Are IPO Allocations for Sale? Evidence from Mutual Funds

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Journal of Finance (forthcoming)

Current Draft: June 2005

Abstract

Combining data on explicit brokerage commissions that mutual fund families paid for trade execution between 1996 and 1999 with data on mutual fund holdings of initial public offerings (IPOs), I document a robust positive correlation between commissions paid to lead underwriters and reported holdings of the IPOs they underwrote. Moreover, I find that the correlation is limited to IPOs with nonnegative first-day returns and strongest for IPOs that occur shortly before mutual funds report their holdings, when the noise introduced by flipping is smallest. Overall, the evidence suggests that business relationships with lead underwriters increase investor access to underpriced IPOs.

*Jonathan Reuter is at the Lundquist College of Business, University of Oregon. I wish to thank an anonymous referee, Reena Aggarwal, Daniel Bergstresser, Walid Busaba, John Chalmers, Randy Cohen, Diane Del Guercio, Glenn Ellison, Wayne Ferson, Denis Gromb, Dirk Jenter, Jonathan Lewellen, Alexander Ljungqvist, Tim Loughran, Robin McKnight, Wayne Mikkelson, Stew Myers, Eddie O'Neal, Megan Partch, Jeffrey Pontiff, Jay Ritter, Jorge Rodriguez, Antoinette Schoar, Donghang Zhang, individuals within the mutual fund and underwriting communities, and seminar participants at Boston College, the Federal Reserve Bank of Boston, the Federal Reserve Board of Governors, Harvard Business School, MIT Sloan, Texas A&M, University of Illinois Urbana-Champaign, University of Oregon, University of Southern California, U.S. Department of Justice, Washington University in St. Louis, the Second EVI Conference on Entrepreneurship, Venture Capital, and IPOs, the 2003 Pacific Northwest Finance Conference, the 2004 Western Finance Association Annual Meetings, the Tuck Conference on Contemporary Corporate Finance Issues III, and the Ohio State and Federal Reserve Bank of New York Conference on Agency Problems and Conflicts of Interest in Financial Intermediaries for helpful comments. The financial support of an NSF Graduate Research Fellowship and the MIT Entrepreneurship Center are gratefully acknowledged. Remaining errors are my own.

During the hot initial public offering market of the late 1990s, the typical IPO was significantly underpriced and oversubscribed. The first-day returns earned by investors in these IPOs received considerable public attention.[1] The source of these first-day returns and related questions about the practices that underwriters use to allocate IPOs across investors continue to receive attention from regulators and academics alike. A central question is whether U.S. underwriters use their discretion over IPO allocations to reward investors—either institutional or individual—for directing brokerage business to their investment banks. This question highlights a potential agency conflict between underwriters and issuers. To the extent that underwriters are able to use shares in underpriced IPOs to earn inflated brokerage commissions or attract additional investment banking business, they have an incentive to set offer prices below the levels that maximize proceeds for issuers (see, for example, Baron (1979) and Loughran and Ritter (2002)).[2]

In this paper, I test a key assumption of these agency conflict theories of IPO underpricing by asking whether lead underwriters allocate more underpriced shares to investors from whom they receive more brokerage business. Specifically, I analyze IPO allocations across mutual fund families between 1996 and 1999. Brokerage commission data unique to this paper allow me to identify the investment banks to which each U.S. mutual fund family paid explicit brokerage commissions (as opposed to bid-ask spreads), as well as the dollar amounts paid. Because data on IPO allocations are not publicly available, I use reported mutual fund equity holdings from the same period to infer the IPO shares allocated to each mutual fund family. Combining these data, and controlling for other potential determinants of IPO allocations, I find evidence of an economically significant link between the reported IPO holdings of mutual fund families and the level of the brokerage commission payments those families direct to lead underwriters each year.

