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Why are IPO investors net buyers through lead underwriters?☆

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Abstract

In Nasdaq initial public offerings (IPOs) issued between 1997 and 2002, purchases of lead underwriter clients exceed sales by an amount equal to 8.79% of the total issue. We find that lead underwriter clients do not buy to build larger long-term positions, capitalize on superior execution quality, or because of clientele effects. However, characteristics of net buying that are at odds with these explanations and other behaviors (like institutional purchases of cold IPOs) are all consistent with lead underwriters engaging in quid pro quo arrangements with clients. Price

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contribution analysis shows that such client buying activity contributes significantly to first-day price increases.

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1. Introduction

In 1999 and 2000, shares of initial public offerings (IPOs) soared an average of 71.7% and 56.1% on the first day of trading, respectively, transferring more than $65 billion of wealth from issuers to fortunate shareholders through underpricing.[1] While many studies focus on the puzzle of why issuing firms leave large sums of money on the table, it is perhaps even more perplexing that sophisticated underwriters also presumably forgo the substantial fees associated with this underpricing ($4.6 billion during 1999–2000).[2] This paper provides evidence consistent with a partial explanation for this puzzle. Specifically, we find that underwriters seem to receive quid pro quo benefits from underpricing, such as pre-arranged client demand in the aftermarket.

This paper focuses on client trading in the IPO aftermarket. We document persistent net buying in trades executed through the bookrunner (lead underwriter) and address three main questions. First, is this net buying through the bookrunner particular to the bookrunner, or do other market makers face similar order flow? Second, why are bookrunner clients net buyers? Third, what is the effect of this net buying on IPO prices?

Using a unique sample of Nasdaq IPO trading by brokerage houses for the 1997–2002 period, we find that on the first day of public trading, bookrunner clients buy an amount equal to 20.64% of shares issued but sell only 11.85%, for a net buy imbalance of 8.79%. This pattern of net buying by bookrunner clients obtains across most brokerage houses, time periods, and IPOs with varying degrees of underpricing. Bookrunner client net buying contrasts noticeably with small net selling by clients of other syndicate members.

We explore four main explanations for bookrunner client buy imbalances. Our tests focus on: (1) whether demand from long-term shareholders creates these imbalances, (2) whether the bookrunner attracts a disproportionate amount of buy orders by offering superior execution quality, (3) whether bookrunners attract and serve investor clienteles with strong demand for IPO shares, and (4) whether 'laddering'—quid pro quo agreements whereby underwriters require or induce clients to buy aftermarket shares—results in net buy imbalances.

Laddering, beyond the term's appeal for provocative headlines (Pulliam and Smith, 2000), finds economic motivation from models by Fulghieri and Spiegel (1993) and Loughran and Ritter (2002). In those models, underwriters are able to extract indirect

[1]These numbers are taken from Ritter and Welch's (2002) survey of the extensive IPO literature. Ljungqvist (2006) also provides a comprehensive survey of the IPO literature.

[2]As per Chen and Ritter (2000), $4.6 billion is 7% of the underpricing in 1999 and 2000 based on a flat fee of 7% of capital raised.

rents from clients in exchange for underpriced shares. Fulghieri and Spiegel model how an investment bank allocates underpriced shares to clients who provide business for other parts of the bank. Loughran and Ritter provide an explanation for the firm's ex ante choice of an underwriter who is likely to underprice the issue ex post. Because underpricing is lucrative for clients of the underwriter who receive IPO allocations, these clients engage in rent-seeking behavior to increase their probability of receiving shares.

The working assumption in the IPO industry is that there is a negatively sloped demand curve. Thus, if a bookrunner fails to generate sufficient client demand for an IPO, then subsequent issuers may view the underwriter as a poor promoter. Laddering arrangements, by exchanging aftermarket trading for underpricing benefits, help to bond initial IPO investors to demand for shares in the secondary market. In the case of particularly weak demand, these quid pro quo arrangements allow bookrunners to substitute client purchases for direct aftermarket support. Laddering clients comply with these agreements in cold IPOs because they do not wish to be excluded from future deals. Conversely, if underwriters generate excess demand via laddering, this demand can be used to support higher secondary market prices, boosting reputation capital and providing bookrunners additional revenues through these pre-committed aftermarket trades.

To economize on monitoring costs, laddering predicts that the net buying should be driven by institutional shareholders buying through the lead underwriter. Laddering is also more likely to be associated with highly active underwriters, whose threat of exclusion from future deals is greatest. Additionally, if laddering clients purchase shares in the aftermarket solely to fulfill quid pro quo commitments, they have no long-term interest in holding shares and IPOs with large net buying should experience net institutional selling in the future. Similarly, these commitments are likely to be more important in cold IPOs, for which aftermarket support is more essential. Finally, laddering clients are likely to be less concerned about execution costs and may even pay higher execution costs than other clients.

Of course, there are other reasons to think that the bookrunner's clients will be stronger net buyers than those of other brokerage houses. Client net buying on the first day of the IPO may simply be due to institutional investors who have a genuine desire to hold the stock; these investors would see benefits to purchasing the stock early. Indeed, given the dominance of the lead underwriter in the IPO process, these institutional investors are likely to purchase the security through the lead underwriter. Aggarwal (2003) and Zhang (2004) argue that institutional investors with a small allocation will either flip or buy additional shares in the aftermarket. Underwriters may take advantage of the fact that institutional investors target positions above a certain size. The bookrunner, interested in fostering long-term shareholders, may strategically allocate "toeholds" to institutional shareholders to encourage buying in the aftermarket. A distinguishing prediction of this long-term shareholders hypothesis is that IPOs with large initial bookrunner client buying should have a stable institutional shareholder base over time.

Buying through the lead underwriter could also be due to the bookrunner offering more attractive prices to encourage buying (or discourage selling). If this were true, then we would expect to see superior execution quality for buy trades and/or inferior execution quality for sell trades executed through the lead underwriter as compared to other market makers. Lastly, customers with excess demand for IPOs may migrate to brokerage houses that specialize in issuing IPOs to receive larger share allocations. We denote these two alternatives as the execution quality and clientele hypotheses, respectively.

We test these predictions jointly by utilizing the bookrunner client net buying activity immediately following an IPO. We employ comprehensive brokerage-level data for a set of 1,294 Nasdaq IPOs. Since we do not have information about specific clients or IPO allocants, overall client net buying through the lead underwriter proxies for client activity. Consistent with institutional traders driving the net buying through the lead underwriter, we find that all of the net buying of bookrunner clients is due to trades of 1,000 shares or more and 88% is due to trades of 5,000 shares or more. Moreover, we find consistently positive net buying through the bookrunner across IPO "temperatures" and price ranges—strong buying at prices just above the offer price is particularly noticeable in colder IPOs. Net buy demand from bookrunner clients is also more prevalent for investment banks that issue many IPOs in our sample. Each of these results is consistent with laddering.

We find that IPOs with higher levels of bookrunner client buying experience more institutional selling over the four subsequent quarters. The finding that these purchases represent transient investor holdings is consistent with bookrunner clients taking initial positions to fulfill short-term commitments, but not with demand from long-term shareholders. Furthermore, we find that in the trade-size categories in which net buying occurs, the bookrunner actually offers worse execution compared to nonsyndicate brokerage houses. This result is at odds with execution quality differences generating net buying through the bookrunner, but consistent with institutional investors agreeing ex ante to purchase shares regardless of trading costs. Lastly, we find no evidence of clienteles—clients are consistently large net buyers when their brokerage house is the bookrunner but are typically small net sellers when the same brokerage house is just another member of the syndicate. In sum, our results are strongly consistent with the laddering hypothesis and inconsistent with other explanations.

To address the relation between client net buying and price movements, we explore the effect of first-day bookrunner client net buying activity on IPO prices both in the short term and over longer periods. Most bookrunner client net buying occurs in the first 30 minutes of IPO trading, suggesting that this demand likely contributes to the opening secondary market price. We perform a price contribution analysis over the first day of trading and find that for those IPOs that increase in price, bookrunner client purchases of 1,000 shares or more are responsible for roughly half of the positive price movement. For IPOs that decrease in price on the first trading day, bookrunner clients play only a small role in driving prices down. However, we find only weak and mostly insignificant evidence linking first-day bookrunner client net buying to return reversals over longer periods.

Our findings relate to the growing body of literature examining the dual role of underwriter/market maker that investment banks play (e.g., Schultz and Zaman, 1994; Ellis, Michaely, and O'Hara, 2000; and Ellis, 2006). The findings suggest that interdealer trading documented by Ellis results from net sales through nonsyndicate dealers flowing back to the bookrunner to service net client demand. This evidence, which is consistent with quid pro quo arrangements, is also in line with recent IPO papers that find empirical support for other types of agency conflicts (Ljungqvist and Wilhelm, 2003; Nimalendran, Ritter, and Zhang, 2006; Reuter, 2006). Hao (2006) models some implications of laddering.

The remainder of the paper is organized as follows. Section 2 discusses the alternative hypotheses about different buying and selling patterns across members of the syndicate as well as their distinguishing testable predictions. We discuss the data and summarize the characteristics of our Nasdaq IPO sample in Section 3. Section 4 provides empirical evidence on aftermarket client trading imbalances, and Section 5 tests predictions of the previously outlined hypotheses. Section 6 examines both the short- and long-run relations between client net buying and prices. We discuss accounting issues related to how initial shares sold might arise from short selling or flipping in Section 7. Finally, we conclude in Section 8.

2. Explanations for differential buying patterns through the lead underwriter

Below we detail four explanations for net buying activity through the lead underwriter. We then characterize the distinguishing testable implications associated with each explanation.

2.1. Laddering

A substantial amount of controversy surrounds the turbulent IPO activity of the "internet bubble" period. One argument is that underwriters allocated issues to favored institutional clients with the understanding that the clients would buy more shares of these IPOs in the aftermarket. Such activity is referred to as laddering, in that it may help to push prices to higher levels through artificial demand. Laddering involves a quid pro quo relationship between underwriters and their clients: clients receive IPO share allocations with the implicit or explicit understanding that they will purchase additional shares in the aftermarket. In the case of reneging, underwriters enforce these alleged arrangements by withholding future IPO allocations.[3]

Concerns about laddering are not new. In 1961, 1984, and again in 2000, the SEC issued warning statements that laddering violates antifraud and antimanipulation security laws.[4] Jay Ritter notes that while it is known that laddering occurred in the past with penny stock underwriters, it "generally has not been a focus of allegations against prestigious underwriters until recently" (Harris, 2001). However, as Barry Barbash, former director of the SEC's Division of Investment Management, states, "proving this kind of conspiracy as a practical matter is very difficult" (Loomis, 2001).

To understand why and when aftermarket buying is valuable to the underwriter, we must examine the lead underwriter's incentives. The lead underwriter bears primary responsibility for the success of the IPO. Estimating the demand for an IPO is difficult, and the bookrunner works to ensure that all shares can be sold. Failing to sell the IPO is costly for the bookrunner, as it results in both lost revenues from the IPO as well as reputational damage.[5] Further, in the event of a cold IPO, the bookrunner incurs direct costs of supporting the IPO if the bookrunner purchases shares that later fall when price support is

[3]In a similar vein, Hanley and Wilhelm (1995) argue that quid pro quo arrangements likely affect allocations: clients participate in less attractive issues so that they can receive allocations in hot IPOs. Chen and Wilhelm (2005) provide an economic rationale for coordination between the bookrunner and institutional investors, arguing that collaboration smoothes the IPO's transition to secondary market trading.

[4]Securities Exchange Act Release No. 6536 (April 24, 1961); Report of the SEC Concerning the Hot Issues Markets (August 1984); SEC Staff Legal Bulletin No. 10 (August 25, 2000).

