 16.0% for First 2-Day and 38.9% versus 26.9% for Month 1; these differences

are statistically significant). These results suggest that underwriters discourage flipping more actively in cold IPOs.[13]

To characterize the overall holding period of institutional IPO allocations, we compute the *Average Holding Period*, which is the value-weighted average number of trading days (divided by 21 to arrive at months) sample institutions hold their IPO allocations. For residual allocations held at the end of the first year, we impute an additional holding period of one year by institutions, since the average holding period by institutions for common stocks is about one year (Investment Company Institute 2004). We find that institutions hold their IPO allocations for 9.65 months on average. They hold cold IPOs longer; the *Average Holding Period* is 10.87 months for cold IPOs versus 8.62 months for hot IPOs.

A related question regarding institutional allocation sales is whether institutions split their orders of allocation sales more in the month immediately following the IPO, potentially to hide their trades from the underwriter. Table 4 reports results on institutional IPO allocation sales on the transaction level. We construct three trade size measures. *Trade Size (Share Volume)* is the number of shares traded in an allocation sale. *Trade Size (Dollar Volume)* is the dollar principal traded in an allocation sale. *Share Volume as a Fraction of Offer* is *Share Volume* divided by shares offered. Table 4, Panel A, shows the results for all IPOs. We find that institutional investors do split their orders to a greater extent in the first month. For example, the median trade size in the first month immediately after an IPO is 500 shares, whereas that in the second month is 1,600 shares. The difference is statistically significant. Results using the other two trade size measures are similar. The above results indicate that one reason why institutions are able to flip a significant portion of their allocations in the first month post-IPO is that institutions are able to avoid detection of their flipping by underwriters by splitting their orders to a greater extent during this period.[14] Another potential interpretation of this result is that in the first month, a large fraction of the trading comes from retail investors who buy from institutions, which explains the small trade size. If the small trade size is driven mainly by retail investors, trade size in the first month post-IPO should be smaller in hot IPOs for which retail investors are more likely to trade. To test this, we further partition the sample into hot and cold IPOs and compare institutional trading size in the first month post-IPO (see Table 4, Panel B). The results show that first-month trade size is significantly smaller in hot IPOs than in cold IPOs, which seems to be consistent with the retail trader interpretation—namely, that retail investors trade hot IPOs more. Panels C and D of Table 4 show institutional trading size for the first 12 months for hot and

[13] The results are unchanged if we define hot and cold IPOs by splitting the sample into more than two groups based on initial returns.

[14] We thank an anonymous referee for suggesting that we perform this analysis of the splitting of orders by institutional investors when flipping their allocations.

Table 4
Summary Statistics for Institutional IPO Allocation Sales on Transaction Level

Panel A: Institutional IPO Allocation Sales on Transaction Level for All IPOs

	Total Number of Trades	Trade Size (Share Volume)		Trade Size (Dollar Volume)		Share Volume as a Fraction of Offer (%)	
		Mean	Median	Mean	Median	Mean	Median
Month 1	69,447	3,323.50	500.00	99,953.56	15,159.25	0.05	0.01
Month 2	4,387	5,730.04	1,600.00	175,162.25	43,572.50	0.09	0.03
Month 3	2,699	7,800.65	1,800.00	225,142.39	46,125.00	0.13	0.04
Month 4	1,956	9,679.98	2,500.00	263,269.41	62,517.39	0.12	0.04
Month 5	1,801	8,383.04	2,400.00	234,986.09	49,223.34	0.10	0.03
Month 6	2,095	10,070.06	2,108.00	292,531.89	57,881.25	0.12	0.03
Month 7	2,591	13,399.16	2,080.00	421,369.90	57,762.50	0.14	0.02
Month 8	1,620	18,557.28	2,100.00	573,249.07	40,227.91	0.18	0.03
Month 9	1,931	8,969.12	2,163.00	254,636.48	48,144.06	0.13	0.03
Month 10	1,842	9,694.62	2,282.00	252,490.20	28,004.90	0.15	0.03
Month 11	1,759	15,361.10	2,500.00	415,498.58	59,625.00	0.20	0.02
Month 12	1,648	14,801.23	3,202.00	409,105.03	63,302.72	0.22	0.05
Test Equality							
Month 1 vs. Month 2		(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗
Month 1 vs.Months 2 thru 12		(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(0.405)	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗

Panel B: Institutional IPO Allocation Sales on Transaction Level in Month 1: Hot vs. Cold IPOs

	Total Number of Trades	Trade Size (Share Volume)		Trade Size (Dollar Volume)		Share Volume as a Fraction of Offer (%)	
		Mean	Median	Mean	Median	Mean	Median
Hot IPOs	54,445	2,380.60	400.00	93,671.62	14,694.56	0.04	0.01
Cold IPOs	15,002	6,745.45	1,000.00	122,751.89	17,150.93	0.07	0.01
Test Equality							
Hot vs. Cold		(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗

(*continued*)

Table 4
Continued

Panel C: Institutional IPO Allocation Sales on Transaction Level for Hot IPOs

	Total Number of Trades	Trade Size (Share Volume)		Trade Size (Dollar Volume)		Share Volume as a Fraction of Offer (%)	
		Mean	Median	Mean	Median	Mean	Median
Month 1	54,445	2,380.60	400.00	93,671.62	14,694.56	0.04	0.01
Month 2	2,758	4,832.43	1,300.00	206,077.99	48,048.27	0.09	0.02
Month 3	1,719	5,627.18	1,300.00	246,917.38	45,014.08	0.11	0.03
Month 4	1,077	6,365.24	2,200.00	242,480.67	75,666.60	0.11	0.04
Month 5	1,078	6,039.55	1,700.00	249,923.56	51,404.05	0.08	0.03
Month 6	1,053	7,936.99	1,900.00	333,293.86	55,343.75	0.14	0.04
Month 7	1,766	10,804.25	1,800.00	424,654.04	55,159.98	0.12	0.02
Month 8	958	11,872.98	2,300.00	480,351.61	50,556.15	0.22	0.04
Month 9	653	8,827.83	2,000.00	318,537.97	83,413.40	0.17	0.05
Month 10	837	12,884.39	2,300.00	404,575.29	35,638.04	0.21	0.05
Month 11	931	13,473.75	2,659.00	550,502.11	105,112.00	0.18	0.01
Month 12	767	17,373.30	4,932.00	607,828.00	122,711.41	0.32	0.10
Test Equality							
Month 1 vs. Month 2		(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗
Month 1 vs. Months 2 thru 12		(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗	(< 0.001) ∗ ∗∗

(*continued*)

Table 4
Continued

Panel D: Institutional IPO Allocation Sales on Transaction Level for Cold IPOs

	Total Number of Trades	Trade Size (Share Volume)		Trade Size (Dollar Volume)		Share Volume as a Fraction of Offer (%)	
		Mean	Median	Mean	Median	Mean	Median
Month 1	15,002	6,745.45	1,000.00	122,751.89	17,150.93	0.07	0.01
Month 2	1,629	7,249.74	2,219.00	122,819.93	36,425.00	0.09	0.03
Month 3	980	11,613.08	3,200.00	186,947.27	52,015.94	0.15	0.05
Month 4	879	13,741.40	3,000.00	288,740.94	52,210.00	0.12	0.03
Month 5	723	11,877.19	3,600.00	212,714.19	47,467.08	0.12	0.03
Month 6	1,042	12,225.65	2,600.00	251,339.62	61,497.76	0.09	0.02
Month 7	825	18,953.86	2,900.00	414,339.84	62,080.95	0.18	0.03
Month 8	662	28,230.34	1,895.00	707,683.77	30,576.74	0.14	0.03
Month 9	1,278	9,041.31	2,200.00	221,985.71	37,225.00	0.11	0.02
Month 10	1,005	7,038.06	2,200.00	125,828.28	23,054.46	0.10	0.03
Month 11	828	17,483.23	2,400.00	263,701.12	32,406.43	0.23	0.04
Month 12	881	12,561.99	2,400.00	236,096.50	31,444.36	0.13	0.03
Test Equality							
Month 1 vs. Month 2		(0.272)	(< 0.001) * **	(0.993)	(< 0.001) * **	(< 0.001) * **	(< 0.001) * **
Month 1 vs. Months 2 thru 12		(0.065)*	(< 0.001) * **	(0.009) * **	(< 0.001) * **	(< 0.001) * **	(< 0.001) * **

This table presents results on the pattern of IPO allocation sales by identified sample institutions on the transaction level. Sample means and medians are presented. Panel A presents results for all IPOs during the first 12 months post-IPO. Panel B compares institutional trading size in hot versus cold IPOs in the first month post-IPO. Panels C and D present results for institutional trading size in the first 12 months post-IPO in hot and cold IPOs, respectively. *Total Number of Trades* is the total number of transactions of allocation sales by identified sample institutions. *Trade Size* (*Share Volume*) is the number of shares traded in an allocation sale. *Trade Size* (*Dollar Volume*) is the dollar principal traded in an allocation sale. *Share Volume as a Fraction of Offer* is *Share Volume* divided by shares offered. The last two rows test the significance of the differences in the means and medians between the first month and the second month, and those between the first month and the rest of the year, respectively. *P*-values, which are in parentheses, are based on *t*-tests for the difference in means and the Mann-Whitney tests for the difference in medians. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

cold IPOs, respectively. Consistent with the order-splitting hypothesis, we find that even for cold IPOs, trade size by institutions is significantly smaller in the first month than in other months following the IPO. This result suggests that institutions do split orders when flipping their IPO allocations in order to hide their trades from the underwriter (even in IPOs where retail buying is weak). Given that larger orders are easier to detect, one would expect that splitting orders would make such detection harder (see Aggarwal 2003 and Boehmer, Boehmer, and Fishe 2006 for details on how underwriters monitor flipping).

Our unique dataset also enables us to compare the investment and trading behavior of institutional investors in IPO stocks versus seasoned stocks. For each IPO stock in our sample, we pick a matched firm that is in the same industry (same first 2 digits of SIC code) and year, traded on the same exchange, has been listed for at least three years, and has the closest market equity in the year pre-IPO. Institutional turnover of a stock in a quarter is calculated as the sum of institutional buys and sells divided by 0.5 times the sum of institutional holdings of the stock at the start of the quarter and that at the end of the quarter. This definition follows that in Barber and Odean (2001) and Gaspar, Massa, and Matos (2005). We track institutional trading in IPO stocks and matched seasoned stocks for three years (12 quarters) post-IPO. Figure 2 shows that institutional investors hold IPO stocks for a shorter period (as measured by their turnover rate) than matched seasoned stocks in the first seven quarters

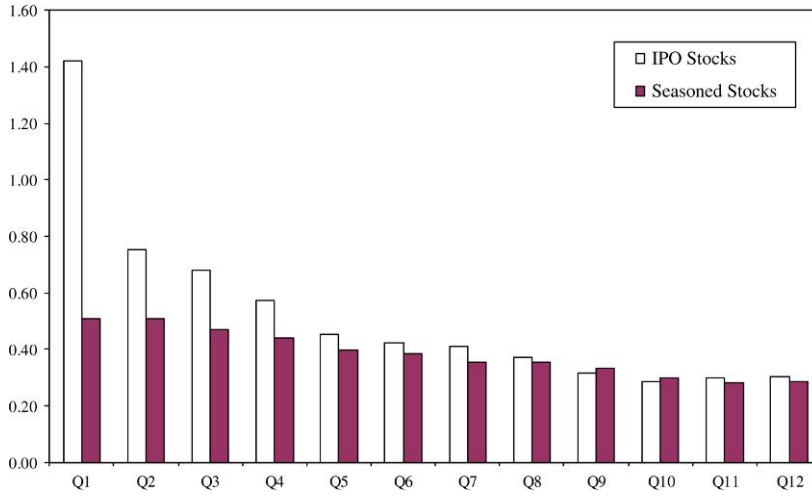

Figure 2
Institutional turnover in IPO stocks vs. seasoned stocks
This figure plots the time-series pattern of institutional turnover rate in IPO stocks and matched seasoned stocks in 12 quarters (3 years) post-IPO. Quarter 1 (Q1) is the first quarter after an IPO. Institutional turnover of a stock in a quarter is calculated as the sum of institutional buys and sells divided by the average holdings of the stock during the quarter.

post-IPO. In particular, institutional turnover rate for IPO stocks is 1.42 in the first quarter post-IPO, compared with 0.51 for seasoned stocks.[15] Interestingly, the turnover rate becomes similar for IPOs and seasoned stocks starting from the eighth quarter. Thus, we can think of IPO stocks becoming similar to seasoned stocks in terms of the turnover rate starting from the eighth quarter.