Traditional bookbuilding theories of IPO underpricing (such as Benveniste and Spindt (1989)) predict

[1]The *Wall Street Journal* began reporting on IPO allocation practices—and investigations into those practices—in December 2000, and *Red Herring* published a seven-part series on IPO allocation practices in May 2001. According to former SEC Chairman Harvey Pitt, "Participation in these IPOs became immensely valuable for both underwriters and customers, inducing aggressive conduct to gain this business. As a result, serious questions arose about the price setting process and the allocation practices of the underwriters of some of these offerings" (SEC Press Release 2002–127, August 22, 2002). In January 2002, Credit Suisse First Boston agreed to pay $100 million to settle an investigation brought by the SEC and NASD into the tying of IPO allocations to inflated brokerage payments. Subsequently, Robertson Stephens and J.P. Morgan agreed to pay fines of $28 million and $6 million, respectively.

[2]In related work, Loughran and Ritter (2004) argue that IPO allocations to venture capitalists and CEOs were used to increase investment banking business or reduce issuer incentives to prevent underpricing. Ljungqvist and Wilhelm (2003) argue that the increased underpricing during the Internet bubble of 1999 and 2000 reflected the reduced incentives of issuers to prevent underpricing, and they cite reduced CEO ownership shares and increased allocations of underpriced shares to "friends and family" as possible explanations for these reduced incentives.

that lead underwriters will use allocations of underpriced IPOs to reward regular investors for sharing private information on demand for the IPO, and for accepting allocations in overpriced IPOs. In contrast, according to the favoritism hypothesis, lead underwriters will use allocations of underpriced IPOs to reward those institutions with which they have strong business relationships. Therefore, favoritism predicts a positive correlation between the level of brokerage business that institutional investors direct to lead underwriters and the number of underpriced shares they are allocated. Of course, favoritism and bookbuilding are not mutually exclusive and it is important that tests for favoritism control for the determinants of IPO allocations predicted by bookbuilding theories. In particular, since brokerage payments are plausibly correlated with information production, I include a proxy for the level of private information each mutual fund family is likely to have about each new issue (based on the SIC codes of other IPOs it holds).

Empirically, I find that mutual fund families making positive brokerage payments to lead underwriters in a given year report holding more shares of the IPOs they underwrite, and that reported IPO holdings increase with the level of the brokerage payments. These findings are consistent with lead underwriters using both the existence and strength of business relationships with mutual fund families to determine which families to include in the bookbuilding process (Sherman and Titman (2002)). To distinguish favoritism, which predicts that business relationships will increase access to underpriced IPOs, from bookbuilding, which predicts that access to underpriced IPOs will be bundled with overpriced IPOs, I interact the level of brokerage payments with dummy variables that indicate whether an IPO's first-day return is negative, between 0 and 20%, or greater than 20%. The observed association between the level of brokerage payments and reported holdings is highest for IPOs with first-day returns greater than 20%, and zero for IPOs with negative first-days. The finding that stronger business relationships increase access to underpriced IPOs but not overpriced IPOs is consistent with favoritism and inconsistent with bookbuilding.

Since I observe reported IPO holdings rather than IPO allocations, my tests for favoritism implicitly assume that a positive correlation between brokerage payments and reported holdings reflects a positive correlation between brokerage payments and IPO allocations. In the absence of favoritism, my findings might instead reflect a positive correlation between brokerage payments and trading behavior in the days following an IPO. To address this concern, I repeat the tests for favoritism using subsets of IPOs defined by the number of trading days between the IPO and the end of the month, when mutual funds typically report their holdings. Doing so, I find the strongest evidence of favoritism among the subset of IPOs that occur on the last trading day of the month, when reported IPO holdings best proxy for initial allocations. Therefore, tests for favoritism using the full sample of IPOs likely underestimate the link between business relationships and allocations of underpriced IPOs.