[5]For instance, Strasbourger Pearson Tulcin Wolff, Inc. underwrote the failed Claimsnet.com IPO in December 1998 and subsequently lost the business to Cruttenden Roth (which successfully took the firm public four months later).

removed.[6] To avoid poorly received IPOs, the underwriter therefore has the incentive to maximize IPO underpricing.

However, because the bookrunner is typically paid a flat commission fee based on the amount of capital raised, the bookrunner balances the incentive to underprice against lower underwriting fees. Fulghieri and Spiegel (1993) and Loughran and Ritter (2002) demonstrate that underpricing can be used by the underwriter to increase nonunderwriting revenues. Nonunderwriting revenues can stem from a variety of other bank functions such as brokerage trading, custodial duties, risk management, and advisory services. These rents can accrue indirectly by inducing business legally or directly through illegal payments such as excess commissions.[7]

Given these motivations, we can see that laddering is attractive to the bookrunner. These arrangements shift costly aftermarket price support to clients and, to the extent that laddering pushes secondary market prices higher, create underpricing that can be used to extract revenues in other parts of the business, including directly adding commissions from laddering trades. Since the demand for an IPO is uncertain and laddering agreements are agreed upon ex ante, even if the underwriter's main motivation for client net buying is to provide aftermarket price support, laddering may induce net buying in all IPOs, including those that open and trade above the initial offering price. These agreements are advantageous for the underwriter in reducing uncertainty: the buying provides aftermarket price support for colder IPOs but also boosts prices for hotter IPOs, both of which are beneficial outcomes for the bookrunner. Without access to the direct financial incentives of each underwriter, it is not possible to know whether the underwriter's incentive to use client buying to support prices in cold IPOs is stronger than the incentive to use client buying to push prices higher for rent extraction. However, while investors are not enthusiastic about cold IPOs, laddering clients interested in preserving access to future IPOs are likely to follow through with aftermarket commitments in all IPOs.

It is important to note that we can only examine aggregate trading at the brokerage house level, since we do not have data on client-level trading and allocations. If some clients engage in laddering purchases but other clients flip their shares (either legitimately or in an effort to rebate profits to the underwriter), then net buying activity at the brokerage house level should understate the magnitude of buying due to laddering.

Laddering allegations suggest pre-arranged unconditional buying support by large institutional clients, which should lead to more persistent net buying through the bookrunner in large trades than in small trades. This implication is formalized in our first testable hypothesis:

H1.1: *Bookrunner Client Net Buying in Large Trades > Bookrunner Client Net Buying in Small Trades.*

As discussed above, without information on the underwriter's profit function it is not possible to know whether laddering clients will buy more in cold, cool, warm, or hot IPOs.

[6] Hanley, Kumar, and Seguin (1993), Ruud (1993), and Aggarwal (2000) each explore stabilization activities in greater detail. Aggarwal reports that covering short positions costs the underwriter 3.61% of underwriting fees.

[7] During our sample period, the SEC uncovered evidence of underwriters explicitly tracking and collecting up to 65% of underpricing profits through active trading in other liquid stocks (SEC Litigation Release No. 17327). Excessive trading in other liquid securities and excessive mutual fund commissions are documented by Nimalendran, Ritter, and Zhang (2006) and Reuter (2006), respectively.

Nevertheless, in the presence of laddering, we should definitely see buying in cold IPOs as there is a direct price support benefit to the underwriter in that case. We summarize this idea in hypothesis H1.2:

H1.2: *Bookrunner Client Net Buying in Large Trades* >0 *|Cold IPO.*

Since the most likely penalty for a client not purchasing shares in the aftermarket is withholding allocations in future IPOs, it is easier to enforce such laddering agreements for underwriters that issue many IPOs. Thus, we expect a positive relationship between laddering activity (as proxied by client net buying in large trades) and the number of IPOs issued by the bookrunner. We formalize this idea in hypothesis H1.3:

H1.3: *Correlation (Bookrunner Client Net Buying in Large Trades, Number of IPOs Issued)* >0.

However, since active underwriters generally enjoy a higher reputation and they have more to lose if they are caught in a laddering arrangement, their laddering incentives are tempered. We discuss other predictions related to laddering as we turn to the predictions of our other hypotheses.

2.2. Strategic allocations to long-term shareholders

Bookrunners may strategically allocate shares to investors with long-term interest in the stock. If these shareholders' allocations are rationed in any way, they may be induced to add to their holdings when secondary market trading begins. A variant of this hypothesis suggests that the lead underwriter allocates shares to institutional investors with a genuine interest to hold the stock and these investors increase their positions early in the trading process by purchasing through the lead underwriter. Since underwriters focus on investors who can hold sizeable positions, the long-term shareholders hypothesis predicts that buy imbalances arise due to institutional investor trades which we proxy for with large trades (as we do for hypothesis H1.1).

A distinguishing feature is that if the net buying activity is due to long-term shareholders, strong aftermarket buy imbalances by large traders should result in more stable long-term institutional holdings, that is, IPOs with strong aftermarket bookrunner client buying should have fewer shares sold by institutions in subsequent quarters than IPOs with weak initial bookrunner client buying. Formally,

H2: *Correlation (Bookrunner Client Net Buying, Long-Term Change in Institutional Ownership)* >0.

It is important to note that the intention of an aftermarket buyer to be a long-term shareholder does not preclude the existence of laddering agreements. Nevertheless, one would expect that some laddering clients would fulfill these short-term commitments with no intention of holding shares for the long-run. Laddering therefore predicts the opposite relation from H2.

2.3. Execution quality

The bookrunner may also generate client buy imbalances by offering superior buy trade execution (i.e., allowing their customers to buy within posted spreads) and/or inferior sell trade execution. Clients that are churning shares, potentially speculating on short-term price changes, might see an advantage in buying shares through the lead underwriter and selling through another brokerage house. Consistent with this possibility, Ellis (2006) finds evidence of the bookrunner offering price improvement to buy trades. To investigate the superior execution hypothesis, we investigate whether the bookrunner offers differential execution quality relative to all other nonsyndicate brokerage houses. Since execution varies by trade size and net buying should be particularly heavy in the trade sizes that receive price improvement, we investigate execution quality across multiple trade-size groups. The execution quality hypothesis predicts that bookrunner clients pay lower average effective half-spreads (measured by the difference between the trade price and the quoted bid-ask midpoint) compared to nonsyndicate market maker clients. This forms our hypothesis 3:

H3: *Bookrunner Effective Half-Spreads < Nonsyndicate Effective Half-Spreads | Trade-Size Group.*

Since the bookrunner imbalances could arise as a result of offering inferior prices to those wishing to sell shares, we examine sell trade execution quality as well.

If a client is induced to buy in the aftermarket to fulfill a quid pro quo obligation, then the client would likely not be as focused on execution quality as in a normal trading situation. Additionally, the bookrunner may charge higher spreads to extract rents from clients. For both of these reasons, the laddering hypothesis predicts the opposite relation from H3.

2.4. Clienteles

Certain investors may prefer to invest in young companies, such as IPO firms, with high volatility and growth potential. These clienteles may migrate their trading to brokerage houses that have a propensity to issue IPOs, and it may be natural for them to seek additional shares in the aftermarket. To investigate whether aftermarket client buying is due to pent-up demand by IPO investors, we examine client trading by brokerage house. The clientele hypothesis predicts that for a particular underwriter, net client aftermarket demand may be greater when the brokerage house is not the bookrunner (relative to the demand when the broker is the bookrunner), given that these clients receive a smaller allocation. Since much trading takes place through the lead underwriter, a less restrictive version of this hypothesis posits that the magnitude of net buying through a particular brokerage house when the brokerage is the lead will be strongly related to the magnitude of net buying when the brokerage house is a co-manager or other syndicate member. We summarize this conjecture in our hypothesis 4:

H4: *Correlation (Client Net Buying as Bookrunner$_U$, Client Net Buying as Non-Lead$_U$) > 0, where U denotes a particular underwriter.*

We discuss and test each of these hypotheses both independently and jointly in the following sections.

3. Data and summary statistics

Using the Thomson Financial Securities Data Company (SDC) new issues database, we identify IPOs from January 1997 to December 2002 and exclude certificates, ADRs, shares of beneficial interest, units, closed-end funds, REITs, companies incorporated outside the US, and IPOs not covered by the Center for Research in Securities Prices (CRSP) data. We collect characteristics of the offerings from SDC, calculate total shares issued by aggregating all the underwriter allocations for an IPO, and use the underwriter reputation rankings from Loughran and Ritter (2004) and are the company founding dates from both Field and Karpoff (2002) and Loughran and Ritter. We restrict our attention to Nasdaq IPOs, since we merge IPO characteristics with proprietary Nasdaq clearing data. Our final sample consists of 1,294 IPOs, with most listing in the first half of our sample period.

We collect Nasdaq clearing data that identifies all trades by brokerage house from January 1997 to December 2002 for the first 21 days of trading in each IPO. In addition to the brokerage house identification, the Nasdaq data identify both the buyer and the seller in each trade, allowing us to avoid misclassification errors that result from tick test rules. Each side of the trade is classified as to whether the market maker is trading for its own account (as a principal) or handling a trade for a brokerage client (as an agent). Thus, for each brokerage house we classify trades according to whether the market maker executes orders for a client or for its own inventory.[8] Since our focus is on the trading behavior of clients, we separately analyze trades executed through bookrunners, co-managers, other syndicate members, and nonsyndicate members.

Table 1 presents some summary statistics for our data, first for the whole period and then by year. Not surprisingly, the number of IPOs is highest in 1999 (390) and 1997 (332) and lowest in 2001 (45) and 2002 (38). For the whole sample period (1997 to 2002), the mean one-day return is 44.50% and the median return is 17.78%. The year-by-year IPO returns show that the large one-day returns are primarily driven by the 75.88% and 60.41% average returns in 1999 and 2000, respectively. The average one-week return is only slightly higher than the one-day return. However, the average one-month return is substantially higher at 57.53%, mainly due to the 109.55% return in 1999.

For a typical IPO in our sample, there is one bookrunner, two co-managers, and 12 syndicate members. The average bookrunner underwrites 42.13% of the total shares issued, co-managers underwrite 37.52%, and other syndicate members underwrite the remaining 20.35%. The amount of shares allocated by the bookrunner is typically much greater than the number of shares the bookrunner underwrites (Chen and Ritter, 2000;

[8] Even though each trade is included in our final data only once, some trades are routed multiple times. The Nasdaq data include both reported and nonreported legs of routed trades. After checking for consistency in principal/agent codes for each leg, we are able to classify 97.2% of the trades and 95.3% of the volume on the first trading day. We manually match underwriter names from SDC with Nasdaq market maker codes, accounting for mergers, changed names, and firms using multiple codes (for different trading desks, for instance).

Table 1
Summary statistics

This table provides cross-sectional means and medians of various IPO characteristics for a sample of Nasdaq IPOs issued between 1997 and 2002 for the whole sample period and for each year. 1-day return is the percentage increase from the offer price to the first closing price. 1-week return and 1-month return are the returns for the first five and 21 trading days, respectively. Numbers of bookrunners/co-managers/syndicate members are provided by Securities Data Company (SDC) new issues database. % underwritten by bookrunners/co-managers/syndicate members are the percentages of total shares underwritten by bookrunners/co-managers/syndicate members.