4.3 Determinants of the Holding Period of Institutional IPO Allocations

In this subsection, we study the determinants of institutional IPO allocation holding periods. We run different specifications of the following regression:

$$\begin{aligned} \textit{Average Holding Period} = {} & \alpha + \beta_1 \textit{Initial Return} + \beta_2 \textit{High Pre-IPODemand} \\ & + \beta_3 \text{Low}\textit{Pre-IPO Demand} \\ & + \beta_4 \textit{Average Holding Period in Seasoned Stocks} \\ & + \beta_5 Log(Age+1) + \beta_6 Log(Reputation) \\ & + \beta_7 Log(Proceeds) + \beta_8 Log(Institution\ Size) \\ & + \beta_9 Bubble + \beta_{10} NASDAQ + \beta_{11} High\text{-}Tech \\ & + \beta_{12} Financial + \beta_{13} Venture\ Capital \\ & + \beta_{14} Lockup + \beta_{15} Log(ME) \\ & + \beta_{16} Log(BE/ME) \\ & + \beta_{17} \text{1-}Year\ Abnormal\ Return + \varepsilon. \end{aligned} \tag{1}$$

Table 5 reports results on the regression analysis of the holding period of IPO allocations by identified sample institutions. The dependent variable is the *Average Holding Period* of institutional IPO allocations in months. The definitions of the independent variables are as follows. *Initial Return* is the IPO return from the offer price to first-day closing price. *High (Low) Pre-IPO Demand* equals one if the final offer price is higher (lower) than the file range in the preliminary prospectus and zero otherwise. *Average Holding Period in Seasoned Stocks* is the average holding period of the institution in matched seasoned stocks (as constructed above) in months. *Log(Age+1)* is the natural logarithm of the IPO firm age plus one, where age is IPO year minus company founding year. Company founding year data are obtained from the Field-Ritter dataset of company founding dates (Field and Karpoff 2002; Loughran and Ritter 2004). *Log(Reputation)* is the natural logarithm of the lead underwriter reputation ranking. The 1992–2000 rankings are used for 1999–2000

[15] An average turnover rate of 0.51 means that the average stock is turned over by institutions 25.5% in a quarter, or 102% in a year. Thus, the holding period in the average seasoned stock by institutions is 11.8 (12/1.02) months.

IPOs, and the 2001–2004 rankings are used for 2001–2003 IPOs. The maximum ranking is used when there are multiple lead underwriters. The rankings are obtained from Jay Ritter's website (Loughran and Ritter 2004), which are loosely based on Carter and Manaster (1990) and Carter, Dark, and Singh (1998) rankings. *Log(Proceeds)* is the natural logarithm of the IPO offer proceeds. *Log(Institution Size)* is the natural logarithm of the annualized dollar principal traded by the institution. *Bubble* equals one for 1999 and 2000 IPOs, and zero otherwise. *NASDAQ* equals one if it is a NASDAQ IPO, and zero otherwise. *High-Tech* equals one if the IPO firm is in high-tech industries (defined by SIC codes; see Ljungqvist and Wilhelm 2003 and Loughran and Ritter 2004 for details), and zero otherwise. *Financial* equals one if the IPO firm is in the financial industry (SIC codes 60–63 and 67), and zero otherwise. *Venture Capital* equals one if the IPO has venture capital backing, and zero otherwise. *Lockup* equals one if the IPO has a lockup provision, and zero otherwise. *Log(ME)* is the natural logarithm of the IPO firm's market equity, which equals

Table 5
Regression Analysis of Institutional IPO Allocation Holding Period

	(1)	(2)	(3)	(4)	(5)
Initial Return	−0.451***	0.224			
	(0.001)	(0.269)			
High Pre-IPO Demand			−1.753***	−1.436***	−1.418***
			(< 0.001)	(< 0.001)	(< 0.001)
Low Pre-IPO Demand			3.449***	3.107***	3.084***
			(< 0.001)	(< 0.001)	(< 0.001)
Avg Holding Period in Seasoned Stocks	0.253***	0.243***	0.251***	0.250***	0.250***
	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)
Log(Age+1)	0.613***	0.119	0.386***	0.046	0.055
	(< 0.001)	(0.452)	(0.007)	(0.770)	(0.728)
Log(Reputation)	−0.824	−2.004*	−0.596	−2.203*	−2.310**
	(0.445)	(0.087)	(0.568)	(0.057)	(0.046)
Log(Proceeds)	0.249	0.553	0.415***	0.364	0.391
	(0.124)	(0.119)	(0.010)	(0.264)	(0.231)
Log(Institution Size)	0.763***	0.757***	0.749***	0.749***	0.742***
	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)
Bubble		−0.724*		−0.227	−0.171
		(0.071)		(0.570)	(0.670)
NASDAQ		−0.617		−0.692	−0.724
		(0.270)		(0.209)	(0.189)
High-Tech		−0.871***		−0.780***	−0.771***
		(0.001)		(0.003)	(0.003)
Financial		0.931		0.554	0.566
		(0.156)		(0.399)	(0.387)
Venture Capital		−0.160		−0.036	−0.023
		(0.607)		(0.907)	(0.942)
Lockup		−1.129***		−0.868***	−0.889***
		(< 0.001)		(0.005)	(0.004)
Log(ME)		−0.664**		−0.152	−0.200
		(0.035)		(0.578)	(0.468)
Log(BE/ME)		0.133		−0.029	−0.017
		(0.584)		(0.901)	(0.942)

(*continued*)

Table 5
Continued

	(1)	(2)	(3)	(4)	(5)
1-Year Abnormal Return		1.036***		1.003***	5.864***
		(< 0.001)		(< 0.001)	(0.009)
1-Year Abnormal Return					−0.236 **
**Log(ME)*					(0.030)
Intercept	−20.850***	−7.136	−23.164***	−13.545 **	−12.697 **
	(< 0.001)	(0.187)	(< 0.001)	(0.014)	(0.022)
Observations	4,620	4,477	4,620	4,477	4,477
Adjusted *R*-square	0.041	0.071	0.066	0.088	0.089

This table presents regression analysis of the holding period of IPO allocations by identified sample institutions. The dependent variable is *Average Holding Period* in months as defined before. Definitions of independent variables are as follows. *High (Low) Pre-IPO Demand* equals one if the final offer price is higher (lower) than the file range in the preliminary prospectus. *Average Holding Period in Seasoned Stocks* is the average holding period of the institution in matched seasoned stocks (in months). *Log(Age+1)* is the natural logarithm of the IPO firm age plus one, where age is IPO year minus company founding year. Company founding year data are obtained from the Field-Ritter dataset of company founding dates (Field and Karpoff 2002 and Loughran and Ritter 2004). *Reputation* is the natural logarithm of the lead underwriter reputation ranking. The 1992–2000 rankings are used for 1999–2000 IPOs, and the 2001–2004 rankings are used for 2001–2003 IPOs. The maximum ranking is used when there are multiple lead underwriters. The rankings are obtained from Jay Ritter's website (Loughran and Ritter 2004), which are loosely based on Carter and Manaster (1990) and Carter, Dark, and Singh (1998) rankings. *Initial Return* is the IPO return from the offer price to first-day closing price. *Log(Proceeds)* is the natural logarithm of the IPO offer proceeds. *Log(Institution Size)* is the natural logarithm of the annualized dollar principal traded of the institution. *Bubble* equals one for 1999 and 2000 IPOs, and zero otherwise. *NASDAQ* equals one if it is a NASDAQ IPO, and zero otherwise. *High-Tech* equals one if the IPO firm is in a high-tech industry (defined by SIC codes; see Ljungqvist and Wilhelm 2003 and Loughran and Ritter 2004 for details), and zero otherwise. *Financial* equals one if the IPO firm is in the financial industry (SIC codes 60–63 and 67), and zero otherwise. *Venture Capital* equals one if the IPO has venture capital backing, and zero otherwise. *Lockup* equals one if the IPO has a lockup provision, and zero otherwise. *Log(ME)* is the natural logarithm of the IPO firm's market equity, which equals shares outstanding multiplied by the first-day closing price. *Log(BE/ME)* is the natural logarithm of the ratio of the IPO firm's book equity and market equity. *1-Year Abnormal Return* is the IPO one-year buy-and-hold return (starting the day after the first trading day) net of the matched Fama/French 25 size and book-to-market portfolio buy-and-hold value-weighted return. The unit of observation is an IPO/institution pair. *P*-values, which are in parentheses, are adjusted using White's robust standard errors with clustering on IPOs. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

shares outstanding multiplied by the first-day closing price. *Log(BE/ME)* is the natural logarithm of the ratio of the IPO firm's book equity and market equity. *1-Year Abnormal Return* is the IPO one-year buy-and-hold return (starting the day after the first trading day) net of the matched Fama/French 25 size and book-to-market portfolio buy-and-hold value-weighted return.

Since IPO initial return and our pre-IPO demand measures are highly correlated, we include them in our regressions separately. Consistent with earlier univariate results, Model 1 in Table 5 shows that institutions hold hotter (more underpriced) IPO allocations for a shorter period. However, when more control variables are included in Model 2, the coefficient on *Initial Return* becomes insignificant. As for regressions using the pre-IPO demand measures, we use IPOs with medium pre-IPO demand as the base group and include two dummies in the regressions. We find that the regression coefficients on the *High Pre-IPO Demand* (*Low Pre-IPO Demand*) are negative (positive) and highly significant in Models 3, 4, and 5, suggesting that institutions sell their

allocations in high pre-IPO demand IPOs faster and hold on to their allocations in low pre-IPO demand IPOs longer. This finding is again consistent with our previous univariate result. Interestingly, the coefficient on *Average Holding Period in Seasoned Stocks* is positive and significant, suggesting that institutions consider IPO investments as similar to their regular investments in seasoned stocks as opposed to being opportunistic investments (in other words, if an institution holds its investments in seasoned stocks longer, it will also hold its IPO allocations longer). There is some evidence that institutions hold allocations in younger IPOs for a shorter period. In Models 1 and 3, the regression coefficients on *Log(Age+1)* are positive and significant. We find that institutions sell allocations in bubble-period IPOs and high-tech IPOs faster. Interestingly, institutions also sell allocations in IPOs with lockup provisions faster. This could be because institutions attempt to avoid the negative returns around the lockup expiration day that has been documented by the existing literature (e.g., Brav and Gompers 2003). Another possibility is that underwriters are more likely to institute lockups when there is weaker institutional demand in IPOs. Under this interpretation, IPOs with lockups will be the ones institutions like less: Either institutions dislike the IPO and do not ask for allocations, or if they do ask for allocations, they sell them faster.

In terms of economic magnitudes, compared with the base case of medium pre-IPO demand IPOs, the *Average Holding Period* is 1.44 months shorter for high pre-IPO demand IPOs and 3.11 months longer for low pre-IPO demand IPOs. The *Average Holding Period* is 0.87 months shorter for IPOs with lockup provisions and 0.78 months shorter for high-tech IPOs based on Model 4. Finally, institutions appear to hold IPOs with better long-run performance longer. In other words, institutions flip out of worse long-run performers faster, suggesting that they have private information about IPOs.[16] We address the issue of whether institutions possess private information by studying the predictive power of institutional trading on subsequent long-run IPO performance in detail in Section 7.