While prior empirical studies of IPO allocation acknowledge that underwriters may use their discretion over IPO allocations to favor brokerage clients (see, in particular, Aggarwal, Prabhala, and Puri (2002) and Ljungqvist and Wilhelm (2002)), these studies lack measures of the brokerage relationships between investors and underwriters needed to directly test for favoritism.[3] For example, Aggarwal, Prabhala, and Puri (2002) find that the fraction of shares allocated to institutional investors exceeds that explained by bookbuilding, but cannot say whether this pattern reflects fluctuations in the demand of institutional investors based on their private information or favoritism by underwriters. In contrast, I look within the set of institutional investors and find evidence across a large number of U.S. investment banks and IPOs that allocations of underpriced IPOs vary with the level of brokerage business directed to lead underwriters. Nevertheless, the estimated coefficients on my proxy for private information and other control variables are consistent with bookbuilding theories of IPO allocation. These findings complement the evidence of bookbuilding in Hanley and Wilhelm (1995), Cornelli and Goldreich (2001), and Ljungqvist and Wilhelm (2002), and suggest that favoritism and bookbuilding coexist.

A number of the investment banks that served as lead underwriters between 1996 and 1999 also managed mutual funds. This fact allows me to test for favoritism along a second dimension by asking whether lead underwriters allocate relatively more shares to affiliated mutual fund families. Interestingly, I find little evidence that IPO allocations to affiliated mutual fund families differ systematically from those to non-affiliated mutual fund families.

Overall, my IPO-level analysis suggests that the stronger the business relationship between the mutual

[3] Cornelli and Goldreich (2001) and Jenkinson and Jones (2004) use detailed bid and allocation data to analyze IPO allocations across institutional investors in a small number of offerings managed by a single European investment bank, but lack measures of the brokerage relationships between investors and underwriters needed to test for favoritism. Hanley and Wilhelm (1995), Aggarwal, Prabhala, and Puri (2002), Ljungqvist and Wilhelm (2002), and Boehmer, Boehmer, and Fishe (2005) equate institutional investors with informed investors and study how the division of shares between institutional and retail investors varies with the first-day return of the IPO, but are unable to examine allocations at the investor level.

fund family and the lead underwriter, the greater the mutual fund family's access to underpriced IPOs. To determine whether the favoritism shown to mutual fund families is economically significant, I use reported IPO holdings to estimate the total first-day returns earned by each mutual fund family on the IPOs managed by each lead underwriter in each year. This family-by-underwriter-by-year aggregation allows me to quantify the benefit of a stronger business relationship with the lead underwriter, recognizing that the lead underwriter can favor investors with either small allocations of each underpriced IPO or large allocations of a few underpriced IPOs. The estimated correlation between brokerage commission payments and first-day returns is economically significant throughout the sample period, but approximately 4.75 times higher in 1999, roughly mirroring the increase in average first-day returns from 16% in 1996–1998 to 73% in 1999. In addition, I find weak evidence that within mutual fund family and lead underwriter pairs, access to underpriced IPOs fluctuates with the level of annual brokerage commission payments.[4]

Having documented an economically significant link between brokerage business and IPO allocations, two questions remain. First, how many of the dollars left on the table are underwriters able to recapture?[5] As Loughran and Ritter (2002) argue, in order for lead underwriters to benefit from underpricing they must earn more in incremental brokerage business via favoritism than they forego in direct fees, typically seven cents per dollar raised (Chen and Ritter (2000), Hansen (2001)). Lacking data on the margins underwriters earn on brokerage commissions, I examine brokerage payments directed to underwriters versus other investment banks. Between 1996 and 1999, the level of brokerage payments to underwriters increased from $1.5 billion to $2.5 billion, and the fraction of brokerage payments directed to underwriters increased from 60.1% to 78.4%. However, between 1998 and 1999, when the average first-day return on IPOs jumped 244.3% (from 21.2% to 73.0%) and the total dollars left on the table jumped 677.3% (from $4.5 billion to $35.3 billion), the increase in brokerage payments to all underwriters was a relatively modest 17.4%. While I cannot observe variation in the bid-ask spreads paid to underwriters, the limited adjustment of explicit brokerage commissions to

[4] Nimalendran, Ritter, and Zhang (2004) find the level of IPO underpricing is positively correlated with the contemporaneous trading volume of liquid stocks, a fact consistent with short-term brokerage commissions influencing IPO allocations. My findings complement theirs by providing more direct evidence on the link between longer-term business relationships and allocations of underpriced IPOs.