	All ($n=1294$)		1997 ($n=332$)		1998 ($n=202$)		1999 ($n=390$)		2000 ($n=287$)		2001 ($n=45$)		2002 ($n=38$)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Offer price	12.95	12.00	10.85	10.50	11.83	12.00	14.19	14.00	14.49	13.50	12.74	13.00	13.01	13.00
1-day return (%)	44.50	17.78	13.73	9.01	25.41	10.26	75.88	45.21	60.41	28.68	16.46	17.19	5.72	1.75
1-week return (%)	45.08	16.57	13.56	7.63	22.97	10.00	77.83	45.96	62.98	29.58	15.77	14.67	1.39	1.29
1-month return (%)	57.53	23.44	13.98	8.33	30.13	10.97	109.55	66.38	71.40	38.02	11.03	11.00	0.16	0.46
Number of bookrunners	1.03	1.00	1.01	1.00	1.01	1.00	1.03	1.00	1.05	1.00	1.09	1.00	1.26	1.00
% underwritten by bookrunners	42.13	39.40	41.61	34.50	41.59	36.52	40.67	39.16	42.98	41.76	45.35	43.12	54.28	50.07
Number of co-managers	1.97	2.00	1.21	1.00	1.52	2.00	2.36	2.00	2.44	2.00	2.53	2.00	2.66	2.00
% underwritten by co-managers	37.52	40.61	30.39	32.78	33.98	36.45	41.04	42.50	42.64	43.73	45.43	47.25	34.44	39.68
Number of syndicate members	12.02	12.00	14.36	15.00	11.69	12.00	11.79	11.00	11.02	10.00	8.64	9.00	7.26	8.00
% underwritten by syndicate members	20.35	19.24	28.00	30.00	24.43	24.83	18.29	17.90	14.38	13.50	9.22	9.00	11.28	9.91

Boehmer, Boehmer, and Fishe, 2006). Unfortunately, we do not have data on the actual allocations.

4. Persistent net buying through the bookrunner

Table 2 displays patterns of buying and selling behavior for clients of lead underwriters, co-managers, syndicate members, and nonsyndicate members on the first day of the IPO. Panel A shows that most of the first-day volume is due to the bookrunner's clients and clients of market makers that are not part of the syndicate. On average, bookrunner clients buy 20.64% of the total shares offered and sell 11.85%, resulting in a first-day net buy imbalance of 8.79% of the total shares issued.

Co-manager clients are responsible for a much smaller proportion of trading and are small net sellers of 0.63% of the shares issued. Trading through the other syndicate members accounts for only a small proportion of volume (consistent with Aggarwal and Conroy, 2000), with very small imbalances. Customers trading through nonsyndicate brokerage houses also sell more than they buy, which may reflect short-selling activities or attempts to mask sales by flipping through nonsyndicate brokerage houses, as we explore further in Section 7.

Consistent with Ellis, Michaely, and O'Hara (2000), the lead underwriter is a very active market maker, buying 23.07% of the shares issued and selling 21.55%, on average. This net buying (just 1.52%) is small compared to the 8.79% associated with their clients. Conversely, co-managers and other syndicate members experience little change in inventory positions on the first day of trading. Nonsyndicate members and their clients sell to offset bookrunner client buying. Total volume on the first day is approximately 112.3% of shares issued. Since Aggarwal (2003) finds that, on average, only 15% of the shares offered are flipped, the large amount of customer and market maker trading activity is consistent with the substantial churning activity documented by Ellis (2006).

Panel B of Table 2 presents trading as a percentage of total trading volume for the first day. Imbalances scaled by volume are similar in magnitude to those scaled by shares issued. Bookrunner client buying and selling represent 19.45% and 10.11% of first-day trading volume, respectively.[9]

Panel C displays total dollar value of first-day trading. The panel shows that over the whole sample, bookrunner clients buy shares worth $35.36 billion on the first day and sell $21.45 billion for a net buy imbalance of $13.91 billion. In contrast, the bookrunners buy $36.77 billion and sell $37.06 billion from their own inventory. Despite net buying of 1.52%, the bookrunner net dollar position is nearly flat because the bookrunners generally buy low and sell high.

Panel D displays dollar value of trading for each year. The panel shows that the largest dollar amounts of client net buying are in 1999 and 2000, with $4.86 and $6.21 billion, respectively. These levels of client net buying are more than four times the levels in other years.

Panel E displays year-by-year figures for trading through the bookrunner with net buying scaled by the number of shares issued. In 2000 and 2001, the pattern of net buying

[9] Although customers purchase shares through the lead underwriter slightly less often than through nonsyndicate market makers (19.45% vs. 23.12% of volume) for the whole sample, subperiod results (overlapping with Ellis, 2006) for the first half of 1997 show that customers are more likely to buy through the lead underwriter.

Table 2
First-day IPO trading characteristics by market maker and client type

This table provides cross-sectional first-day trading characteristics by investor type for a sample of Nasdaq IPOs issued between 1997 and 2002. Panels A and B present the average buy, sell, and buy-sell (imbalance) volume statistics as a percentage of the total shares issued and as a percentage of total trading volume, respectively. Buy and sell trades are first aggregated for each IPO individually and then averaged across all IPOs. Panel C presents the total dollar amount of trading for the whole sample (in millions). Panel D shows total dollar figures for trading through the bookrunner on behalf of clients and for their own inventory across years (in millions). Panel E displays the trading activity through the bookrunner as a percentage of total shares issued for each year in the sample.

	Clients			For own inventory		
	Buy	Sell	Buy–sell	Buy	Sell	Buy–sell
Panel A. Trading as a percentage of total shares issued						
Bookrunner	20.64	11.85	8.79	23.07	21.55	1.52
Co-manager	1.62	2.25	−0.63	3.73	3.67	0.05
Syndicate member	1.05	1.03	0.02	0.36	0.42	−0.06
Nonsyndicate	34.39	40.87	−6.48	27.44	30.66	−3.22
Panel B. Trading as a percentage of total trading volume						
Bookrunner	19.45	10.11	9.34	22.95	19.87	3.07
Co-manager	1.72	2.01	−0.29	3.48	3.47	0.01
Syndicate member	0.93	0.99	−0.06	0.46	0.55	−0.09
Nonsyndicate	23.12	32.34	−9.23	22.93	25.68	−2.75
Panel C. Total $ figures for the whole sample (in millions)						
Bookrunner	35,358	21,445	13,913	36,768	37,064	−296
Co-manager	2,772	4,329	−1,557	6,600	6,567	33
Syndicate member	1,961	1,970	−9	738	777	−39
Nonsyndicate	69,560	75,145	−5,585	47,495	53,953	−6,458
Panel D. Total $ figures for trading through the bookrunner across years (in millions)						
1997 ($n = 332$)	2,955	1,851	1,104	3,112	2,986	126
1998 ($n = 202$)	2,614	2,030	584	3,301	3,040	261
1999 ($n = 390$)	14,499	9,641	4,859	14,838	15,442	−603
2000 ($n = 287$)	13,251	7,042	6,209	13,104	13,516	−413
2001 ($n = 45$)	1,603	593	1,009	1,645	1,623	22
2002 ($n = 38$)	436	288	148	768	457	311
Panel E. Trading through the bookrunner as a percentage of total shares issued across years						
1997 ($n = 332$)	16.26	9.12	7.15	17.40	16.23	1.17
1998 ($n = 202$)	18.01	12.14	5.88	22.75	20.07	2.68
1999 ($n = 390$)	24.35	15.49	8.86	27.35	26.09	1.26
2000 ($n = 287$)	23.52	10.76	12.76	24.26	23.75	0.50
2001 ($n = 45$)	22.20	9.71	12.49	24.45	22.75	1.70
2002 ($n = 38$)	11.14	7.67	3.47	19.95	11.33	8.62

by bookrunner clients is extremely strong, with over 12% net buy imbalances. In 2000, the bookrunner net buy imbalance of 0.50% pales in comparison to the 12.76% for bookrunner clients. Bookrunner client net buying drops to only 3.47% in 2002, while the bookrunners purchase 8.62%.[10]

[10]Net buying continued through 2001 despite the Wall Street Journal coverage in December 2000 (Pulliam and Smith, 2000). Such evidence can be viewed as either inconsistent with laddering or consistent with the persistence

Fig. 1 examines changes in bookrunner client, co-manager client, and other syndicate member client holdings (scaled by the total number of shares issued) over the first 21

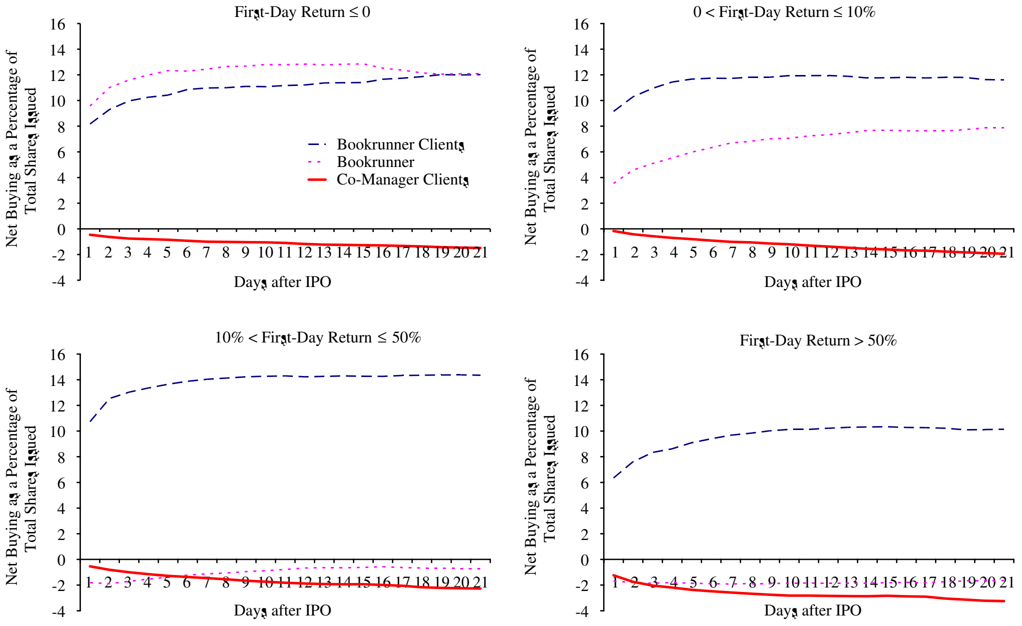

Fig. 2. Net buying by first-day return. For a sample of Nasdaq IPOs issued between 1997 and 2002, this figure presents aggregate buy-sell imbalances for bookrunner clients, bookrunners, and co-manager clients as a percentage of the total shares issued for the first 21 trading days. IPOs are classified into four groups according to first-day returns. Buy and sell trades are first aggregated for each IPO individually and then averaged within each first-day return group.

with first-day returns higher than 10% percent. On the other hand, bookrunner client net buying persists across first-day return categories. In sum, bookrunner client net buying is concentrated in the first few days of trading, persists across each sample year, and is present in cold, cool, warm, and hot IPOs.

5. Why is there client net buying?

We test the four hypotheses related to bookrunner client net buying that we outline in Section 2 in several ways. First, we examine trade-size results. We then test each of the hypotheses across IPO groups sorted by first-day client net buying. Third, since the hypotheses are not mutually exclusive, we exploit the cross-sectional variation in client net buying to jointly test the competing hypotheses through cross-sectional regressions that allow us to control for other potentially confounding effects. Finally, we further examine long-term shareholdings and first-day trading costs.

5.1. Trade size

Both the long-term shareholders and laddering hypotheses predict that client net buying is driven by institutional clients and thus predominantly by large trades. To examine the effect of trade size, in Table 3 we present buy, sell, and buy–sell (imbalance) volume by initial IPO returns for four trade-size groups. The table first shows that bookrunner client trades below 1,000 shares, which are likely to be individual investor trades, generate net are generally net sellers. Co-manager clients exhibit some small net buying through block trades in the hottest IPOs, but exhibit net selling in the coldest IPOs. With respect to nonsyndicate clients, small traders are consistently net buyers; large traders are net sellers in all four return categories, although the magnitude of net selling decreases with initial IPO returns.