4.4 Determinants of Institutional IPO Allocations

In this subsection, we test the hypothesis that institutions that flip cold IPOs are penalized in terms of share allocations. Assuming that the relationship between institutions and underwriters is at a steady state, this hypothesis would predict that underwriters would allocate more shares to those institutions that hold IPO

[16] An alternative interpretation of this result is that stocks have downward-sloping demand curves, and heavy institutional selling causes the prices to go down. This effect should be stronger for smaller IPOs. We test this possibility by including an interaction term that combines the one-year abnormal return variable with firm size in Model 5. The coefficient on the interaction term is negative and significant, suggesting that this positive effect of downward-sloping demand curve is indeed stronger for smaller firms. The coefficient on the one-year abnormal return variable, however, remains positive and significant. Another interpretation of this result is that institutions have no private information but flip more IPOs with better short-term performance (because underwriters do not prevent flipping in these IPOs), and these IPOs happen to be worse long-term performers. Although we cannot completely rule out this latter possibility using this test, our profitability results (Tables 8 and 9) and predictive power results (Table 10) strengthen the interpretation that institutions have private information about IPOs.

allocations longer, especially in cold IPOs. We run different specifications of the following regression:

$$\begin{aligned} Institutional\ Allocation = {} & \alpha + \beta_1 Average\ Holding\ Period \\ & + \beta_2 High\ Pre\text{-}IPO\ Demand \\ & + \beta_3 Low\ Pre\text{-}IPO\ Demand \\ & + \beta_4 Log(Age + 1) \\ & + \beta_5 Log(Reputation) + \beta_6 Log(Proceeds) \\ & + \beta_7 Log(Institution\ Size) + \beta_8 Bubble \\ & + \beta_9 NASDAQ + \beta_{10} High\text{-}Tech \\ & + \beta_{11} Financial + \beta_{12} Venture\ Capital \\ & + \beta_{13} Lockup + \beta_{14} Log(ME) \\ & + \beta_{15} Log(BE/ME) \\ & + \beta_{16} 1\text{-}Year\ Abnormal\ Return + \varepsilon. \end{aligned} \tag{2}$$

Table 6 reports results on the regression analysis of IPO allocations received by identified sample institutions. The dependent variable is *IPO Allocation* received by identified institutions as a fraction of total IPO offer proceeds. The variable of interest is *Average Holding Period* of institutions in IPO allocations. We further decompose this variable into two components based on initial returns. In particular, *Average Holding Period in Hot (Cold) IPOs* is calculated as the average number of months institutions hold their allocations in hot (cold) IPOs. The definitions of other control variables can be found in Section 4.3.

In Models 1 and 2, the coefficients on *Average Holding Period* are positive and significant, suggesting that underwriters reward institutions that hold their allocations for a longer period with larger IPO allocations. More importantly, when we decompose the above holding periods into holding periods in hot versus cold IPOs, we find that only the institutional holding periods in cold IPOs matter in determining the IPO allocations received by institutions.[17] This effect is economically significant as well. If the average holding period in cold IPOs of an institution increases by one month, the IPO allocation received by the institution will increase by 0.09%, which is economically significant considering that, as shown in Table 2, the mean (median) allocation the average institution receives in an IPO is 0.96% (0.46%). This finding is consistent with the hypothesis that underwriters penalize institutions that flip cold IPOs by allocating fewer IPO shares to them.

[17] In unreported results, we redo this analysis using an alternative measure of institutional holding periods—i.e., the institution's average holding period in all IPOs underwritten by the same underwriter excluding the current IPO. This measure would be appropriate if underwriters have access to institutions' IPO allocation-holding behavior only in those IPOs in which they acted as the lead underwriter (even though, given that most IPOs are syndicated, it is quite likely that underwriters would have access to institutions' IPO allocation-holding behavior even when they are not the lead underwriter). The results are qualitatively similar when we use this alternative measure.

Table 6
Regression Analysis of Institutional IPO Allocations

	(1)	(2)	(3)	(4)
Average Holding Period	0.069***	0.070***		
	(< 0.001)	(< 0.001)		
Average Holding Period in Cold IPOs			0.085***	0.085***
			(< 0.001)	(< 0.001)
Average Holding Period in Hot IPOs			−0.006	−0.005
			(0.569)	(0.655)
High Pre-IPO Demand	−0.359***	−0.367***	−0.332***	−0.345***
	(0.002)	(0.002)	(0.004)	(0.003)
Low Pre-IPO Demand	1.435***	1.320***	1.418***	1.312***
	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)
Log(Age+1)	0.149**	0.114*	0.136**	0.105
	(0.013)	(0.084)	(0.025)	(0.110)
Log(Reputation)	−0.381	−1.648**	−0.311	−1.577**
	(0.519)	(0.015)	(0.599)	(0.020)
Log(Proceeds)	−0.344***	−0.690***	−0.353***	−0.690***
	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)
Log(Institution Size)	0.884***	0.881***	0.847***	0.843***
	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)
Bubble		−0.180		−0.138
		(0.286)		(0.403)
NASDAQ		−0.233		−0.242
		(0.258)		(0.239)
High-Tech		−0.194		−0.211*
		(0.106)		(0.081)
Financial		−0.255		−0.261
		(0.254)		(0.240)
Venture Capital		−0.033		−0.019
		(0.792)		(0.880)
Lockup		−0.691***		−0.681***
		(< 0.001)		(< 0.001)
Log(ME)		0.279**		0.274**
		(0.022)		(0.023)
Log(BE/ME)		0.252**		0.248**
		(0.010)		(0.011)
1-Year Abnormal Return		0.116**		0.119**
		(0.012)		(0.011)
Intercept	−13.727***	−8.964***	−12.961***	−8.238***
	(< 0.001)	(0.001)	(< 0.001)	(0.002)
Observations	4,620	4,477	4,620	4,477
Adjusted *R*-square	0.139	0.146	0.140	0.147

This table presents a regression analysis of institutional IPO allocations. The dependent variable is IPO allocations institutions receive in an IPO measured as the fraction of the offer allocated to an institution, in percentage. Most independent variables are as defined before. *Average Holding Period*, as defined above, is the value-weighted average number of trading days (divided by 21 to arrive at months) sample institutions hold their IPO allocations. *Average Holding Period* is decomposed into a hot and a cold component based on initial returns. *Average Holding Period in Hot (Cold) IPOs* is calculated as the average months that institutions hold their allocations in IPOs with initial return above (below) the median. The unit of observation is an IPO/institution pair. *P*-values, which are in parentheses, are adjusted using White's robust standard errors with clustering on IPOs. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6 also shows that institutions receive fewer allocations (as a fraction of the offer proceeds) in high pre-IPO demand IPOs and in large IPOs. These results suggest that competition for allocations is more intense in such offerings. Larger institutions tend to receive more allocations, which is consistent with our previous result that larger institutions participate more actively in IPOs.

Institutional investors receive fewer allocations in IPOs with lockups. This situation can arise because underwriters are more likely to institute lockups when there is weaker institutional demand in IPOs. As a result, institutional IPO allocations decrease in the presence of lockups.[18] We also find that institutions receive larger allocations in IPOs with better long-run performance (i.e., the coefficient of *1-Year Abnormal Return* is positive and significant), which is consistent with Boehmer, Boehmer, and Fishe (2006).

5. Profitability of Institutional IPO Allocation Sales

Our results in the previous section suggest that institutions continue to sell significant portions of their IPO allocations beyond the immediate post-IPO period. In this section, we continue to use the subsample of identified institutions to study how profitable these allocation sales are to institutions and how much of the money left on the table is realized by institutions.

Table 7 reports results on the profitability of IPO allocation sales by identified sample institutions. Panel A partitions the sample IPOs into hot and cold IPOs. *Amount Invested* is the dollar amount of IPO allocations received by sample institutions. For each IPO, sample institutions received $15.77 million in allocations, with *Money Left on the Table* of $9.11 million. The *Money Left on the Table* is $17.28 million per IPO for hot IPOs, and only $1.05 million for cold IPOs. Note that the *Money Left on the Table* here is based on the allocation sales by institutions in our sample, not for the whole IPO. *Institutional Raw Profit* here measures the realized raw profit earned by institutions from selling their IPO allocations, using real transaction prices and net of trading commissions.[19] For allocations not sold within the first year, we mark them to the market at the end of the first year. *Institutional Abnormal Profit* is computed by discounting *Institutional Raw Profit* back to the first day of IPO using the matched Fama/French 25 size and book-to-market portfolio buy-and-hold value-weighted return. We discount the raw profit to make it directly comparable to the money left on the table, which is calculated on the first day of IPO. We find that *Institutional Abnormal Profit* is in general close to or slightly higher than *Money Left on the Table*—i.e., institutions fully realize the money left on the table for their IPO allocations. For each IPO, sample institutions make $10.55 million in abnormal profits from selling their allocations. Overall, institutional IPO allocation sales are highly profitable: Our sample institutions collectively made about $10.31 billion ($11.61 million multiplied by 888

[18] In our sample of IPOs, 57.0% have lockup provisions. When we split the sample based on pre-IPO demand, the probability of instituting lockups is 64.9% for IPOs with low pre-IPO demand, compared with only 44.1% for IPOs with high pre-IPO demand.

[19] We are able to accurately measure the realized profitability of both institutional IPO allocation sales and institutional post-IPO trading. In addition to trading commissions (which directly reduce realized profits), implicit trading costs such as implementation shortfall (Perold 1988) could also be important and further reduce investors' realized profits. Our results account for both trading commissions and implicit trading costs, since we use actual transaction prices to calculate institutional investors' realized profits.

Table 7
Profitability of Institutional IPO Allocation Sales

	All IPOs	Hot IPOs	Cold IPOs	Test Equality
Number of IPOs	888	441	447	
Amount Invested ($ millions)	15.77	17.11	14.44	(0.447)
Money Left on the Table ($ millions)	9.11 ∗ ∗∗	17.28 ∗ ∗∗	1.05 ∗ ∗∗	(< 0.001) ∗ ∗∗
	(< 0.001)	(< 0.001)	(< 0.001)	
Institutional Raw Profit ($ millions)	11.61 ∗ ∗∗	19.27 ∗ ∗∗	4.06 ∗ ∗∗	(< 0.001) ∗ ∗∗
	(< 0.001)	(< 0.001)	(0.007)	
Institutional Abnormal Profit ($ millions)	10.55 ∗ ∗∗	17.51 ∗ ∗∗	3.70 ∗ ∗∗	(< 0.001) ∗ ∗∗
	(< 0.001)	(< 0.001)	(0.009)	
Raw $ Realization Shortfall ($ millions)	−2.50	−1.99	−3.01 ∗ ∗	(0.757)
	(0.127)	(0.503)	(0.036)	
Abnormal $ Realization Shortfall ($ millions)	−1.44	−0.23	−2.64 ∗ ∗	(0.463)
	(0.378)	(0.940)	(0.049)	
IPO Initial Return (%)	57.79 ∗ ∗∗	100.98 ∗ ∗∗	7.30 ∗ ∗∗	(< 0.001) ∗ ∗∗
	(< 0.001)	(< 0.001)	(< 0.001)	
Institutional Raw Return (%)	73.65 ∗ ∗∗	112.59 ∗ ∗∗	28.11 ∗ ∗∗	(< 0.001) ∗ ∗∗
	(< 0.001)	(< 0.001)	(< 0.001)	
Institutional Abnormal Return (%)	66.95 ∗ ∗∗	102.31 ∗ ∗∗	25.60 ∗ ∗∗	(< 0.001) ∗ ∗∗
	(< 0.001)	(< 0.001)	(< 0.001)	
Raw Realization Shortfall (%)	−15.85	−11.61	−20.81 ∗ ∗∗	(0.619)
	(0.104)	(0.489)	(0.008)	
Abnormal Realization Shortfall (%)	−9.15	−1.33	−18.30 ∗ ∗	(0.370)
	(0.356)	(0.939)	(0.013)	