[5] It is standard to define the dollars left on the table in an IPO as its offer price times its first-day return times the number of shares issued. However, this definition likely overstates the number of dollars the issuer could have raised in the absence of any agency conflict. For example, a positive level of underpricing is optimal when promotional activity and underpricing are substitutes (Habib and Ljungqvist (2001)) or when uninformed investors face a winner's curse (Rock (1986)).

the level of underpricing suggests that mutual fund families retained the majority of the dollars left on the table in 1999. Put differently, observable time-series variation in brokerage payments to underwriters is only weakly positively correlated with time-series variation in dollars left on the table, suggesting underwriters recaptured relatively few of the dollars left on the table in 1999. Consistent with this evidence, Hansen and Hrnjić (2003) find no direct link between the abnormal stock returns of publicly traded investment banks and the unexpected level of underpricing of the IPOs they manage.

Finally, what is the impact of favoritism on issuing firms? On the one hand, allocating underpriced IPOs to favored clients creates an incentive to price new issues below the level predicted by bookbuilding (Loughran and Ritter (2002, 2004)). Therefore, on the margin, favoritism harms issuers through excess underpricing. On the other hand, in a competitive market for underwriting, issuers will attempt to minimize these agency costs by using underpricing to reduce direct fees or purchase additional services (see, for example, Cliff and Denis (2004)). Moreover, the discretion that makes favoritism possible has been shown to benefit issuers through increased price discovery during the bookbuilding period (Ljungqvist and Wilhelm (2002)). Ultimately, the costs of favoritism need to be balanced against the benefits of bookbuilding.

The remainder of the paper is organized as follows. In section I, I describe the sample and discuss how reported mutual fund holdings of IPOs vary with first-day returns. In section II, I present an empirical framework and test for favoritism using data on reported holdings and brokerage payments. In section III, I attempt to quantify the economic significance of the observed favoritism by examining the relationship between the estimated first-day returns families earned on IPOs each year and the brokerage payments they made to lead underwriters in those years. I also document changes in the fraction of brokerage payments going to underwriters over my sample period. Finally, in section IV, I summarize my results and conclude.

I. The Data

A. Construction of the Sample

The Securities Data Company's (SDC) New Issues database was used to identify initial public offerings that took place between January 1996 and December 1999. I exclude unit investment trusts, unit offerings, closed-end mutual funds, REITs, ADRs, and IPOs with an offer price less than $5. I further restrict the sample to stocks that the Center for Research in Security Prices (CRSP) lists as trading on AMEX, NYSE, or Nasdaq within five days of SDC's IPO date, leaving a sample of 1,868 IPOs. For each of these IPOs, SDC provides the initial price range, offer price, first-day closing price, shares outstanding, identities of underwriters (including the lead underwriter), and an SIC code for the issuing firm. I use CRSP to identify the exchange on which each stock first began trading, and to fill in any missing first-day closing prices.