We also examine the nature of the bookrunners' and their clients' net buying across price ranges within each initial IPO return category. Aggarwal (2000) discusses how the lead underwriter frequently takes a naked short position in IPOs in which weak demand is anticipated and then purchases shares in the aftermarket to provide price support and cover the position in the process. Consistent with this activity, we find that the lead underwriter buys in net at the offer price in cold IPOs. Interestingly, similar patterns obtain for bookrunner clients as well. In cold IPOs, bookrunner client purchases peak just above the offer price and are many times larger than nonsyndicate client purchases. Moreover, bookrunner client net buying through large trades is widely present in almost all price ranges across cold, cool, warm, and hot IPOs.

Overall, the results strongly indicate that bookrunner client net buying is driven by large trades (H1.1), is generally increasing in trade size, and differs substantially from the trading activity of co-manager and nonsyndicate clients. Client net buying through large trades is also observed in cold IPOs (H1.2).

5.2. Sorting results

In this subsection we first examine the relation between client net buying and the individual variables related to each hypothesis in Section 2 through simple sorts. We sort our sample into five groups according to bookrunner client net buying, focusing on trades that contribute to client imbalances (those at or above 1,000 shares) when forming quintiles. Variables that are positively related to net buying should be increasing in quintiles of client net buying. For example, the long-term shareholders hypothesis (H2) predicts a positive relation between client net buying and long-term institutional ownership. If bookrunner client net buying is due to long-term shareholders purchasing additional shares in the aftermarket, then we should see relatively more stable (or growing) long-term share ownership in the top quintile of first-day client net buying compared to the bottom quintile of client net buying.

To identify institutional investors that hold shares at the time of the first quarterly reporting date following the IPO, we use quarterly 13F filings.[12] We track holdings of these institutions through the next four quarters.[13] Unfortunately, we cannot capture ownership changes between the first day of aftermarket trading and the first reporting date. Consequently, to the extent that transient investors purchase shares on the first day but sell before the first reporting date to long-term holders, our estimates understate the amount of shares sold and bias our findings in favor of the long-term shareholders hypothesis and against the laddering hypothesis.

[12]All institutions with over $100 million under management are required to file 13F forms quarterly on all U.S. equity positions in which they own greater than 10,000 shares or $200,000. The data involve many known reporting issues that we thoroughly take into account before applying the data to our sample.

[13]While we do not know what fraction of our sample is initially allocated to institutions, Aggarwal, Prabhala, and Puri (2002) and Ljungqvist and Wilhelm (2002) find that 72.8% and 80.4% of the shares are allocated to institutional investors in their respective U.S. and international samples.

Table 4
Bookrunner client net buying quintiles

The sample of Nasdaq IPOs is ranked by bookrunner client net buying at or above 1,000 shares and assigned to quintiles. This table reports equal-weighted averages for various characteristics for each quintile. Bookrunner client net buying is the difference between the buy and sell volumes at or above 1,000 shares for bookrunner clients and is expressed as a percentage of the total shares issued. Changes in institutional ownership are computed with respect to the holdings of the institutional shareholders at the time of the first quarter-end after the IPO and are expressed as a percentage of shares outstanding. Effective half-spreads, computed as *effective half-spread*$_{it}$ = 100 $* D_{it} * (Price_{it} - Mid_{it})/Mid_{it}$, where D_{it} is a binary variable that equals one for buy trades and negative one for sell trades, $Price_{it}$ is the transaction price for security i at time t, and Mid_{it} is the midpoint of the quoted ask and bid prices, are calculated using trades at or above 1,000 shares. Effective half-spreads for each IPO are computed as volume-weighted averages. Average client net buying when bookrunner serves as co-manager/syndicate member is computed using trades at or above 1,000 shares in IPOs where the bookrunner serves as a co-manager/syndicate member and is expressed as a percentage of the total shares issued. Number of IPOs as bookrunner is the number of IPOs for which the bookrunner serves as a lead underwriter for the whole sample. The last two columns report the difference between the means for the high and low quintiles (H–L) and the *p*-value associated with the difference. Tests are performed to see whether effective half-spreads for bookrunner clients are different from effective half-spreads for co-manager/syndicate member/nonsyndicate clients within each quintile, and significance results are reported.

	L	2	3	4	*H*	*H–L*	*p*-val
Bookrunner client net buying	−3.95	3.56	8.13	13.75	25.33	29.28	0.000
Change in institutional ownership for							
1-quarter horizon	−2.46	−2.83	−2.65	−3.41	−4.26	−1.81	0.002
4-quarter horizon	−5.82	−6.17	−6.70	−7.03	−8.79	−2.97	0.004
Effective half-spreads for buy trades							
Bookrunner clients	−0.11	0.17	0.15	0.31	0.48	0.59	0.001
Co-manager clients	0.68[a]	0.41	0.11	0.14	0.23[a]	−0.45	0.085
Syndicate member clients	0.42[a]	0.45[a]	0.14	0.16	0.12[a]	−0.30	0.034
Nonsyndicate clients	0.53[a]	0.29	0.11	0.10[a]	0.02[a]	−0.51	0.000
Effective half-spreads for sell trades							
Bookrunner clients	0.62	0.62	0.65	0.39	0.25	−0.37	0.015
Co-manager clients	0.32	0.47	0.51	0.42	0.41	0.09	0.574
Syndicate member clients	0.27	0.23[a]	0.45	0.44	0.39	0.12	0.280
Nonsyndicate clients	0.37	0.45[b]	0.43[b]	0.35	0.34	−0.03	0.687
Average client net buying when							
Bookrunner serves as co-manager	−0.15	−0.16	−0.13	−0.04	−0.18	−0.03	0.562
Bookrunner serves as syndicate member	−0.05	−0.03	−0.05	−0.06	−0.06	−0.01	0.281
Number of IPOs as bookrunner	37.9	37.4	48.2	54.2	54.1	16.2	0.000

[a]Significant at 1%.
[b]Significant at 5%.

As Table 4 indicates, institutions that hold the stock as of the first 13F date generally sell significantly more shares during both the first quarter and the first year following the IPO when first-day bookrunner client net buying is the largest. During the first quarter, institutional holdings fall 4.26% for IPOs in the highest quintile of net buying but just 2.46% in the lowest quintile. Over the first four quarters, institutional holdings fall 8.79% in the highest quintile compared to 5.82% in the lowest quintile. These findings of less stable institutional holdings are largely consistent with laddering and do not support the long-term shareholders hypothesis (H2).

Table 4 also shows that effective half-spreads for bookrunner client buy trades are strongly positively related to client net buying. In fact, for the highest quintile of net buying, bookrunner client effective half-spreads average 0.48% compared to an average of negative 0.11% in the lowest quintile. More importantly perhaps, bookrunner clients pay higher spreads than co-manager, other syndicate member, and nonsyndicate clients in the top three quintiles of client net buying. The spreads for large buy trades executed through the bookrunner are significantly higher than the spreads paid by nonsyndicate clients in the top two quintiles. Effective half-spreads for sell trades exhibit less striking and largely insignificant patterns across quintiles and market maker types. These findings suggest that investors who churn shares on the first day have a greater incentive to buy through nonsyndicate brokers than through the lead underwriter. These results support laddering and directly contradict the execution quality hypothesis (H3).

The clientele hypothesis (H4) predicts that clients with an affinity for IPOs concentrate their trading with brokerage houses that specialize in issuing IPOs, purchasing more shares in the aftermarket. Because bookrunner client net buying dwarfs net buying through other syndicate members, our sorts test whether there is a positive relation between bookrunner client net buying and average client buying when the bookrunner serves as co-manager or syndicate member, as predicted in hypothesis H4. Average client net buying when the bookrunner serves as co-manager or syndicate member does not significantly differ across quintiles.

Bookrunners for IPOs in the top two quintiles of client net buying underwrite more than 54 IPOs during our sample period on average, whereas bookrunners in the lowest two quintiles underwrite fewer than 38 IPOs. In unreported results, we find that investment banks that issue more than 45 IPOs over our sample period experience bookrunner client net buying of 10.61% of shares issued, whereas banks that are the lead underwriter for less than ten IPOs experience client net buying of less than 4%. These results are consistent with the laddering hypothesis (H1.3).

Taken together, our univariate tests strongly support the laddering hypothesis and fail to support any of the alternatives. However, because these hypotheses are not mutually exclusive, we examine the four hypotheses both individually and jointly in cross-sectional regressions below.

5.3. *Cross-sectional regressions*

Table 5 presents cross-sectional regressions of bookrunner client net buying on variables related to the long-term shareholders, execution quality, clientele, and laddering hypotheses, expanding on the univariate sorting results in Table 4. With these regressions, we examine each hypothesis in isolation and we then examine all four hypotheses jointly, both with and without control variables representing other common IPO characteristics for robustness. Bookrunner client net buying in trades at or above 1,000 shares is our dependent variable; our results are mostly unchanged when we include all trades.

In the first regression in Table 5, the significantly negative coefficient on the one-quarter change in institutional ownership indicates that IPOs with large initial client buying subsequently experience significantly more institutional selling than IPOs with less initial client buying. Therefore, initial client purchases likely represent short-term shareholders (inconsistent with hypothesis H2).

To examine the execution quality hypothesis (H3), we calculate volume-weighted average effective half-spreads by market maker type for buy and sell trades separately, excluding trades under 1,000 shares. Because execution costs can vary across time and by

Table 5

Determinants of bookrunner client net buying

For a sample of Nasdaq IPOs issued between 1997 and 2002, this table presents regressions of bookrunner client net buying at or above 1,000 shares, expressed as a percentage of the total shares issued, on the following variables: Change in institutional ownership for 1-quarter-horizon and Change in institutional ownership for 4-quarter-horizon, computed with respect to the holdings of institutional shareholders at the time of the first quarter-end after the IPO; Difference in effective half-spreads for client buy trades, the difference between the volume-weighted average effective half-spreads for trades at or above 1,000 shares for bookrunner client buy trades and nonsyndicate client buy trades; Difference in effective half-spreads for client sell trades, the difference between the volume-weighted average effective half-spreads for trades at or above 1,000 shares for bookrunner client sell trades and nonsyndicate client sell trades; Client net buying in IPOs in which bookrunner is co-manager/syndicate member, the average client net buying for the same underwriter at or above 1,000 shares in IPOs in which the bookrunner serves as a co-manager/syndicate member; No. of IPOs by bookrunner, the log of the number of IPOs for which the bookrunner serves as a lead underwriter for the whole sample; First-day return, the percentage increase from the offer price to the first closing price in excess of the return on the Nasdaq Composite Index; Bookrunner net buying, the net first-day buy-sell imbalance of the bookrunner at or above 1,000 shares; Post-crash dummy, which equals one if the IPO was offered following the market break (April 1, 2000); No. of recent IPOs, the number of Nasdaq IPOs issued during the 60 days preceding the IPO; High-tech dummy, which equals one if the IPO firm is in the high-tech industry; % Secondary shares, the percentage of secondary shares offered relative to total shares offered; Risk, measured by the standard deviation of daily returns over the first year of IPO trading, excluding the first day's return; Revision, measured as (offer price−midpoint of filing price range)/midpoint of filing price range; Overallotment, measured as overallotment shares relative to shares offered; Syndicate size, the number of syndicate members; Age, the log of (1 + IPO year−founding year); Venture capital dummy, which equals one if the IPO is backed by venture capital; Bookrunner reputation, computed using rankings for the 1992–2000 period from Jay Ritter's website; and 15-day Nasdaq return, the buy-and-hold return on the Nasdaq Composite Index for the previous 15 trading days. All the variables are standardized by their cross-sectional means and standard deviations. We provide *t*-statistics in parentheses below the parameter estimates. Significant coefficients (at the 5% level) are denoted with *italics*.