This table presents results on the profitability of IPO allocation sales by identified sample institutions. We partition the IPO sample into hot and cold IPOs based on IPO initial return. *Amount Invested* is the dollar amount of IPO allocations received by sample institutions. *Money Left on the Table* equals *Amount Invested* multiplied by *IPO Initial Return*, where *IPO Initial Return* is the IPO return from the offer price to first-day closing price. *Institutional Raw Profit* here measures the realized raw profit earned by institutions from selling their IPO allocations, using real transaction prices and net of trading commissions. For allocations not sold within the first year, we mark them to the market at the end of the first year. *Institutional Abnormal Profit* is computed by discounting *Institutional Raw Profit* back to the first day of IPO using the matched Fama/French 25 size and book-to-market portfolio buy-and-hold value-weighted return. *Raw $ Realization Shortfall* equals *Money Left on the Table* minus *Institutional Raw Profit*. *Abnormal $ Realization Shortfall* equals *Money Left on the Table* minus *Institutional Abnormal Profit*. *Institutional Raw Return* equals *Institutional Raw Profit* divided by *Amount Invested*. *Institutional Abnormal Return* equals *Institutional Abnormal Profit* divided by *Amount Invested*. *Raw Realization Shortfall* equals *Raw $ Realization Shortfall* divided by *Amount Invested*. *Abnormal Realization Shortfall* equals *Abnormal $ Realization Shortfall* divided by *Amount Invested*. Sample means of dollar values and dollar value-weighted means of percentages are reported. The last column tests the significance of the differences in the means, with *p*-values in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

IPOs) in raw profits and $9.37 billion ($10.55 million multiplied by 888 IPOs) in abnormal profits.

Raw $ Realization Shortfall is given by *Money Left on the Table* minus *Institutional Raw Profit*, and *Abnormal $ Realization Shortfall* is *Money Left on the Table* minus *Institutional Abnormal Profit*. We use these two measures to quantify how much of the money left on the table institutions fail to realize. For all IPOs, the two dollar shortfall measures are slightly negative but not significantly different from zero, indicating that both *Institutional Raw Profit* and *Institutional Abnormal Profit* are not significantly different from *Money Left*

on the Table. Institutions are able to realize more profits than the money left on the table for cold IPOs.

Institutional Raw Return is defined as *Institutional Raw Profit* divided by *Amount Invested*, and *Institutional Abnormal Return* as *Institutional Abnormal Profit* divided by *Amount Invested*.[20] Similar to findings using dollar values, we find that *Institutional Abnormal Return* is close to or slightly higher than *IPO Initial Return*. Both *Institutional Raw Return* and *Institutional Abnormal Return* are very high, 73.7% and 67.0%, respectively. In other words, IPO allocation sales are highly profitable to institutions.

Raw Realization Shortfall is *Raw $ Realization Shortfall* divided by *Amount Invested*, and *Abnormal Realization Shortfall* is *Abnormal $ Realization Shortfall* divided by *Amount Invested*. Note that, by definition, *Raw Realization Shortfall* is also the difference between *IPO Initial Return* and *Institutional Raw Return*, and that *Abnormal Realization Shortfall* is the difference between *IPO Initial Return* and *Institutional Abnormal Return*. For all IPOs, both measures are negative but not significantly different from zero. This means that institutions fully realize the money left on the table for their IPO allocations. One reason that institutions are able to fully realize the money left on the table is that institutions flip out of IPOs with worse long-run performance faster, as we documented in the previous section. Similar to dollar-value results, institutions realize higher returns than *IPO Initial Return* for cold IPOs.

6. Profitability of Post-IPO Institutional Trading

Our results in the previous section show that institutional IPO allocation sales are very profitable, and institutions fully realize the money left on the table for their IPO allocations. In this section, we use all sample institutions to study the profitability of institutional post-IPO trading, and in particular, whether institutions outperform a buy-and-hold investment strategy in IPOs. We also separately analyze the profitability of post-IPO trading by institutions that participated in IPO allocations and those that did not participate. We then analyze the determinants of institutional outperformance in post-IPO trading.

6.1 Profitability of Post-IPO Institutional Trading

Table 8 reports results on the profitability of post-IPO trading by all sample institutions. Panel A partitions the 909 IPOs into hot and cold IPOs. *Amount Invested* is the actual dollar amount of buy principal plus trading commis-

[20] Following Ellis, Michaely, and O'Hara (2000), we study the dollar profitability of IPOs to institutions. In Table 8, all percentage values are value-weighted by amount invested. We do this because value-weighted percentage values better reflect the true profitability of IPOs to institutions. This way, results on dollar and percentage values are consistent; for example, IPO *Initial Return* is equal to *Money Left on the Table* divided by the *Amount Invested*. This is also why the *Initial Return* reported in Table 7 is slightly different from the equal-weighted initial return reported in Table 1. The initial return reported in Table 7 better reflects the true profitability of IPOs allocated to institutions.

Table 8
Profitability of Post-IPO Institutional Trading

Panel A: Profitability of Post-IPO Trading for All Institutions, Partitioned by *IPO Initial Return*

	All IPOs	Hot IPOs	Cold IPOs	Test Equality
Number of IPOs	909	455	454	
Amount Invested ($ millions)	137.08	198.70	75.32	(< 0.001)***
Amount Invested in Current Dollars ($ millions)	124.33	175.69	72.86	(< 0.001)***
Institutional Raw Profit ($ millions)	−0.43	−0.25	−0.61	(0.974)
	(0.937)	(0.981)	(0.755)	
Institutional Abnormal Profit ($ millions)	−1.93	−3.83	−0.03	(0.671)
	(0.667)	(0.665)	(0.986)	
Institutional Abnormal Return (%)	−1.55	−2.18	−0.03	(0.699)
	(0.673)	(0.674)	(0.986)	
IPO Buy-and-Hold Abnormal Return (%)	−22.59 **	−31.73 **	0.56	(0.002)***
	(< 0.001)	(< 0.001)	(0.931)	
Institutional Abnormal Outperformance (%)	21.03 **	29.54 **	−0.60	(< 0.001)***
	(0.003)	(0.002)	(0.930)	

Panel B: Profitability of Post-IPO Trading for Identified Institutions, Partitioned by Participation

	Participating Institutions	Nonparticipating Institutions	Test Equality
Number of IPOs	888	888	
Amount Invested ($ millions)	101.39	16.11	(< 0.001)***
Amount Invested in Current Dollars ($ millions)	90.94	14.96	(< 0.001)***
Institutional Raw Profit ($ millions)	1.78	−1.82 **	(0.491)
	(0.731)	(0.014)	
Institutional Abnormal Profit ($ millions)	0.45	−1.73 **	(0.611)
	(0.915)	(0.002)	
Institutional Abnormal Return (%)	0.50	−11.58 **	(< 0.001)***
	(0.649)	(< 0.001)	
IPO Buy-and-Hold Abnormal Return (%)	−22.45 **	−22.45 **	
	(< 0.001)	(< 0.001)	
Institutional Abnormal Outperformance (%)	22.95 **	10.88*	(< 0.001)***
	(< 0.001)	(0.079)	

This table presents results on the profitability of post-IPO trading by institutions. Panel A partitions IPOs traded by all sample institutions into hot versus cold IPOs. Panel B partitions identified institutions into those that participate in IPO allocations and those that do not. *Amount Invested* is the actual dollar amount of buy principal plus trading commissions spent by sample institutions in post-IPO trading within the first year post-IPO. *Amount Invested in Current Dollars* is computed by discounting *Amount Invested* back to the first day of IPO using the return on the matched Fama/French 25 size and book-to-market portfolio. *Institutional Raw Profit* is the raw profit earned by institutions from post-IPO trading (excluding allocation sales) within the first year post-IPO, using real buying and selling prices by institutions and net of trading commissions, and marking net positions to the market at the end of the first year post-IPO. *Institutional Abnormal Profit* is computed by discounting *Institutional Raw Profit* back to the first day of IPO using the matched Fama/French 25 size and book-to-market portfolio buy-and-hold value-weighted return. *Institutional Raw Return* equals *Institutional Raw Profit* divided by *Amount Invested*. *IPO Buy-and-Hold Raw Return* is the first-day closing market value-weighted buy-and-hold return in the first year for initial sample IPOs. *Institutional Raw Outperformance* equals *Institutional Raw Return* minus *IPO Buy-and-Hold Raw Return*. *Institutional Abnormal Return* equals *Institutional Abnormal Profit* divided by *Amount Invested in Current Dollars*. *IPO Buy-and-Hold Abnormal Return* is computed by discounting *IPO Buy-and-Hold Raw Return* back to the first day of IPO using the matched Fama/French 25 size and book-to-market portfolio buy-and-hold value-weighted return. *Institutional Abnormal Outperformance* equals *Institutional Abnormal Return* minus *IPO Buy-and-Hold Abnormal Return*. Sample means of dollar values and dollar value-weighted means of percentages are reported. The last column tests the significance of the differences in the means, with *p*-values in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

sions spent by sample institutions in post-IPO trading within the first year post-IPO. *Amount Invested in Current Dollars* is computed by discounting

Amount Invested back to the first day of IPO using the return on the matched Fama/French 25 size and book-to-market portfolio. *Amount Invested* and *Amounted Invested in Current Dollars* by institutions in hot IPOs are significantly higher than those in cold IPOs, suggesting that hot IPOs attract more post-IPO institutional investment.

Institutional Raw Profit is the raw profit earned by institutions from post-IPO trading (excluding allocation sales) within the first year post-IPO, using real buying and selling prices by institutions and net of trading commissions, and marking net positions to the market at the end of the first year post-IPO. *Institutional Abnormal Profit* is computed by discounting *Institutional Raw Profit* back to the first day of IPO using the return on the matched Fama/French 25 size and book-to-market portfolio. Both *Institutional Raw Profit* and *Institutional Abnormal Profit* from post-IPO trading are much smaller compared with the profits from IPO allocation sales in Table 7, even though the *Amount Invested* is much higher in post-IPO trading. Note that none of the dollar profits from post-IPO trading are significantly different from zero, suggesting that institutions do not significantly gain or lose money in post-IPO trading.

Institutional Abnormal Return is *Institutional Abnormal Profit* divided by *Amount Invested in Current Dollars*. *IPO Buy-and-Hold Abnormal Return* is computed by discounting *IPO Buy-and-Hold Raw Return* back to the first day of IPO using the return on the matched Fama/French 25 size and book-to-market portfolio. Further, *Institutional Abnormal Outperformance* is given by *Institutional Abnormal Return* minus *IPO Buy-and-Hold Abnormal Return*. Note that the reported outperformance is averaged across all sample IPOs. None of the *Institutional Abnormal Returns* are significantly different from zero, suggesting that institutions do not significantly outperform or underperform the overall stock market in post-IPO trading (after controlling for Fama/French factors). However, institutions do show some ability in trading IPOs in the secondary market, since they outperform a naive buy-and-hold investment strategy in IPOs, which is money-losing. Again, institutions' ability in post-IPO trading seems to stem from their ability to avoid "bad" IPOs—i.e., they outperform in hot IPOs, where the buy-and-hold abnormal returns are negative.[21]

Table 8, Panel B, partitions identified institutions as participating or nonparticipating institutions based on whether they received allocations in the IPO. Participating institutions invest more than their counterparts. Specifically, participating institutions invest $101.39 million per IPO in post-IPO trading, compared with only $16.11 million for nonparticipating institutions. More importantly, participating institutions generate significantly higher profits and returns from post-IPO trading than nonparticipating institutions. For example,

[21] The results are qualitatively similar if raw return measures are used.