	1	2	3	4	5	6	7	8
Change in institutional ownership for 1-quarter horizon	*−0.112*				*−0.091*		*−0.079*	
	(−3.62)				*(−2.98)*		*(−2.67)*	
Change in institutional ownership for 4-quarter horizon						*−0.084*		*−0.065*
						(−2.78)		*(−2.16)*
Difference in effective half-spreads for client buy trades		*0.260*			*0.211*	*0.211*	*0.144*	*0.142*
		(8.22)			*(6.19)*	*(6.26)*	*(4.11)*	*(4.12)*
Difference in effective half-spreads for client sell trades		0.014			−0.020	−0.019	−0.041	−0.041
		(0.43)			(−0.58)	(−0.58)	(−1.23)	(−1.25)
Client net buying in IPOs in which bookrunner is co-manager			−0.012		−0.005		−0.032	
			(−0.39)		(−0.18)		(−1.08)	
Client net buying in IPOs in which bookrunner is syndicate member						−0.009		−0.014
						(−0.28)		(−0.43)
No. of IPOs by bookrunner				*0.246*	*0.169*	*0.186*	*0.098*	*0.099*
				(8.64)	*(5.45)*	*(5.73)*	*(2.07)*	*(1.98)*
First-day return							*−0.277*	*−0.275*
							(−6.60)	*(−6.61)*
Bookrunner net buying							*−0.372*	*−0.372*
							(−11.51)	*(−11.66)*
Post-crash dummy							*0.185*	*0.178*
							(5.14)	*(5.02)*

Table 5 (*continued*)

	1	2	3	4	5	6	7	8
No. of recent IPOs							*0.142*	*0.137*
							(4.46)	*(4.40)*
High-tech dummy							−0.035	−0.028
							(−1.06)	(−0.85)
% Secondary shares							−0.042	−0.040
							(−1.34)	(−1.31)
Risk							0.011	0.010
							(0.31)	(0.27)
Revision							*0.080*	*0.084*
							(1.98)	*(2.13)*
Overallotment							*−0.080*	*−0.081*
							(−2.43)	*(−2.47)*
Syndicate size							*0.113*	*0.112*
							(3.63)	*(3.60)*
Age							0.042	0.045
							(1.34)	(1.44)
Venture capital dummy							0.034	0.039
							(1.03)	(1.19)
Bookrunner reputation							0.063	0.080
							(1.33)	(1.64)
15-day Nasdaq return							0.043	0.035
							(1.33)	(1.07)
N	1,030	1,112	1,096	1,161	984	1,006	823	839
Adj. R^2	0.012	0.063	−0.001	0.060	0.088	0.097	0.303	0.309

firm, we control for differences in execution costs by measuring the difference between bookrunner client and nonsyndicate client effective half-spreads on an IPO basis, separately for both buy and sell trades. The significantly positive coefficient on buy trade effective half-spread differentials in Table 5 indicates that there is more bookrunner client net buying in IPOs in which the bookrunner charges higher effective half-spreads relative to nonsyndicate brokerage houses. This result directly contradicts the execution quality hypothesis. A one-standard deviation increase in the difference between bookrunner and nonsyndicate spreads is contemporaneously associated with a 0.26-standard deviation increase in client buying. The difference in effective half-spreads for sell trades is unrelated to client net buying. The positive relation between client net buying and higher bookrunner spreads on purchases is consistent with the laddering hypothesis according to which client purchases provide additional revenue to bookrunners in the aftermarket.

Our regressions test whether bookrunner client net buying is related to the demand in other IPOs when the same underwriter is a co-manager or other syndicate member (H4). The insignificant negative coefficients for the co-manager and other syndicate roles provide no support for the clientele hypothesis. The significantly positive coefficient on the log of the number of IPOs underwritten by the bookrunner is consistent with the laddering hypothesis (H1.3). A one-standard deviation increase in the log of the number of IPOs issued is associated with a 0.25-standard deviation increase in client net buying.

We jointly examine our four hypotheses in the final four columns (5–8) of Table 5. Although significance drops slightly among most variables, the results above do not change. In the final two columns, we control for a myriad of IPO characteristics that have been found to be important in other studies of IPO underpricing. Each pattern documented above remains significant even though some of these control variables (e.g., bookrunner reputation) are correlated with variables related to our hypotheses (e.g., number of IPOs by the bookrunner). In addition, bookrunner client net buying is larger when first-day returns are lower, consistent with the laddering hypothesis of buying in cold IPOs (H1.2).

5.4. Further examination of long-term shareholding patterns

Our regressions of bookrunner client net buying in Table 5 include future changes in institutional ownership as an explanatory variable. Since net buying may be related to future changes in ownership, we regress the change in holdings of the institutional shareholders at the time of the first reporting date on the magnitude of first-day client buying in Table 6. We control for the first-day excess IPO return, the log of one plus the number of days from the IPO date to the first spectrum reporting date, lockup expiration, and quarterly fixed effects.

Panel A employs raw changes in initial institutional holdings as the dependent variable, while Panel B uses abnormal changes in initial holdings for each firm by computing the difference between the change in institutional holdings for the IPO and the average change for matched firms from the same size and book-to-market portfolio. Both panels show that at horizons up to the following four quarters, the change in ownership for the shareholders as of the first reporting date is significantly negatively related to bookrunner client net buying. These results are inconsistent with the hypothesis that strategic allocation leads to stable long-term shareholders, but consistent with aftermarket client buying representing transient investors.

5.5. Further examination of trading costs

We use effective half-spreads to measure execution quality. As an alternative, we compare the bookrunner price improvement rate (the proportion of buy trading volume executed below the ask price) to the nonsyndicate price improvement rate, focusing on the large trade-size groups that generate buy imbalances. In unreported results, we find that for block purchases, the lead underwriter, compared to nonsyndicate members, offers better price improvement rates more often (47.42% vs. 40.20% of the time) only in the lowest quintile of bookrunner client net buying. For each of the other quintiles, the lead underwriter offers price improvement less frequently. In the highest quintile, the lead underwriter price improvement rate is 32.30% compared to 43.57% for the nonsyndicate members. Ellis' (2006) finding that the lead underwriter offers its clients price improvement to encourage buying is present only in the lowest quintile of client net buying and not in our sample at large.

In sum, both univariate and multivariate tests favor the laddering hypothesis over the long-term shareholders, execution quality, and clientele hypotheses. Specifically, five features of the data are consistent with laddering. Bookrunner client net buying is driven by large (institutional) trades, is present in cold IPOs, is followed by greater institutional selling, is more prevalent for underwriters issuing a greater number of IPOs, and is associated with bookrunners charging clients higher, not lower, effective half-spreads (relative to other market makers).

Table 6
Cross-sectional ownership regressions

For a sample of Nasdaq IPOs issued between 1997 and 2002, this table presents regressions of raw (Panel A) and abnormal (Panel B) changes in institutional ownership for 1-quarter, 2-quarter, 3-quarter, and 4-quarter horizons on the following variables: Bookrunner client net buying, the net first-day buy-sell imbalances of bookrunner clients at or above 1,000 shares; First-day return, the percentage increase from the offer price to the first closing price in excess of the Nasdaq Composite Index return; Days, defined as the log of (1 + the number of days from the IPO date to the first quarter-end); Lockup dummies, which equal one if there is lockup expiration during a specific quarter, for each of the four quarters following the first quarter-end; and Quarter dummies. The data on institutional holdings is obtained from the Thomson Financial CDA/Spectrum Institutional Money Manager (13F) Holdings database. All changes are computed with respect to the holdings of institutional shareholders at the time of the first quarter-end after the IPO. Abnormal changes are computed by subtracting the changes in institutional holdings for the corresponding size and book-to-market portfolios constructed as in Brav and Gompers (1997). We provide *t*-statistics in parentheses below the parameter estimates. Significant coefficients (at the 5% level) are denoted with *italics*.

	Intercept	Bookrunner client net buying	First-day return	Days	Lockup dummies	Quarter dummies	*N*	Adj. R^2
Panel A								
Change in 1 quarter	*−0.026*	*−0.056*			No	No	1046	0.011
	(−10.90)	*(−3.54)*						
Change in 1 quarter	*−0.025*	*−0.057*			No	Yes	1046	0.037
	(−3.07)	*(−3.47)*						
Change in 1 quarter	−0.011	*−0.051*	0.003	−0.004	Yes	Yes	1030	0.044
	(−0.91)	*(−2.96)*	(1.21)	(−1.67)				
Change in 2 quarters	−0.029	*−0.056*	*0.010*	−0.002	Yes	Yes	1030	0.040
	(−1.74)	*(−2.48)*	*(2.84)*	(−0.67)				
Change in 3 quarters	−0.027	*−0.064*	*0.016*	−0.003	Yes	Yes	1030	0.039
	(−1.30)	*(−2.29)*	*(3.62)*	(−0.94)				
Change in 4 quarters	−0.023	*−0.076*	*0.018*	−0.006	Yes	Yes	1030	0.050
	(−1.01)	*(−2.49)*	*(3.78)*	(−1.45)				
Panel B								
Abnormal change in 1 quarter	0.004	*−0.045*			No	No	902	0.006
	(1.52)	*(−2.62)*						
Abnormal change in 1 quarter	−0.003	*−0.055*			No	Yes	902	0.066
	(−0.08)	*(−3.15)*						
Abnormal change in 1 quarter	0.020	*−0.045*	0.005	−0.002	Yes	Yes	891	0.078
	(0.47)	*(−2.50)*	(1.88)	(−0.80)				
Abnormal change in 2 quarters	0.048	*−0.054*	*0.015*	−0.002	Yes	Yes	891	0.100
	(0.79)	*(−2.16)*	*(3.90)*	(−0.60)				
Abnormal change in 3 quarters	0.055	*−0.065*	*0.023*	−0.003	Yes	Yes	891	0.119
	(0.73)	*(−2.08)*	*(4.77)*	(−0.85)				
Abnormal change in 4 quarters	0.052	*−0.079*	*0.027*	−0.005	Yes	Yes	891	0.143
	(0.63)	*(−2.28)*	*(5.01)*	(−1.15)				

6. How does net buying relate to prices?

Given large observed client buying, a natural question to ask is if client net buying affects prices. We examine the effects of bookrunner client buying on prices in three ways. First, we discuss the possible effects in the pre-market prior to an IPO. Second, we calculate each investor group's contribution to price changes on the first day of aftermarket trading. Third, we examine long-run IPO returns.

6.1. Opening price effects

Aggarwal and Conroy (2000) find that the bookrunner's opening quote (which is always the first quote entered—up to 30 minutes prior to the open during our sample period) explains a large portion of the initial returns. This indicates that price discovery begins even before Nasdaq pre-market quoting begins. Unfortunately, we do not have access to information conveyed prior to or during the pre-market quoting period. However, if large institutional clients submit orders only after secondary market trading has begun, their orders will not contribute to the opening price. While we cannot observe the times orders were submitted, we do observe the intraday trade times. If client block purchases cluster later in the day, then this would suggest that large bookrunner client buy orders play little role in pre-market pricing. Conversely, if many of the trades are executed early in the trading day, then this would suggest that these orders were submitted in the pre-market.

We find that, on average 73.6% of the overall bookrunner client net buying for the first day occurs through trades at or above 1,000 shares in the first 30 minutes of trading. This heavy concentration during the first half hour of trading suggests that the bookrunner client pre-market demand may contribute substantially to the pre-market price run-up.

6.2. Intraday price contribution

Client trading activity may influence short-term prices during the day as well. Price contribution measures that calculate trade-to-trade price movements rely on accurate trade report sequencing, and this is particularly a problem for the first day of trading in IPOs. If electronic venues automatically report trades faster than venues in which market makers must record trades, then trades will not be sequenced properly, and price contribution estimates may contain significant noise. Indeed, the standard Barclay and Warner (1993) price contribution measures are rendered useless for this reason.[14] However, we estimate a modified price contribution measure using price changes over time intervals rather than from trade to trade. Using intervals substantially mitigates problems associated with an incorrect sequencing of trades. Here we discuss issues relating to interval length; details regarding the construction of our measure can be found in the Appendix.