Institutional Abnormal Outperformance is 22.95% and highly significant for participating institutions, whereas that for nonparticipating institutions is only 10.88% and only marginally significant. These findings suggest that institutions have greater incentives (and ability) to produce information about an IPO if they received allocations in that IPO (since they would be part of the book-building process for that IPO). They may then use this information advantage successfully in post-IPO trading as well.

6.2 Determinants of Institutional Abnormal Outperformance in Post-IPO Trading

In this subsection, we study the determinants of institutional abnormal outperformance in post-IPO trading in a regression framework. We run different specifications of the following regression:

$$\begin{aligned} &Institutional\ Abnormal\ Outperformance \\ &= \alpha + \beta_1 Participating + \beta_2 High\ Pre\text{-}IPO\ Demand \\ &\quad + \beta_3 Low Pre\text{-}IPO\ Demand + \beta_4 Log(Age + 1) \\ &\quad + \beta_5 Log(Reputation) + \beta_6 Initial\ Return + \beta_7 Log(Proceeds) \\ &\quad + \beta_8 Log(Institution\ Size) + \beta_9 Bubble + \beta_{10} NASDAQ \\ &\quad + \beta_{11} High\text{-}Tech + \beta_{12} Financial + \beta_{13} Venture\ Capital \\ &\quad + \beta_{14} Lockup + \beta_{15} Log(ME) + \beta_{16} Log(BE/ME) \\ &\quad + \beta_{17} Young/Large + \beta_{18} Low\ Reputation/Large + \varepsilon. \end{aligned} \tag{3}$$

Table 9 reports the results of our regression analysis of abnormal outperformance in post-IPO trading by all sample institutions (in Models 1 and 2) and by identified institutions (in Models 3 and 4). The dependent variable is *Institutional Abnormal Outperformance* in post-IPO trading for an institution/IPO pair. See Section 6.1 for details of *Institutional Abnormal Outperformance* in post-IPO trading. The definitions of most of the independent variables can be found in Section 4.3. Participating dummy equals one if the institution participates in the IPO allocation and zero otherwise. There are two additional interactive terms. *Young/Large* is a dummy variable that equals one if the IPO firm is young (younger than the sample mean age of 14 years) and the trading is done by a large institution (more than $10 billion in annualized dollar principal traded), and zero otherwise. *Low Reputation/Large* is a dummy variable that equals one if the IPO is underwritten by a low-reputation lead underwriter (reputation rank lower than 9.1) and the trading is done by a large institution, and zero otherwise.

Table 9
Regression Analysis of Institutional Abnormal Outperformance in Post-IPO Trading

	IPOs Traded by all Institutions		IPOs Traded by Identified Institutions	
	(1)	(2)	(3)	(4)
Participating Dummy			0.142***	0.147***
			(< 0.001)	(< 0.001)
High Pre-IPO Demand	−0.001	0.048	−0.020	−0.010
	(0.997)	(0.731)	(0.457)	(0.715)
Low Pre-IPO Demand	0.020	0.024	−0.052	−0.054
	(0.861)	(0.843)	(0.107)	(0.115)
Log(Age+1)	−0.089**	−0.082*	−0.086***	−0.061***
	(0.023)	(0.059)	(< 0.001)	(< 0.001)
Log(Reputation)	−0.829***	−0.440**	−0.667***	−0.449***
	(0.002)	(0.036)	(< 0.001)	(< 0.001)
Initial Return	0.061*	0.196***	0.033***	0.097***
	(0.099)	(0.001)	(0.002)	(< 0.001)
Log(Proceeds)	0.237***	0.262***	0.143***	0.114***
	(< 0.001)	(0.003)	(< 0.001)	(< 0.001)
Log(Institution Size)	0.019***	0.007	−0.001	−0.007
	(< 0.001)	(0.137)	(0.956)	(0.399)
Bubble	−0.122	−0.040	0.111***	0.178***
	(0.153)	(0.686)	(< 0.001)	(< 0.001)
NASDAQ	0.130	0.202**	0.125***	0.165***
	(0.125)	(0.037)	(< 0.001)	(< 0.001)
High-Tech	0.027	0.064	0.016	0.023
	(0.852)	(0.656)	(0.565)	(0.423)
Financial	−0.157	−0.178	−0.131***	−0.192***
	(0.126)	(0.114)	(< 0.001)	(< 0.001)
Venture Capital		−0.026		−0.033
		(0.825)		(0.235)
Lockup		0.205*		0.171***
		(0.098)		(< 0.001)
Log(ME)		−0.042		0.026
		(0.596)		(0.199)
Log(BE/ME)		0.162**		0.119***
		(0.020)		(< 0.001)
Young/Large		0.109**		0.129***
		(0.014)		(0.002)
Low Reputation/Large		−0.019		−0.031
		(0.720)		(0.414)
Intercept	−3.089***	−3.361**	−1.266***	−1.701***
	(0.006)	(0.019)	(< 0.001)	(< 0.001)
Observations	20,424	19,636	5,882	5,669
Adjusted *R*-square	0.034	0.054	0.039	0.050

This table presents a regression analysis of *Institutional Abnormal Outperformance* in post-IPO institutional trading. The dependent variable is *Institutional Abnormal Outperformance* measured as the institutional abnormal return minus the IPO buy-and-hold abnormal return (both are adjusted by the matched Fama/French 25 size and book-to-market portfolio buy-and-hold value-weighted return). The first two columns report results using all sample institutions. The last two columns report results using only identified institutions. Most independent variables are as defined before. *Participating* is a dummy variable that equals one if the institution receives an allocation in the IPO, and zero otherwise. *Young/Large* is a dummy variable that equals one if the IPO firm is young (younger than the sample mean age of 14 years) and the trading is done by a large institution (more than $10 billion in annualized dollar principal traded), and zero otherwise. *Low Reputation/Large* is a dummy variable that equals one if the IPO is underwritten by a low-reputation lead underwriter (i.e., with a reputation rank lower than 9.1) and the trading is done by a large institution, and zero otherwise. The unit of observation is an IPO/institution pair. *P*-values, which are in parentheses, are adjusted using White's robust standard errors with clustering on IPOs. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 9 shows that institutional outperformance is more pronounced when there is higher information asymmetry about the IPO firm—namely, in younger IPOs and IPOs underwritten by less reputable investment banks (i.e., coefficients on both *Log(Age+1)* and *Log(Reputation)* are negative and significant). As for economic magnitudes, a one-standard-deviation increase in *Log(Age+1)* (*Log(Reputation)*) leads to a decrease of 8.7% (9.5%) in abnormal outperformance based on Model 1 (8.2% for *Log(Age+1)* and 5.0% for *Log(Reputation)* in Model 2). The coefficients on the interactive term *Young/Large* are positive and significant. This result suggests that large institutions have especially higher abnormal outperformance in post-IPO trading when they trade in younger issuers, which tend to be informationally opaque. In terms of economic significance, a one-standard-deviation increase in *Log(Institution Size)* leads to an increase of 4.4% in abnormal outperformance based on Model 1. In Model 2, which includes the two interactive terms, the coefficient on *Log (Institution Size)* is positive but insignificant. In addition, the coefficient on the interactive term *Young/Large* suggests that when large institutions trade in young IPO firms, they achieve an additional 10.9% abnormal outperformance.

Consistent with our previous univariate results, Models 3 and 4 show that participating institutions generate significantly higher abnormal outperformance in post-IPO trading than nonparticipating institutions. Specifically, the abnormal outperformance by participating institutions is 14 percentage points higher than nonparticipating institutions, consistent with our earlier discussion of the greater information advantage enjoyed by institutions participating in IPO allocations. Consistent with earlier univariate results, the outperformance of institutions tends to be stronger in hotter IPOs (i.e., coefficients on *Initial Return* are positive and significant in all specifications). There is some evidence that institutions outperform more in NASDAQ IPOs. Institutions also appear to outperform more in IPOs with lockup provisions. Being sophisticated investors, institutional investors may be able to avoid the pitfalls of lockup expiration (see, e.g., Brav and Gompers 2003, who show that stock prices for IPOs decline at the time of lockup expiration).

7. Institutional Trading and Subsequent Long-run IPO Performance

In the previous two sections, we studied the realized profitability of institutional IPO allocation sales and post-IPO trading. We now use all sample institutions to study whether institutional trading can predict subsequent long-run IPO performance. We then use identified institutions to study whether trading by institutions that participate in IPO allocations has more predictive power than by nonparticipating institutions. We extend Krigman, Shaw, and Womack (1999) by using transaction-level institutional trading data that include the direction of each trade and studying institutional net buying (buying minus selling) in IPOs. We also analyze the information content of institutional trading beyond the immediate post-IPO period.

7.1 Can Institutional Trading Predict Subsequent Long-run IPO Performance?

Figure 3 plots the relation between trading in IPOs by all sample institutions over time and subsequent long-run IPO performance. As before, the first year post-IPO is divided into 13 trading periods. *Net Buying* for each trading period is the total shares bought by institutions minus the total shares sold by institutions normalized by shares offered in the IPO. We then sort our sample IPOs into quintiles based on *Net Buying*. The lowest, middle three, and highest quintiles of institutional *Net Buying* are categorized as low, moderate, and high IPOs, respectively. *Subsequent Raw Return* is the IPO one-year buy-and-hold raw return starting after each of the 13 trading periods. *Subsequent Abnormal Return* is the difference between *Subsequent Raw Return* and the return on the matched Fama/French 25 size and book-to-market portfolio.

The High – Low differences in subsequent raw and abnormal returns are plotted in Figure 3. If institutional trading is informative, then the return differences should be positive—i.e., the IPOs bought by institutions should experience higher subsequent returns than IPOs sold by institutions. There is a clear downward sloping trend over time. For the first two days, month 1, and month 2, High – Low subsequent raw and abnormal returns are all highly positive (in

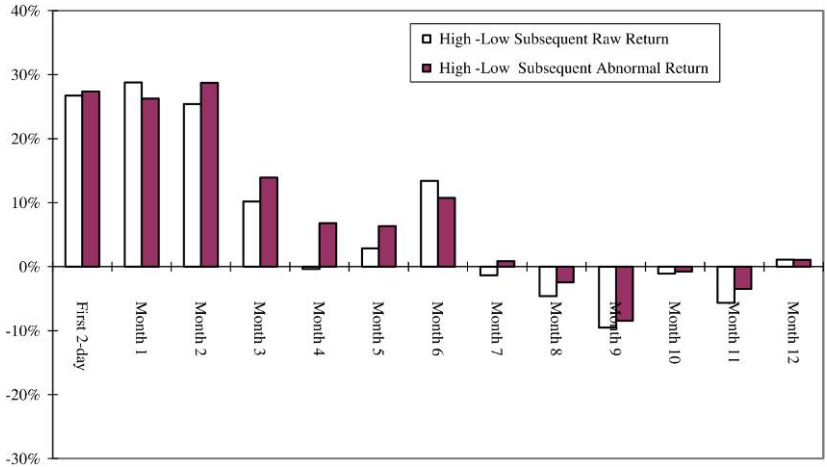

Figure 3
Institutional Trading and Subsequent Long-run IPO Performance
This figure plots the relation between trading in IPOs by all sample institutions over time and subsequent long-run IPO performance. As before, the first year post-IPO is divided into 13 trading periods. *Net Buying* for each trading period is the total shares bought by all sample institutions minus the total shares sold by all sample institutions normalized by the number of shares offered in the IPO. For initial sample IPOs, the lowest, middle three, and highest quintiles of *Net Buying* are categorized as low, moderate, and high IPOs, respectively. *Subsequent Raw Return* is the IPO one-year buy-and-hold raw return starting after each of the 13 trading periods. If delisted, the CRSP delisting return is used. *Subsequent Abnormal Return* is the difference between *Subsequent Raw Return* and the matched Fama/French 25 size and book-to-market portfolio buy-and-hold value-weighted return. The mean High – Low differences in subsequent raw and abnormal returns are plotted in the figure.

results not reported here, these return differences are all statistically significant at the 1% or 5% level). For month 3, the return differences are still positive but smaller (they are only marginally statistically significant). After month 3, the return differences become smaller and sometimes are even negative (none of these later return differences are statistically significant). These results suggest that although institutions do possess private information immediately after an IPO, their information advantage decays over time.