6.2.1. Price contribution results

Table 7 reports the price contribution estimates for client trading for intervals ranging from one to 15 minutes. Weighted average price contribution estimates are reported for IPOs with positive open-to-close price movements in Panel A and for those with negative price movements in Panel B. Price contribution estimates for client trading are rescaled so that the figures for the clients add up to 100% for the subsample with positive price

[14]We comprehensively examine Barclay and Warner (1993) estimates for our IPO sample and other Nasdaq samples. For Nasdaq data, these measures result in nonsensical estimates for groups of traders (above +1,400% and below −1,000%, for instance) and serve to highlight the sensitivity of such measures to accurate trading sequences.

Table 7
Price contribution

This table provides first-day price contribution estimates for client trading for a sample of Nasdaq IPOs issued between 1997 and 2002. First, the trading day for each IPO is divided into short-term intervals and the price movements during each interval are distributed across groups. Groups are formed according to the role of the market maker in the syndicate, whether the market maker is trading on behalf of clients or for their own inventory, and trade size. Bid-ask midpoints are used to measure price movements during the intervals. Price changes in each interval are distributed proportionally, according to the magnitude of net buying, to those groups with net trading in the same direction as the price movement during that interval. Thus, positive price movements are proportionally assigned to net buyers and negative price movements are proportionally assigned to net sellers. Second, all stock price changes that are assigned to a given group are added up for each IPO. Third, the price changes of each group are divided by the aggregate price movement in the stock over the first trading day. Fourth, a weighted cross-sectional mean is computed across IPOs, where the weights are equal to the absolute value of the aggregate price change over the first trading day. Weighted averages are reported separately for subsamples of IPOs with positive and negative price movements over the first trading day in Panels A and B, respectively. Price contribution estimates for client trading are rescaled so that the figures for the clients add up to 100% for the subsample with positive price movements and -100% for the subsample with negative price movements. Results are reported for all trade size groups and for all trades at or above 1,000 shares. Intervals range from one to 15 minutes.

Trade size range	1 min	90 s	5 min	10 min	15 min
Panel A. Change in first-day open-to-close price > 0 (n = 639)					
Bookrunner					
(0, 1,000)	−5.6	−3.3	0.8	2.6	2.7
[1,000, 5,000)	18.8	20.3	22.0	22.0	21.8
[5,000, 10,000)	9.6	11.6	13.5	14.3	14.4
10,000 +	15.5	17.9	22.3	25.3	25.1
Trade size ⩾ 1,000	43.9	49.8	57.9	61.5	61.2
Co-manager					
(0, 1,000)	−11.9	−9.2	−4.8	−3.3	−2.7
[1,000, 5,000)	−2.3	−2.3	−1.3	−0.9	−0.7
[5,000, 10,000)	1.6	1.6	1.3	1.2	1.1
10,000 +	1.6	1.8	2.1	2.3	2.3
Trade size ⩾ 1,000	0.9	1.1	2.1	2.5	2.7
Syndicate member					
(0, 1,000)	3.3	3.2	2.5	2.0	1.8
[1,‘000, 5,000)	1.8	1.8	1.4	1.3	1.4
[5,000, 10,000)	0.3	0.5	0.3	0.4	0.5
10,000 +	0.1	−0.1	0.2	0.2	0.2
Trade size ⩾ 1,000	2.2	2.1	1.9	1.9	2.1
Nonsyndicate					
(0, 1,000)	78.7	69.5	40.2	29.9	26.9
[1,000, 5,000)	−5.3	−8.0	−3.4	−2.0	−1.3
[5,000, 10,000)	−8.9	−9.5	−5.3	−4.1	−2.8
10,000 +	2.8	4.2	8.0	8.9	9.3
Trade size ⩾ 1,000	−11.4	−13.3	−0.7	2.8	5.2
Panel B. Change in first-day open-to-close price < 0 (n = 597)					
Bookrunner					
(0, 1,000)	−24.5	−19.9	−13.1	−10.2	−9.7
[1,000, 5,000)	−10.1	−8.1	−4.6	−2.4	−3.2
[5,000, 10,000)	−2.0	−3.2	0.7	2.0	1.4
10,000 +	2.2	0.9	5.6	2.5	5.1
Trade size ⩾ 1,000	−9.8	−10.4	1.7	2.0	3.2

Table 7 (*continued*)

Trade size range	1 min	90 s	5 min	10 min	15 min
Co-manager					
(0, 1,000)	−23.1	−18.7	−11.6	−8.8	−8.2
[1,000, 5,000)	−6.2	−5.4	−5.2	−5.1	−4.8
[5,000, 10,000)	−2.7	−1.7	−1.7	−2.0	−2.1
10,000 +	−2.1	−2.5	−3.8	−3.0	−3.4
Trade size ⩾ 1,000	−11.1	−9.6	−10.7	−10.1	−10.3
Syndicate member					
(0, 1,000)	1.9	2.1	1.7	0.3	−0.2
[1,000, 5,000)	−1.8	−0.9	−0.7	−1.5	−1.2
[5,000, 10,000)	−0.7	−0.6	−0.7	−0.8	−0.5
10,000 +	−0.9	−1.1	−1.3	−1.0	−1.3
Trade size ⩾ 1,000	−3.4	−2.6	−2.7	−3.3	−3.0
Nonsyndicate					
(0, 1,000)	94.0	76.4	43.4	20.0	14.3
[1,000, 5,000)	−45.9	−40.0	−31.0	−25.1	−23.8
[5,000, 10,000)	−42.0	−41.6	−38.6	−31.2	−29.5
10,000 +	−36.1	−35.6	−38.9	−33.6	−32.9
Trade size ⩾ 1,000	−124.0	−117.3	−108.6	−89.9	−86.1

movements and –100% for the subsample with negative price movements. Price contribution estimates are reported first for all trade-size groups and then separately for all trades at or above 1,000 shares. Panel A indicates that, for IPOs with positive price changes over the first day, about half of the client-induced stock price changes can be attributed to bookrunner client trades, rising from 43.9% with one-minute intervals to 61.5% with 10 minute intervals.

Small trades executed through the co-manager contribute negatively to positive price movements. This is likely because (as shown in Table 2) co-manager clients are generally net sellers who push prices downward—negative price contribution occurs when a group sells in net during intervals in which the price is falling. Large trades through the co-manager and trades through other syndicate members have a small positive effect on prices. Small trades through nonsyndicate members contribute significantly to rising prices as well, but their contributions are the most sensitive to interval choice, dropping from 78.7% at 1 minute intervals to 26.9% at 15 minute intervals.[15] Nonsyndicate client trades at or above 1,000 shares actually have a small negative impact on the price when calculated over short intervals and a small positive impact at longer intervals. Overall, large trades executed through the bookrunner and small trades executed through nonsyndicate market makers contribute the most to rising IPO prices on the first trading day.

Panel B of Table 7 depicts the distribution of price contribution for IPOs with negative open-to-close price changes on the first trading day. For these IPOs the largest source of downward price pressure consists of large nonsyndicate client trades, followed by small bookrunner client trades, and then small co-manager client trades. Bookrunner client trades of 1,000 shares or more contribute slightly negatively to prices when measured over

[15]If most of these small orders come from electronic venues that record their trades faster than other market makers, then these short intervals may dramatically overstate the importance of small traders.

short intervals, but slightly positively when measured over longer intervals. Even though prices are falling, nonsyndicate trades in the small trade-size category push prices upward.[16]

Overall, price contribution estimates indicate that both bookrunner and nonsyndicate clients play major roles in the first day of IPO trading, with small trades executed through nonsyndicate dealers and bookrunner client trades at or above 1,000 shares generally pushing prices upward.

6.2.2. *Order timing*

Our price contribution analysis potentially understates the impact of bookrunner client trading on prices if the bookrunner uses inventory strategically.[17] To elaborate, if client buy trades are systematically executed during intervals in which the price falls, we assign zero price contribution to these trades, in which case their importance is perhaps understated since it is likely that prices would have fallen further in the absence of this demand.

To further explore price movements around client trades, we calculate the returns for intervals prior to and following client purchases at or above 1,000 shares. For each market maker type in each IPO, we calculate the volume-weighted average return. We then compute an equal-weighted cross-sectional average across IPOs for each market maker group. For comparison, Fig. 3 displays returns around bookrunner client and nonsyndicate client purchases at or above 1,000 shares. Striped bars indicate significant differences between the bookrunner and nonsyndicate client purchases for a given interval. For both groups, prior half-hour returns are positive, but returns are significantly lower prior to bookrunner client purchases. Returns become negative three minutes prior to large bookrunner client purchases. Following the large purchases, bookrunner clients experience negative returns that are significantly lower than returns for nonsyndicate client purchases for 15 minutes.

On average, large client purchases are executed right after and prior to periods of negative returns. Whatever the reason for the timing of the trades, the analysis in Fig. 3 suggests that bookrunner clients have a stabilizing influence on the intraday IPO price. The price contribution analysis shows that bookrunner client trades contribute positively to price movements, and the trade timing analysis suggests that the price contribution estimates are conservative and potentially understated.

6.3. *Price effects over the long run*

Since stocks with high initial net buying have more transient institutional ownership, long-term price reversals may obtain as these investors sell out. However, price reversals can occur over a multitude of horizons. Both heterogeneity in the timing of the reversal and the short sample period add noise to any test for these effects.

[16]We also examine price contribution figures across first-day IPO return groups. For IPOs with positive open-to-close first-day price changes, bookrunner clients push prices upward the most for the coldest IPOs. For IPOs with negative open-to-close first-day price changes, bookrunner client trades push prices upward in all but the hottest IPOs.

[17]Bookrunner clients commonly submit "market not held" orders to be executed in the secondary market of IPO trading. "Not held" refers to the fact that the broker does not hold these orders in hand, with this designation giving the market maker discretion over when to execute these orders.

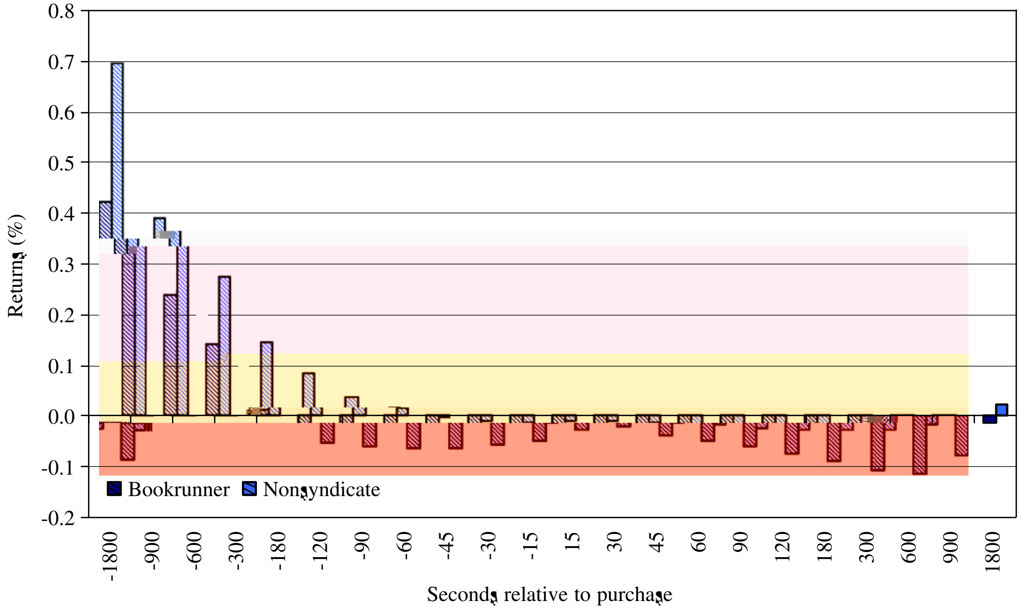

Fig. 3. Returns around large client purchases. This figure displays returns for intervals around large client purchases (buy trades at or above 1,000 shares) on the first trading day for bookrunners and nonsyndicate members. Bid-ask midpoints are used to measure returns for the intervals. Trades for the first and last 30 minutes of the trading day are excluded from the analysis so that returns can be computed for all the intervals around each client purchase. Intervals range from 15 seconds to 30 minutes. Returns for various intervals are computed for each IPO individually as volume-weighted averages and then averaged across all IPOs. Paired t-tests are performed to see whether returns around bookrunner client purchases are different from those around nonsyndicate client purchases for various intervals. Intervals with significant differences (at the 5% level) have striped bars, whereas intervals with insignificant differences have solid bars.

In Table 8, we examine the determinants of post-IPO performance at one-month, three-month, six-month, one-year, two-year, and three-year horizons, excluding the first trading day. We test whether first-day bookrunner client net buying is related to abnormal buy-and-hold returns (relative to the corresponding size and book-to-market portfolio) at these horizons. Table 8 shows that IPOs with higher first-day bookrunner client net buying have insignificantly higher first-month returns. This positive relation diminishes when bookrunner and nonsyndicate individual net buying are included in the regression. Although negative, bookrunner client net buying is not significantly related to IPO returns at six-month, one-year, and three-year frequencies. The exception is a significantly negative relation at the two-year horizon. This significance strengthens after controlling for first-day bookrunner and individual investor net buying.[18] Given the short and extremely unique sample period, volatile market conditions, and a variety of factors influencing long-run returns, the long-run tests at the three-year horizon may simply lack the power to link client net buying to price distortions. We ultimately interpret these findings as suggestive

[18]We also examine returns in excess of size and price-to-sales portfolios and find similar results with one exception: bookrunner client buying is marginally insignificant at the two-year frequency.

Table 8
Long-run returns

For a sample of Nasdaq IPOs issued between 1997 and 2002, this table presents regressions of 1-month, 3-month, 6-month, 1-year, 2-year, and 3-year abnormal IPO returns (net of first-day returns) on the following variables: Bookrunner clients and Bookrunner, the net first-day buy-sell imbalances of bookrunner clients and bookrunners for trades at or above 1,000 shares, respectively; Nonsyndicate individual clients, the aggregate first-day buy-sell imbalances for clients of nonsyndicate brokerage houses that serve individual investors; No. of IPOs by bookrunner, the log of the number of IPOs for which the bookrunner serves as a lead underwriter for the whole sample; First-day return, the percentage increase from the offer price to the first closing price in excess of the return on the Nasdaq Composite Index; Post-crash dummy, which equals one if the IPO was offered following the market break (April 1, 2000); No. of recent IPOs, the number of Nasdaq IPOs issued during the 60 days preceding the IPO; High-tech dummy, which equals one if the IPO firm is in the high-tech industry; % Secondary shares, the percentage of secondary shares offered relative to total shares offered; Risk, measured by the standard deviation of daily returns over the first year of IPO trading, excluding the first day's return; Revision, measured as (offer price – midpoint of filing price range)/midpoint of filing price range; Overallotment, measured as overallotment shares relative to shares offered; Syndicate size, the number of syndicate members; Age, the log of (1 + IPO year – founding year); Venture capital dummy, which equals one if the IPO is backed by venture capital; Reputation, bookrunner reputation computed using rankings for the 1992–2000 period from Jay Ritter's website; and 15-day Nasdaq return, the buy-and-hold return on the Nasdaq Composite Index for the previous 15 trading days. Abnormal returns are computed by subtracting the returns on the corresponding size and book-to-market portfolios constructed as in Brav and Gompers (1997). All the variables are standardized by their cross-sectional means and standard deviations. We provide t-statistics in parentheses below the parameter estimates. Significant coefficients (at the 5% level) are denoted with *italics*.

	1-Month return		3-Month return		6-Month return	
Bookrunner clients	0.045	0.024	0.030	−0.008	−0.028	−0.029
	(1.31)	(0.62)	(0.86)	(−0.21)	(−0.81)	(−0.74)
Bookrunner		−0.068		*−0.103*		−0.012
		(−1.83)		*(−2.69)*		(−0.32)
Nonsyndicate individual clients		0.021		0.001		0.014
		(0.58)		(0.04)		(0.38)
No. of IPOs by bookrunner	−0.066	−0.062	−0.015	−0.009	0.052	0.053
	(−1.21)	(−1.14)	(−0.26)	(−0.16)	(0.92)	(0.93)
First-day return	−0.030	−0.043	−0.009	−0.021	−0.043	−0.048
	(−0.68)	(−0.95)	(−0.21)	(−0.45)	(−0.95)	(−1.04)
Post-crash dummy	*−0.093*	*−0.093*	−0.076	*−0.081*	*−0.193*	*−0.192*
	(−2.39)	*(−2.38)*	(−1.92)	*(−2.02)*	*(−42.83)*	*(−4.75)*
No. of recent IPOs	*0.067*	*0.070*	*0.098*	*0.102*	*0.074*	*0.076*
	(2.00)	*(2.10)*	*(2.87)*	*(2.97)*	*(2.16)*	*(2.20)*
High-tech dummy	*0.075*	*0.074*	0.070	0.068	0.047	0.046
	(2.12)	*(2.08)*	(1.91)	(1.87)	(1.28)	(1.27)
% Secondary shares	0.036	0.032	−0.009	−0.015	−0.009	−0.010
	(1.08)	(0.97)	(−0.28)	(−0.44)	(−0.28)	(−0.30)
Risk	*0.155*	*0.149*	0.070	0.064	0.008	0.006
	(4.19)	*(3.98)*	(1.84)	(1.68)	(0.22)	(0.15)
Revision	*−0.126*	*−0.131*	*−0.155*	*−0.167*	*−0.112*	*−0.111*
	(−2.99)	*(−3.06)*	*(−3.59)*	*(−3.82)*	*(−2.57)*	*(−2.51)*
Overallotment	*0.192*	*0.168*	*0.137*	*0.104*	*0.111*	*0.105*
	(5.82)	*(4.79)*	*(4.07)*	*(2.90)*	*(3.25)*	*(2.91)*
Syndicate size	−0.010	−0.011	−0.021	−0.021	−0.067	−0.067
	(−0.31)	(−0.31)	(−0.60)	(−0.60)	(−1.94)	(−1.94)
Age	−0.032	−0.028	−0.036	−0.033	0.001	0.003
	(−0.97)	(−0.84)	(−1.06)	(−0.96)	(0.02)	(0.07)
Venture capital dummy	0.044	0.044	0.012	0.012	0.035	0.035
	(1.23)	(1.22)	(0.34)	(0.34)	(0.97)	(0.96)
Reputation	*0.126*	*0.129*	0.108	0.116	0.054	0.053
	(2.22)	*(2.26)*	(1.86)	*(2.00)*	(0.92)	(0.89)
15-day Nasdaq return	*−0.180*	*−0.184*	*−0.145*	*−0.148*	*−0.177*	*−0.179*
	(−5.17)	*(−5.27)*	*(−4.06)*	*(−4.15)*	*(−4.95)*	*(−4.97)*
N	922	922	922	922	922	922
Adj. R^2	0.119	0.121	0.079	0.085	0.070	0.068

but inconclusive evidence in support of a link between buying through the bookrunner and harmful long-run effects on shareholders.

7. Nonsyndicate trading

Most of our analysis thus far focuses on bookrunner client trading and how it compares to nonsyndicate client trades. As Table 2 shows, nonsyndicate client sales exceed purchases by 6.48%. Since these market makers do not receive allocations in the IPO, these shares must either be sold short or originate from allocants in the IPO.

We first examine short sales using monthly short interest data reported to Nasdaq. We

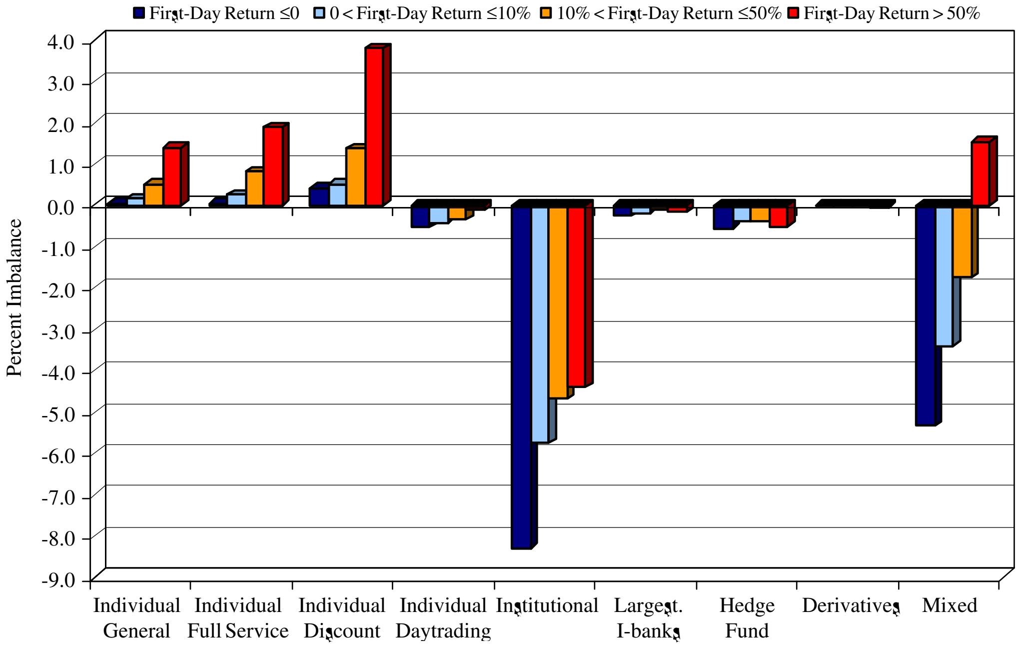

Fig. 4. Breakdown of nonsyndicate member client trading. This figure displays the breakdown of nonsyndicate client net buying by the type of brokers that execute the trades and first-day return. Nonsyndicate client net buying is the difference between the buy and sell volumes for nonsyndicate clients and is expressed as a percentage of the total shares issued. Brokerage houses are classified into nine categories through conversations with Nasdaq officials, broker websites, other publicly available information, and conversations with people in the industry. The categories are individual general, individual full service, individual discount, individual day trading, institutional, largest investment banks, hedge funds, derivatives traders, and brokerage houses that handle a mix of individual and institutional clients. Comprehensive details can be found in the appendix of Griffin, Harris, and Topaloglu (2006). Buy and sell trades are first aggregated for each IPO individually and then averaged across all IPOs within a specific first-day return group.

Nonsyndicate client sales may represent shares flipped through accounts linked to IPO allocants as well. Institutions likely have multiple trading accounts with various market makers. In the absence of any method to track physical shares, allocants may flip shares through nonsyndicate brokers without directly revealing this activity to the underwriting syndicate. However, the Depository Trust Corporation (DTC) IPO tracking service allows underwriters to track shares during our sample period.[20] The large net selling by nonsyndicate clients suggests that: (a) some clients are allowed to flip; (b) these reports

[20]The DTC IPO tracking service provides the bookrunner with daily reports that include the sale price, trade date, number of shares, and clearing agent's participation number but not the exact identity of the clients of other brokerage houses (Aggarwal, 2003). Syndicate members also receive details about own-client activity. However, the DTC tracking system is not flawless (Wisz, 1997a), not all underwriters subscribe, and according to Merrill Lynch's V.P. of syndicate operations, "there will always be guys who will try to beat the system" (Wisz, 1997b). In March 2005, the NASD fined Spear, Leeds and Kellogg $1 million for concealing IPO shares from the DTC system from August 1997 to January 2001.

do not influence client trading practices; and/or (c) there are imperfections in the tracking system, which clients exploit.