7.2 Can Institutional Trading Predict Subsequent Long-run IPO Performance after Controlling for Publicly Available Information?

In this subsection, we study the relation between institutional trading and subsequent long-run IPO performance in a regression framework. The question here is whether institutional trading can predict long-run IPO performance after controlling for publicly available information (and factors known to affect expected stock returns: size and book-to-market). We run the following regression for each of the 13 trading periods:

$$\begin{aligned} Subsequent\,Abnormal\,Return = {} & \alpha + \beta_1 Net\ Buying + \beta_2 Log(Age+1) \\ & + \beta_3 Log(Reputation) \\ & + \beta_4 Initial\ Return + \beta_5 Log(Proceeds) \\ & + \beta_6 Bubble + \beta_7 NASDAQ \\ & + \beta_8 High\text{-}Tech + \beta_9 Financial \\ & + \beta_{10} Venture\ Capital + \beta_{11} Lockup \\ & + \beta_{12} Log(ME) + \beta_{13} Log(BE/ME) \\ & + \varepsilon. \end{aligned} \tag{4}$$

Table 10 reports the results of our regression analysis of institutional trading over time and subsequent long-run IPO performance. The dependent variable is *Subsequent Abnormal Return*, which is the IPO one-year buy-and-hold return (starting one day after each of the 13 trading periods) net of the return on the matched Fama/French 25 size and book-to-market portfolio. *Net Buying* is as defined in Section 7.1. The definitions of other independent variables can be found in Section 4.3.

Table 10, Panel A, reports results on the predictive power of institutional trading for subsequent abnormal returns using all sample institutions. The results show that our univariate results plotted in Figure 3 are robust to controlling for variables reflecting publicly available information. In particular, institutional trading (*Net Buying*) can predict long-run IPO performance even after controlling for publicly available information. In other words, the information advantage possessed by institutions appears to be derived from private

Table 10
Regression Analysis of Institutional Trading and Subsequent Long-run IPO Abnormal Performance

Panel A: All Institutions

Trading Period	First 2-Day	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Net Buying	**1.144***	**0.941****	**1.584****	**1.194****	**0.972****	**0.225**	**0.290**	**0.619****	**0.067**	**−0.146**	**0.096**	**−0.016**	**−0.220**
	(**0.056**)	(**0.019**)	(**0.031**)	(**0.012**)	(**0.017**)	(**0.557**)	(**0.401**)	(**0.030**)	(**0.822**)	(**0.539**)	(**0.705**)	(**0.936**)	(**0.338**)
Log(Age+1)	0.153***	0.156***	0.153***	0.146***	0.127***	0.113***	0.113***	0.119***	0.102***	0.102***	0.085***	0.084***	0.084***
	(0.003)	(0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(0.001)	(< 0.001)	(0.002)	(0.004)	(0.006)
Log(Reputation)	0.397**	0.185	0.132	0.067	0.101	0.149	0.072	0.117	0.093	0.068	−0.087	−0.089	−0.167
	(0.039)	(0.275)	(0.344)	(0.578)	(0.353)	(0.189)	(0.515)	(0.264)	(0.407)	(0.525)	(0.395)	(0.412)	(0.150)
Initial Return	−0.137*	−0.081	−0.062	−0.059	−0.058	−0.086**	−0.083**	−0.068*	−0.083*	−0.078*	−0.078**	−0.086**	−0.073
	(0.063)	(0.209)	(0.249)	(0.203)	(0.163)	(0.048)	(0.049)	(0.088)	(0.052)	(0.059)	(0.049)	(0.042)	(0.102)
Log(Proceeds)	−0.143	−0.065	−0.078	−0.039	−0.018	−0.025	−0.013	−0.010	−0.053	0.007	0.028	−0.018	0.019
	(0.187)	(0.493)	(0.316)	(0.563)	(0.768)	(0.691)	(0.834)	(0.861)	(0.397)	(0.911)	(0.628)	(0.764)	(0.775)
Bubble	−0.231**	−0.283***	−0.266***	−0.211***	−0.234***	−0.270***	−0.229***	−0.177***	−0.147**	−0.103	−0.100	−0.109*	−0.137**
	(0.047)	(0.006)	(0.002)	(0.004)	(< 0.001)	(< 0.001)	(0.001)	(0.005)	(0.030)	(0.108)	(0.107)	(0.098)	(0.049)
NASDAQ	−0.202	−0.103	−0.152	−0.179*	−0.110	−0.129	−0.064	−0.103	−0.173*	−0.196**	−0.146*	−0.146*	−0.141
	(0.190)	(0.445)	(0.175)	(0.063)	(0.207)	(0.155)	(0.465)	(0.218)	(0.055)	(0.022)	(0.074)	(0.094)	(0.129)
High-Tech	0.077	0.028	0.012	−0.010	−0.042	−0.059	−0.031	−0.059	−0.076	−0.069	−0.058	−0.038	−0.031
	(0.393)	(0.720)	(0.852)	(0.853)	(0.406)	(0.260)	(0.546)	(0.222)	(0.145)	(0.162)	(0.225)	(0.455)	(0.569)
Financial	0.142	0.086	0.113	0.119	0.128	0.099	0.138	0.104	0.144	0.131	0.099	0.064	0.076
	(0.419)	(0.579)	(0.376)	(0.277)	(0.198)	(0.342)	(0.171)	(0.278)	(0.162)	(0.180)	(0.289)	(0.518)	(0.474)
Venture Capital	−0.013	−0.029	−0.028	−0.037	−0.035	−0.007	0.058	0.025	0.028	0.018	0.024	0.045	0.068
	(0.891)	(0.738)	(0.696)	(0.545)	(0.526)	(0.909)	(0.301)	(0.642)	(0.622)	(0.744)	(0.644)	(0.413)	(0.246)
Lockup	−0.191**	−0.156*	−0.122*	−0.106*	−0.096*	−0.062	−0.056	−0.062	−0.060	−0.057	−0.029	−0.015	−0.036
	(0.044)	(0.061)	(0.075)	(0.074)	(0.072)	(0.270)	(0.302)	(0.228)	(0.280)	(0.281)	(0.561)	(0.786)	(0.529)
Log(ME)	0.016	0.020	0.024	0.008	−0.017	−0.025	−0.021	−0.057	−0.044	−0.083	−0.080	−0.055	−0.079
	(0.869)	(0.812)	(0.736)	(0.891)	(0.755)	(0.667)	(0.706)	(0.283)	(0.441)	(0.125)	(0.126)	(0.317)	(0.181)
Log(BE/ME)	−0.165**	−0.103	−0.057	−0.047	−0.042	−0.039	−0.023	−0.033	−0.044	−0.074*	−0.069*	−0.039	−0.048
	(0.023)	(0.106)	(0.274)	(0.294)	(0.301)	(0.360)	(0.576)	(0.399)	(0.294)	(0.067)	(0.072)	(0.341)	(0.266)
Intercept	1.202	0.089	0.441	0.164	0.239	0.527	0.286	0.852	1.503**	1.211**	1.055*	1.477**	1.449**
	(0.248)	(0.922)	(0.560)	(0.801)	(0.684)	(0.391)	(0.631)	(0.132)	(0.013)	(0.036)	(0.057)	(0.012)	(0.021)
Observations	864	864	864	864	864	864	864	864	864	864	864	864	864
Adjusted *R*-square	0.033	0.038	0.053	0.070	0.078	0.076	0.063	0.073	0.058	0.064	0.057	0.052	0.050

(*continued*)

Table 10
Continued

Panel B: Identified Institutions, Partitioned by Participation in Allocation

Trading Period	First 2-Day	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Net Buying by Participants	**1.957** ∗ ∗	**1.682** ∗ ∗∗	**1.842** ∗ ∗	**1.453** ∗ ∗∗	**1.174** ∗ ∗	**0.182**	**0.515**	**0.870** ∗ ∗∗	**0.267**	**−0.304**	**0.122**	**0.158**	**−0.331**
	(**0.012**)	(**0.001**)	(**0.026**)	(**0.003**)	(**0.014**)	(**0.695**)	(**0.259**)	(**0.006**)	(**0.435**)	(**0.219**)	(**0.638**)	(**0.409**)	(**0.163**)
Net Buying by Nonparticipants	**−0.048**	**−0.486**	**−1.288**	**−0.449**	**−0.360**	**−0.119**	**0.033**	**−0.182**	**−0.913**	**0.664**	**−0.877**	**−0.962**	**1.276**
	(**0.965**)	(**0.491**)	(**0.466**)	(**0.706**)	(**0.729**)	(**0.908**)	(**0.956**)	(**0.812**)	(**0.277**)	(**0.324**)	(**0.307**)	(**0.138**)	(**0.175**)
Log(Age+1)	0.150∗∗∗	0.157 ∗ ∗∗	0.151 ∗ ∗∗	0.144 ∗ ∗∗	0.123 ∗ ∗∗	0.110 ∗ ∗∗	0.110 ∗ ∗∗	0.113 ∗ ∗∗	0.100 ∗ ∗∗	0.097 ∗ ∗∗	0.088 ∗ ∗∗	0.079 ∗ ∗∗	0.079 ∗ ∗∗
	(0.004)	(0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(0.001)	(< 0.001)	(< 0.001)	(0.003)	(0.007)
Log(Reputation)	0.461 ∗ ∗	0.246	0.217	0.140	0.165	0.161	0.084	0.142	0.162	0.161	0.082	0.069	−0.029
	(0.039)	(0.209)	(0.172)	(0.305)	(0.188)	(0.221)	(0.506)	(0.232)	(0.186)	(0.161)	(0.436)	(0.540)	(0.815)
Initial Return	−0.158 ∗ ∗	−0.104	−0.076	−0.063	−0.063	−0.088 ∗ ∗	−0.087 ∗ ∗	−0.077∗	−0.092 ∗ ∗	−0.080 ∗ ∗	−0.085 ∗ ∗	−0.104 ∗ ∗∗	−0.080∗
	(0.037)	(0.115)	(0.160)	(0.168)	(0.136)	(0.047)	(0.042)	(0.054)	(0.027)	(0.042)	(0.019)	(0.007)	(0.058)
Log(Proceeds)	−0.192∗	−0.118	−0.127	−0.077	−0.045	−0.052	−0.045	−0.035	−0.067	−0.009	0.023	−0.035	0.016
	(0.089)	(0.234)	(0.115)	(0.263)	(0.479)	(0.436)	(0.487)	(0.566)	(0.284)	(0.873)	(0.668)	(0.540)	(0.802)
Bubble	−0.248 ∗ ∗	−0.304 ∗ ∗∗	−0.285 ∗ ∗∗	−0.224 ∗ ∗∗	−0.241 ∗ ∗∗	−0.286 ∗ ∗∗	−0.249 ∗ ∗∗	−0.198 ∗ ∗∗	−0.195 ∗ ∗∗	−0.152 ∗ ∗	−0.151 ∗ ∗∗	−0.153 ∗ ∗	−0.175 ∗ ∗∗
	(0.038)	(0.004)	(0.001)	(0.002)	(< 0.001)	(< 0.001)	(< 0.001)	(0.002)	(0.003)	(0.013)	(0.008)	(0.011)	(0.009)
NASDAQ	−0.231	−0.116	−0.180	−0.213 ∗ ∗	−0.145	−0.163∗	−0.114	−0.121	−0.166∗	−0.211 ∗ ∗	−0.095	−0.148∗	−0.155∗
	(0.161)	(0.420)	(0.123)	(0.034)	(0.118)	(0.093)	(0.223)	(0.168)	(0.067)	(0.013)	(0.225)	(0.075)	(0.094)
High-Tech	0.063	0.014	−0.015	−0.033	−0.058	−0.068	−0.037	−0.065	−0.064	−0.052	−0.040	−0.020	−0.014
	(0.493)	(0.862)	(0.816)	(0.555)	(0.257)	(0.209)	(0.474)	(0.188)	(0.206)	(0.271)	(0.356)	(0.665)	(0.786)
Financial	0.129	0.071	0.115	0.132	0.144	0.127	0.176	0.140	0.165	0.159∗	0.173∗	0.112	0.107
	(0.490)	(0.668)	(0.387)	(0.250)	(0.172)	(0.252)	(0.101)	(0.163)	(0.110)	(0.100)	(0.053)	(0.233)	(0.311)
Venture Capital	−0.033	−0.046	−0.039	−0.041	−0.038	−0.008	0.064	0.028	0.050	0.043	0.040	0.068	0.094∗
	(0.746)	(0.604)	(0.590)	(0.508)	(0.505)	(0.891)	(0.265)	(0.610)	(0.368)	(0.405)	(0.409)	(0.182)	(0.098)
Lockup	−0.196 ∗ ∗	−0.157∗	−0.127∗	−0.111∗	−0.097∗	−0.066	−0.065	−0.063	−0.061	−0.059	−0.027	−0.005	−0.036
	(0.046)	(0.068)	(0.069)	(0.065)	(0.079)	(0.258)	(0.246)	(0.227)	(0.260)	(0.241)	(0.568)	(0.926)	(0.519)
Log(ME)	0.025	0.040	0.043	0.020	−0.014	−0.015	−0.007	−0.037	−0.020	−0.059	−0.060	−0.029	−0.065
	(0.806)	(0.649)	(0.556)	(0.748)	(0.801)	(0.804)	(0.901)	(0.491)	(0.716)	(0.256)	(0.214)	(0.570)	(0.252)
Log(BE/ME)	−0.158 ∗ ∗	−0.087	−0.047	−0.038	−0.041	−0.038	−0.021	−0.026	−0.032	−0.064∗	−0.056	−0.033	−0.048
	(0.034)	(0.184)	(0.378)	(0.398)	(0.330)	(0.385)	(0.620)	(0.520)	(0.437)	(0.097)	(0.113)	(0.385)	(0.254)

continued

Table 10
Continued

Panel B: Identified Institutions, Partitioned by Participation in Allocation

Trading Period	First 2-Day	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Intercept	1.923∗	0.644	0.871	0.556	0.602	0.844	0.627	0.902	1.160∗	0.874	0.374	0.945	0.956
	(0.099)	(0.528)	(0.293)	(0.433)	(0.356)	(0.219)	(0.342)	(0.146)	(0.070)	(0.146)	(0.497)	(0.106)	(0.143)
Observations	827	827	827	827	827	827	827	827	827	827	827	827	827
Adjusted *R*-square	0.036	0.043	0.058	0.079	0.083	0.079	0.069	0.081	0.068	0.076	0.070	0.064	0.052

This table presents regression analysis of trading by all institutions over time and subsequent long-run IPO abnormal performance. Panel A presents results for all sample institutions. Panel B breaks up net buying by identified institutions into that by participating institutions and that by nonparticipating institutions. The dependent variable is *Subsequent Abnormal Return*, which is the difference between *Subsequent Raw Return* and the matched Fama/French 25 size and book-to-market portfolio buy-and-hold value-weighted return. *Subsequent Raw Return* is the IPO one-year buy-and-hold raw return starting after each of the 13 trading periods. If delisted, the CRSP delisting return is used. Most independent variables are as defined before. *Net Buying* for each trading period is the total shares bought by institutions minus the total shares sold by institutions normalized by the number of shares offered in the IPO. *P*-values are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

information. In terms of economic significance, for example, a one-standard-deviation increase in *Net Buying* during the first two days leads to an increase of 7.8% in *Subsequent Abnormal Return* (8.4% for *Net Buying* during the first month). The overall pattern of the informativeness of institutional net buying after controlling for publicly available information is very similar to the univariate results plotted in Figure 3—i.e., the predictive power of institutional net buying decays over time, and it becomes insignificant after the initial four months post-IPO. After a company goes public, it has to make a significant amount of information publicly available (e.g., audited financial statements), which reduces outsiders' cost of information production. Therefore, our results suggest that institutions have a greater information advantage when the cost of producing information is higher (during the immediate post-IPO period). Institutions may gradually lose this information advantage as more and more information about the IPO firm becomes publicly available. As for the control variables, older IPOs (and, to some extent, IPOs underwritten by more reputable investment banks) tend to have better long-run performance. Hotter IPOs, IPOs issued during the bubble period, NASDAQ IPOs, and IPOs with lockup provisions tend to have worse long-run performance.

We make use of the identified institution sample to examine whether participating institutions have better information regarding IPOs than nonparticipating institutions. Table 10, Panel B, reports results using only identified institutions. We decompose the *Net Buying* variable into net buying by participating institutions and net buying by nonparticipating institutions. Our results show that although the predictive power of net buying by participating institutions is robust after controlling for publicly available information, the predictive power of net buying by nonparticipating institutions disappears. This result echoes our earlier findings that participating institutions earn higher profits in post-IPO trading than nonparticipating ones. This is consistent with institutions that participate in IPO allocations having a significant information advantage over those that do not, as a result of the former institutions acquiring additional information during the IPO bookbuilding process.

8. Conclusion

In this article, we analyzed the role of institutional investors in IPOs using a large sample of proprietary transaction-level institutional trading data. The theoretical literature on IPOs has long argued that institutional investors possess private information about IPOs and that underpricing is a mechanism for compensating them to reveal this private information. We investigated whether institutions indeed have private information about IPOs, retain their information advantage in post-IPO trading, and are able to realize significant profits from their participation in IPOs. We also studied institutional IPO allocations and allocation sales to analyze whether institutions play an important role in supporting IPOs in the aftermarket and are rewarded by underwriters for playing

such a role. We found that institutions sell 70.2% of their IPO allocations in the first year, fully realize the "money left on the table," and do not dissipate these profits in post-IPO trading. Further, institutions hold allocations in IPOs with weaker post-issue demand for a longer period, and they are rewarded for this by underwriters with more IPO allocations. Finally, institutional trading has predictive power for long-run IPO performance, especially in IPOs in which they received allocations; however, this predictive power decays over time. Overall, our results suggest that institutional investors possess significant private information about IPOs, play an important supportive role in the IPO aftermarket, and receive considerable compensation for their participation in IPOs.

Appendix A: Details of Matching Abel/Noser Data with Spectrum 13f Data

In this appendix, we describe how we match Abel/Noser's institution IDs (denoted *clientcode*) with Spectrum's institution IDs (denoted *mgrnum*). There are 840 institutions in the Abel/Noser database, out of which 419 institutions satisfy our data requirements to be included in the IPO trading sample (i.e., 13 consecutive months of trading data and traded in at least one sample IPO). There are 3,864,132 institution-firm-quarters in the Abel/Noser database and 13,089,377 institution-firm-quarters in Spectrum.

We first clean the observations in both databases to reduce potential measurement errors in the matching. For the Abel/Noser database, we delete the *clientcode-quarters* that report no stock trades in any month of a calendar quarter. This restriction deletes institutions that enter or exit the Abel/Noser database in the middle of a quarter or fail to file their stock trades for some months of a calendar quarter. To avoid unnecessary complications, we require all *firm-quarters* to satisfy the following five restrictions for both databases: (a) the firms must be publicly traded U.S. domestic firms that issue only one class of common stock traded on one of the three major stock exchanges; (b) there are no stock splits, stock delistings, or IPOs in the calendar quarter; (c) the stock price at the beginning of the calendar quarter is greater than \$5 and the number of common shares outstanding at the beginning of the calendar quarter is greater than one million shares; (d) the net quarterly institutional ownership change should be more than 500 shares (our matching results are the same if we require a minimum of 100 shares); and (e) each firm-quarter must be present in both databases.

These sample restrictions reduce the Abel/Noser database to 2,677,564 institution-firm-quarters and reduce the Spectrum database to 6,862,411 institution-firm-quarters. The loss of observations is largely due to restrictions (a) and (d).

We match Abel/Noser's *clientcodes* with Spectrum's *mgrnums* as follows. For both databases, we compute each institution's quarterly change in stock ownership (in number of shares) for each stock (*permno*), denoted ΔIO. For each pair of *clientcode* and *mgrnum*, we define *N_ABEL* as the total number of firm-quarters that have nonmissing ΔIO in the Abel/Noser database and *N_BOTH* as the total number of firm-quarters that have nonmissing ΔIO in both databases. By definition, *N_BOTH* is always less than or equal to *N_ABEL*. For each pair of *clientcode* and *mgrnum*, we define *N_SAME_*ΔIO as the number of firm-quarters in which the values of ΔIO from the two databases are identical. *MATCH1* is *N_SAME_*ΔIO divided by *N_ABEL* and represents the percentage of a *clientcode*'s firm quarters whose quarterly institutional ownership changes are equal to a *mgrnum*'s quarterly institutional ownership changes in the same firm-quarters.

For each *clientcode*, we retain the *mgrnum* with the highest *MATCH1* (denoted *mgrnum_1*st and *MATCH1_1*st, respectively) and the *mgrnum* with the second highest *MATCH1* (denoted *mgrnum_2*nd and *MATCH1_2*nd, respectively). For example, assume that *clientcode*=001 has valid data in two firm-quarters, IBM-1999-Q1 and DELL-2000-Q2. For IBM-1999-Q1, *mgrnum*=100

and *mgrnum*=200 have the same ΔIO as *clientcode*=001. For DELL-2000-Q2, only *mgrnum*=100 has the same ΔIO. Then, for *clientcode*=001, *mgrnum*=100's *MATCH1*=100% (the highest), and *mgrnum*=200's *MATCH1*=50% (the second highest).

Even if a pair of *clientcode* and *mgrnum* belong to the same institution, *MATCH1* is unlikely to equal 100% for several reasons. These are also reasons why we are only able to identify a relatively small fraction of the institutions in the Abel/Noser database.

a) The Spectrum database does not contain all the stock trades for all the institutions. Small institutions with less than $100 million in equity securities are not required to file the 13f form with the SEC. Even if an institution is required to file the 13f, it is only required to disclose common stock positions greater than 10,000 shares or $200,000.
b) Most Abel/Noser institutional clients are pension plan sponsors, who frequently subcontract out management of their assets to outside investment managers. In these cases, the plan sponsors' holdings are not reported by the plan sponsors themselves, but are reported by the outside investment managers instead. This means that the Spectrum database will not contain complete holdings by such plan sponsors. In these cases, however, Abel/Noser data will still include all trading by these plan sponsors, because Abel/Noser obtains these data from the plan sponsors' custodian banks. This is perhaps one of the main reasons why we are able to identify only a relatively small fraction of the institutions in the Abel/Noser database: Many of Abel/Noser's clients are pension plan sponsors.
c) In a similar vein, mutual fund companies also sometimes subcontract out management of some of their funds.
d) Some institutions may report their stock positions under one *clientcode* in Abel/Noser but under several different *mgrnums* in Spectrum. For example, we find that Fidelity Management & Research (FMR Co.) and Fidelity International are separate companies in Spectrum (they report under different *mgrnums*) even though they are both subsidiaries of Fidelity Investments and share the same *clientcode* in the Abel/Noser database.
e) The stock holdings reported in Spectrum may not reflect the holdings exactly at the end of a calendar quarter (see Tufano, Quinn, and Taliaferro 2006), and thus ΔIO in Spectrum may not be the same as ΔIO in the Abel/Noser database.