Our work helps shed light on the nature of interdealer trading documented in Ellis (2006). IPO clients are net sellers through nonsyndicate market makers. These sold shares are then conveyed back to the bookrunner via interdealer trades, and the bookrunner then uses these shares to service bookrunner client net buy demand. It is tempting to think that net imbalances simply reflect nonsyndicate selling to avoid the bookrunner. However, this share flow runs contrary to execution quality since a focus on selling does not explain the prevalence of buying through the bookrunner at high prices, nor why net buying is associated with transient share ownership.

We further explore the nature of nonsyndicate client selling in Fig. 4, which displays the types of brokers that execute these trades.[21] Nonsyndicate clients who sell Nasdaq IPOs execute their trades primarily through institutional brokerages. Net selling by institutions is more intense in cold IPOs (8.31%) than in hot IPOs (4.40%). Clients at brokerage houses that serve a mix of individual and institutional order flow are generally net sellers except for hot IPOs. Conversely, individual discount, individual full service, and general individual brokerage clients are net buyers, with the magnitude of net buying increasing monotonically with the IPO return.[22] In summary, the net selling by nonsyndicate clients does not appear to be driven by short selling, and it may be the product of institutional allocants flipping shares in the secondary market.

8. Conclusion

Theoretical and anecdotal evidence motivate an examination of whether bookrunner clients provide price support by purchasing additional shares in the aftermarket. We find that on the first trading day, purchases of bookrunner clients exceed sales by $13.91 billion over the 1997–2002 period. While this pattern varies widely across IPOs, over 85% of the IPOs in our Nasdaq sample experience more client buying than selling through the lead underwriter. We examine explanations for this persistent net buying activity including strategic allocations to potential long-term shareholders, differential execution quality, clientele effects, and laddering.

Nasdaq IPOs with large bookrunner client net buying observe more institutional selling activity over the first quarter and year following the IPO. Initial client buy imbalances do not reflect the buying of long-term shareholders, but rather purchases of transient shareholders. In addition, bookrunners offer inferior execution quality to buyers in large trades, for which client buy imbalances are the highest. This finding is contradictory to the superior execution argument for client net buying, but consistent with bookrunners extracting rents from clients. Client net buying is driven by large trades, and this buying through large trades persists even in cold IPOs. Furthermore, strong bookrunner client demand is more prevalent for active underwriters, who might have the greatest ability to extract rents from their clients. These patterns hold in univariate sorts and in multivariate

[21]We classify more than 500 brokers into nine categories through broker websites, other public information, and conversations with Nasdaq officials and industry participants (see details in Griffin, Harris, and Topaloglu, 2006).

[22]This positive relation between individual demand and first-day prices is consistent with the findings of Cornelli, Goldreich, and Ljungqvist (2006) for European IPOs. However, contrary to their evidence, we fail to find a relation between individual demand and long-run returns in Nasdaq IPOs for our sample period.

tests in which we examine all hypotheses both jointly and in the presence of other control variables that are commonly found to affect IPO underpricing. All features of the data strongly support the laddering hypothesis and challenge the other hypotheses.

The majority of bookrunner client buying is concentrated early in the trading day, suggesting that these orders contribute significantly to the opening price on Nasdaq. In addition, for IPOs that rise in price from open to close on the first day of trading, our price contribution analysis shows that client net buying through the bookrunner contributes to approximately half of the client-induced price increase. Bookrunner client buying is negatively and significantly related to long-run returns at the two-year horizon, but the relation is negative and insignificant at the one- and three-year frequencies, suggesting that a longer time series may be required to make more precise inferences about the long-run effects of underwriter client buying on IPO prices. Our results are consistent with lead underwriter client purchases playing a significant role in helping to boost prices in the short run.

Our findings provide an additional rationale for why issuers view the underwriter's role as valuable and thus why they tolerate underpricing: if managers believe that aftermarket stock prices are inflated due to artificial demand generated by the lead underwriter, then they will be pleased to own shares that are selling at high valuations. We believe that additional research exploring quid pro quo arrangements holds much promise in contributing further to our understanding of the relations between underwriters, their clients, and underpricing.

Appendix

Our price contribution analysis breaks the Barclay and Warner (1993) calculations down into four steps. Our first step differs from Barclay and Warner; the other three steps are essentially the same. Barclay and Warner's first step defines the stock-price change that occurs on a given trade as the difference between that trade's price and the price of the previous trade. Here, we divide the trading day into short-term intervals and then distribute price movements (measured using bid-ask midpoints) during each interval to various groups. Groups are formed according to (1) the role of the market maker in the syndicate, (2) whether the market maker is trading on behalf of clients or for their own inventory, and (3) trade size. Price changes in each interval are distributed proportionally to groups with net trading in the same direction as the price movement during that interval, with positive price movements proportionally assigned to net buyers, and negative price movements proportionally assigned to net sellers.[23]

Steps two through four mirror those of Barclay and Warner (1993). In step two, for each IPO we sum all stock price changes that are assigned to a given group during the day. In step three, we divide the price changes of each group by the aggregate price movement in the stock over the first trading day. To be consistent with Barclay and Warner's focus on positive price movements, we separately examine IPOs with positive and negative price movements over the first trading day. In our final step, we compute a weighted

[23]For example, assume that we are examining price contributions for a one-minute interval during which time the stock price moved up ten cents. If the only net buyers during this period are clients of the lead underwriter buying 4,000 shares in net and clients of nonsyndicate members purchasing 6,000 shares in net, then we distribute four cents (10 *[4,000/10,000]) to lead underwriter clients and the remaining six cents to nonsyndicate clients.

cross-sectional mean across stocks, where the weights are equal to the absolute value of the cumulative price change over the first trading day, which gives stocks with greater price movements a larger role in averaging.

In terms of interval length, shorter intervals generate more accurate information about price movements but can lead to biases to the extent that more incorrectly sequenced trades are placed in the wrong interval. Conversely, larger intervals generate less precise mappings between trades and prices, but reduce the odds of a trade being incorrectly placed in the wrong interval. Nasdaq requires that trades be reported within 90 seconds. Late trades (those reported later than 90 seconds) occur more frequently when the market maker is handling heavy volume (for instance, on the first day of an IPO). Since the lead underwriter handles much more volume than any other market maker, the sequencing of bookrunner trades may be the least accurate. This suggests that longer intervals may better serve our purpose in making inferences about price contributions across market maker types.

References

Aggarwal, R., 2000. Stabilization activities by underwriters after initial public offerings. Journal of Finance 55, 1075–1103.

Aggarwal, R., 2003. Allocation of initial public offerings and flipping activity. Journal of Financial Economics 68, 111–135.

Aggarwal, R., Conroy, P., 2000. Price discovery in initial public offerings and the role of the lead underwriter. Journal of Finance 55, 2903–2922.

Aggarwal, R., Prabhala, N.R., Puri, M., 2002. Institutional allocation in initial public offerings: empirical evidence. Journal of Finance 57, 1421–1442.

Barclay, M.J., Warner, J.B., 1993. Stealth trading and volatility: which trades move prices? Journal of Financial Economics 34, 281–305.

Boehmer, B., Boehmer, E., Fishe, R.P.H., 2006. Do institutions receive favorable allocations in IPOs with better long run returns? Journal of Financial and Quantitative Analysis, forthcoming.

Brav, A., Gompers, P.A., 1997. Myth or reality? The long-run underperformance of initial public offerings: evidence from venture and nonventure capital-backed companies. Journal of Finance 52, 1791–1821.

Chen, H., Ritter, J.R., 2000. The seven percent solution. Journal of Finance 55, 1105–1131.

Chen, Z., Wilhelm, W.J., 2005. A theory of the transition to secondary market trading of IPOs. Unpublished working paper. University of Virginia.

Cornelli, F., Goldreich, D., Ljungqvist, A.P., 2006. Investor sentiment and pre-IPO markets. Journal of Finance 61, 1187–1216.

Ellis, K., 2006. Who trades IPOs? A close look at the first days of trading. Journal of Financial Economics 79, 339–363.

Ellis, K., Michaely, R., O'Hara, M., 2000. When the underwriter is the market maker: an examination of trading in the IPO aftermarket. Journal of Finance 55, 1039–1074.

Field, L.C., Karpoff, J.M., 2002. Takeover defenses of IPO firms. Journal of Finance 57, 1857–1889.

Fulghieri, P., Spiegel, M., 1993. A theory of the distribution of underpriced initial public offers by investment banks. Journal of Economics and Management Strategy 2, 509–530.

Griffin, J.M., Harris, J.H., Topaloglu, S., 2006. Who drove and burst the tech bubble? Unpublished working paper. University of Texas at Austin.

Hanley, K.W., Kumar, A.A., Seguin, P.J., 1993. Price stabilization in the market for new issues. Journal of Financial Economics 34, 177–197.

Hanley, K.W., Wilhelm, W.J., 1995. Evidence on the strategic allocation of initial public offerings. Journal of Financial Economics 37, 239–257.

Hao, Q., 2006. Laddering in initial public offerings. Journal of Financial Economics, Forthcoming.

Harris, R., 2001. The sue nation: shareholders on warpath. Online at 〈http://www.cfo.com/〉.

Ljungqvist, A.P., 2006. IPO underpricing. In: Eckbo, B.E. (Ed.), Handbook of Corporate Finance: Empirical Corporate Finance. North-Holland, forthcoming.

Ljungqvist, A.P., Wilhelm, W.J., 2002. IPO allocations: discriminatory or discretionary? Journal of Financial Economics 65, 167–201.

Ljungqvist, A.P., Wilhelm, W.J., 2003. IPO pricing in the dot-com bubble. Journal of Finance 58, 723–752.

Loomis, T., 2001. High-tech fallout: small investors find conspiracy behind IPO plunge. New York Law Journal, June 28, 5.

Loughran, T., Ritter, J.R., 2002. Why don't issuers get upset about leaving money on the table in IPOs? Review of Financial Studies 15, 413–443.

Loughran, T., Ritter, J.R., 2004. Why has IPO underpricing changed over time? Financial Management 33, 5–37.

Nimalendran, M., Ritter, J.R., Zhang, D., 2006. Do today's trades affect tomorrow's IPO allocations? Journal of Financial Economics, forthcoming.

Pulliam, S., Smith, R., 2000. Trade-offs: seeking IPO shares, investors offer to buy more in after-market—and pledges can be a factor, underwriters say, though they deny quid pro quo —trying to avoid the flippers. Wall Street Journal, December 6, A1.

Reuter, J., 2006. Are IPO allocations for sale? Evidence from mutual funds. Journal of Finance 61, 2289–2324.

Ritter, J.R., Welch, I., 2002. A review of IPO activity, pricing, and allocations. Journal of Finance 57, 1795–1828.

Ruud, J.S., 1993. Underwriter price support and the IPO underpricing puzzle. Journal of Financial Economics 34, 135–151.

Schultz, P.H., Zaman, M.A., 1994. Aftermarket support and underpricing of initial public offerings. Journal of Financial Economics 35, 199–219.

Wisz, G., 1997a. IPO-tracking vendor scores with new DTC service. Securities Industry News 9 (30), 3.

Wisz, G., 1997b. New IPO tracking system: only as good as the operators. Securities Industry News 9 (28), 4.

Zhang, D., 2004. Why do IPO underwriters allocate extra shares when they expect to buy them back? Journal of Financial and Quantitative Analysis 39, 571–594.