Because of these reasons, *MATCH1* could be low even if a pair of *clientcode* and *mgrnum* belong to the same institution. To mitigate this problem, we also define an alternative matching score (denoted *MATCH2*) that is identical to *MATCH1* except that ΔIO in Spectrum is deemed identical to ΔIO in Abel/Noser as long as the absolute difference in ΔIO across the two databases is less than 10% of the absolute ΔIO from Abel/Noser.

We follow two basic principles to match *clientcodes* with *mgrnums*. First, there must be a reasonable number of common firm-quarters (i.e., *N_BOTH*) for each pair of *clientcode* and *mgrnum* so that the matching scores *MATCH1* and *MATCH2* are reliable. Second, *MATCH1_1*st (*MATCH2_1*st) should be as high as possible while *MATCH1_2*nd (*MATCH2_2*nd) should be as low as possible. We use the following four sequential iterations to identify 103 matched pairs of *clientcode-mgrnum*. The stringency of the matching conditions declines from iteration 1 to iteration 4.

Iteration 1 requires the following matching conditions: *N_BOTH*>=100 firm quarters; *MATCH1_1*st >= 10%; *MATCH2_1*st >= 20%; *MATCH1_2*nd <= 1%; and *MATCH2_2*nd <= 5%. We selected the cutoffs for iteration 1 based on the empirical distributions of the variables. Iteration 1 results in 62 matched pairs of *clientcode-mgrnum*.

Iteration 2 relaxes some of the matching conditions in iteration 1 as follows: *N_BOTH*>= 100 firm quarters; *MATCH1_1*st >= 5%; *MATCH2_1*st >= 15%; *MATCH1_2*nd <= 1%; and *MATCH2_2*nd <= 5%. Iteration 2 results in 24 additional matched pairs of *clientcode-mgrnum*.

Iteration 3 repeats iterations 1 and 2 after deleting the 84 matched pairs of *clientcode-mgrnum* from iterations 1 and 2. However, iteration 3 results in no additional matched pairs of

clientcode-mgrnum. For the remaining unmatched *clientcodes* and *mgrnums*, iteration 4 requires that *N_BOTH*>=100 firm-quarters and either *MATCH1_1*st >=5% or *MATCH2_1*st >=10%. Those conditions result in a total of 32 pairs of *clientcode-mgrnum*, from which we retain 17 additional matched pairs of *clientcode-mgrnum* whose *MATCH1_1*st dominates *MATCH1_2*nd, or *MATCH2_1*st dominates *MATCH2_2*nd.

To summarize, we are able to identify 103 institutions in the entire Abel/Noser database. For the 419 institutions in our IPO institutional trading sample, this results in 48 institutions being identified.[22]

Appendix B: Details of Algorithm for Identifying Institutional IPO Allocation Sales

For each IPO/institution pair, we implement the following algorithm recursively every day starting from the first IPO trading day ($t = 1$) to trading day 252 ($t = 252$). Note that the algorithm below needs to be implemented recursively every trading day, since whether a given sale of IPO shares by an institution is classified as IPO allocation sales depends on the number of shares bought and sold in the secondary market until that point in time by that institution. For example, if an institution sells 100 shares of an IPO on the first day and then buys 500 shares of the same IPO on the second day, the 100 shares sold on the first day are clearly allocation sales, since the institution could have obtained the 100 shares it sold only from IPO allocations. However, if we reverse the order of these two trades (i.e., if an institution buys 500 shares on the first day and then sells 100 shares on the second day), the 100 shares sold cannot be classified as allocation sales, since, conservatively, these 100 shares can be viewed as part of the 500 shares bought by the institution in the secondary market (in this case, both trades are classified as post-IPO trading). The two numerical examples in Figure 1 also illustrate this point. In both examples, from day 1 to day 3, there are 1,000 shares bought and 1,200 shares sold. However, by switching day 1's and day 2's transactions, there are 500 shares allocation sales in example 1, but only 200 shares allocation sales in example 2.

For each IPO/institution pair, we calculate the number of shares bought on day t, $N_B(t) = \sum_{j=1}^{B_t} N_B(j)$, where B_t is the number of buy trades in the IPO for the institution on day t, and $N_B(j)$ is the number of shares bought in the jth trade, at price $P(j)$, and with trading commissions paid $COM(j)$. Similarly, the number of shares sold on day t is $N_S(t) = \sum_{j=1}^{S_t} N_S(j)$. The change in the institution's IPO position on day t is given by the number of shares bought minus shares sold, as follows:

$$\Delta POS(t) = N_B(t) - N_S(t). \tag{A1}$$

We can calculate the cumulative IPO position from "pure" post-IPO trading (buying and selling in the secondary market, excluding IPO allocation sales) as follows:

$$POS_{POSTIPO}(t) = POS_{POSTIPO}(t-1) + \Delta POS_{POSTIPO}(t), \tag{A2}$$

where

$$POS_{POSTIPO}(0) = 0,$$

and

$$\Delta POS_{POSTIPO}(t) = \max\left(\Delta POS(t),\ -POS_{POSTIPO}(t-1)\right).$$

[22] We have also redone the entire empirical analysis in this article, making use of institutional trading data matched using only criteria (iteration) 1 and 2 above. All our results remain qualitatively unchanged even with this more restrictive matching procedure.

The IPO allocation shares sold on day t are then given by

$$N_S^{ALLO}(t) = -\min\left(0,\ POS_{POSTIPO}(t-1) + \Delta POS(t)\right). \tag{A3}$$

And finally, shares bought and sold in "pure" post-IPO trading excluding IPO allocation sales are given by

$$\begin{aligned} N_B^{POSTIPO}(t) &= N_B(t) \\ N_S^{POSTIPO}(t) &= N_S(t) - N_S^{ALLO}(t)\ . \end{aligned} \tag{A4}$$

References

Aggarwal, R. 2003. Allocation of Initial Public Offerings and Flipping Activity. *Journal of Financial Economics* 68:111–35.

Aggarwal, R., N. Prabhala, and M. Puri. 2002. Institutional Allocation in Initial Public Offerings: Empirical Evidence. *Journal of Finance* 57:1421–42.

Barber, B. M., and T. Odean. 2001. Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment. *Quarterly Journal of Economics* 116:261–92.

Benveniste, L. M., and P. A. Spindt. 1989. How Investment Bankers Determine the Offer Price and Allocation of New Issues. *Journal of Financial Economics* 24:343–62.

Boehmer, B., E. Boehmer, and R. Fishe. 2006. Do Institutions Receive Favorable Allocations in IPOs with Better Long-run Returns? *Journal of Financial and Quantitative Analysis* 41:809–28.

Brav, A., and P. A. Gompers. 2003. The Role of Lockups in Initial Public Offerings. *Review of Financial Studies* 16:1–29.

Carter, R. B., F. H. Dark, and A. K. Singh. 1998. Underwriter Reputation, Initial Returns, and the Long-run Performance of IPO Stocks. *Journal of Finance* 53:285–311.

Carter, R., and S. Manaster. 1990. Initial Public Offerings and Underwriter Reputation. *Journal of Finance* 45:1045–67.

Chemmanur, T. J. 1993. The Pricing of Initial Public Offerings: A Dynamic Model with Information Production. *Journal of Finance* 48:285–304.

Conrad, J. S., K. M. Johnson, and S. Wahal. 2001. Institutional Trading and Soft Dollars. *Journal of Finance* 56:397–416.

Cornelli, F., and D. Goldreich. 2001. Bookbuilding and Strategic Allocation. *Journal of Finance* 56:2337–69.

Ellis, K. 2006. Who Trades IPOs? A Close Look at the First Days of Trading. *Journal of Financial Economics* 79:339–63.

Ellis, K., R. Michaely, and M. O'Hara. 2000. When the Underwriter Is the Market Maker: An Examination of Trading in the IPO Aftermarket. *Journal of Finance* 55:1039–74.

Field, L. C., and J. Karpoff. 2002. Takeover Defenses of IPO Firms. *Journal of Finance* 57:1857–89.

Field, L. C., and M. Lowry. 2005. Institutional versus Individual Investment in IPOs: The Importance of Firm Fundamentals. Working Paper, Penn State University.

Fulghieri, P., and M. Spiegel. 1993. A Theory of the Distribution of Underpriced Initial Public Offers by Investment Banks. *Journal of Economics and Management Strategy* 2:509–30.

Gaspar, J., M. Massa, and P. Matos. 2005. Shareholder Investment Horizons and the Market for Corporate Control. *Journal of Financial Economics* 76:153–65.

Goldstein, M., P. Irvine, E. Kandel, and Z. Wiener. 2009. Brokerage Commissions and Institutional Trading Patterns. *Review of Financial Studies* 22:5175–212.

Griffin, J. M., J. H. Harris, and S. Topaloglu. 2007. Why Are IPO Investors Net Buyers Through Lead Underwriters? *Journal of Financial Economics* 85:518–51.

Hanley, K. W., and W. J. Wilhelm, Jr. 1995. Evidence on the Strategic Allocation of Initial Public Offerings. *Journal of Financial Economics* 37:239–57.

Hu, G., B. Ke, and Y. Yu. 2010. Do Transient Institutions Overreact to Small Negative Earnings Surprises? Working Paper, Penn State University.

Investment Company Institute (ICI). 2004. *Mutual Fund Fact Book*, 44th ed. Washington, DC.

Irvine, P., M. Lipson, and A. Puckett. 2007. Tipping. *Review of Financial Studies* 20:741–68.

Jones, C. M., and M. L. Lipson. 2001. Sixteenths: Direct Evidence on Institutional Execution Costs. *Journal of Financial Economics* 59:253–78.

Keim, D. B., and A. Madhavan. 1995. Anatomy of the Trading Process: Empirical Evidence on the Behavior of Institutional Traders. *Journal of Financial Economics* 37:371–98.

Krigman, L., W. H. Shaw, and K. L. Womack. 1999. The Persistence of IPO Mispricing and the Predictive Power of Flipping. *Journal of Finance* 54:1015–44.

Lipson, M., and A. Puckett. 2010. Institutional Trading During Extreme Market Movements. Working Paper, University of Virginia.

Ljungqvist, A., and W. J. Wilhelm. 2002. IPO Allocations: Discriminatory or Discretionary? *Journal of Financial Economics* 65:167–201.

———. 2003. IPO Pricing in the Dot-com Bubble. *Journal of Finance* 58:723–52.

Loughran, T., and J. R. Ritter. 2002. Why Don't Issuers Get Upset about Leaving Money on the Table in IPOs? *Review of Financial Studies* 15:413–43.

———. 2004. Why Has IPO Underpricing Changed over Time? *Financial Management* 33:5–37.

Perold, A. F. 1988. The Implementation Shortfall: Paper versus Reality. *Journal of Portfolio Management* 14:4–9.

Ritter, J. R. 1991. The Long-run Performance of Initial Public Offerings. *Journal of Finance* 46:3–27.

Ritter, J. R., and I. Welch. 2002. A Review of IPO Activity, Pricing, and Allocations. *Journal of Finance* 57:1795–828.

Rock, K. 1986. Why New Issues Are Underpriced. *Journal of Financial Economics* 15:187–212.

Tufano, P., M. Quinn, and R. Taliaferro. 2006. Live Prices and Stale Quantities: T+1 Accounting and Mutual Fund Mispricing. Working Paper, Harvard Business School.