Lacking public data on IPO allocations, I use reported mutual fund holdings to construct proxies for initial IPO allocations. The mutual fund holdings data come from Thomson Financial and include fund-level holdings of NYSE, AMEX, and Nasdaq stocks for all registered U.S. mutual funds, as well as the name of the mutual fund family to which each fund belongs. The original source of the holdings data is form N-30D, which U.S. mutual funds are required to file with the SEC at the middle and end of their fiscal years. The fraction of U.S. mutual funds that report their holdings in any given month ranges from a high of 41% in June and December to a low of 4% in January and July.[6]

I use the fund-level equity holdings data to measure the number of shares of each IPO held by each mutual fund family. Consider the 62 IPOs that occurred in June 1996. Restricting my attention to the subset of mutual funds that reported their holdings at the end of June 1996, I sum the holdings of each IPO across funds belonging to the same family. For example, if one-sixth of family j's equity funds report their holdings in June 1996, my measure of family j's holdings of IPO i is the total number of shares of IPO i held by this subset of family j's equity funds; because this measure excludes the unreported holdings of the other five-sixths of family j's equity funds, it likely underestimates family j's true IPO i holdings by approximately five-sixths.[7] In contrast, if family j does not report holdings for any of its funds in June 1996, my measure of family j's holdings of IPO i is set to missing. Thus, the analysis is at the IPO–by–family level. For example, the 13,826 observations for June 1996 reflect the facts that 223 families reported holdings for one or more fund during June 1996 and there were 62 IPOs.

Data on the brokerage commissions paid by mutual fund families to investment banks come from NSAR filings, semi-annual reports that mutual funds are required to file with the SEC. The brokerage commission

[6]While some funds voluntarily disclose their holdings on a quarterly frequency, the majority do not. Within my sample, the average fund discloses its holdings 2.27 times per year.

[7]As discussed in section II.A., I scale $BrokerageFrac_{ij}$ and the other independent variables by the fraction of family j's equity funds that report their holdings during the month of IPO i (ϕ_{ij}) to control for variation in reported IPO holdings that comes from variation in the set of funds that report their holdings each month.

data were hand collected from the 21,912 NSARs filed by open-end investment companies with reporting periods that included any of the months between January 1996 and December 1999.[8] Within each NSAR, investment companies list the ten investment banks to which they paid the most brokerage commissions during the reporting period and the amounts paid to each; they also list the investment company's total brokerage commission payments during the reporting period.

Consider an NSAR filing that covers January 1996 through June 1996. This filing reports the brokerage commission payments made to investment banks one through ten over this six-month period, but not the precise timing of those payments. Moreover, the NSAR filings of other investment companies within the same family may cover December 1995 through May 1996, April 1996 through September 1996, and so on. To aggregate brokerage commission payments across investment companies within the same family, I first convert the semi-annual payments into monthly payments by assuming that the reported payments were made in equal monthly installments. I then sum these monthly payments across investment companies and months to estimate the total brokerage commission payments made by each mutual fund family to each investment bank in each year. These annual brokerage payments allow me to identify families that individual underwriters might reasonably choose to favor with IPO allocations, but do not allow me to distinguish between lead underwriters using IPO allocations as rewards for past brokerage business and lead underwriters using IPO allocations to attract future brokerage business.

Of the 21,912 NSAR filings, 9,967 (45.5%) report paying brokerage commissions to ten investment banks, 4,163 (19.0%) report paying brokerage commissions to between one and nine investment banks, and 7,782 (35.5%) report paying no brokerage commissions. Of the 9,967 filings that list payments to ten investment banks, the fraction of their total brokerage commissions payments going to these top ten investment banks is approximately 75%, implying that for many filings I lack data on smaller brokerage commission payments to other investment banks. Of the 7,782 filings that report paying no brokerage commissions, approximately 82% are from investment companies that consist solely of bond funds, which do not pay explicit brokerage commissions on their trades. The remainder of the missing values likely

[8]A registered investment company is a legal entity that consists of one or more mutual funds. Mutual fund families consist of one or more investment companies, which themselves consist of one or more mutual funds. Brokerage commissions are reported at the investment company level rather than the mutual fund level and are not broken down by month.

reflect both that mutual funds that trade OTC stocks typically pay bid-ask spreads to market makers rather than explicit brokerage commissions, and that some mutual funds choose not to disclose their brokerage commissions payments to the SEC despite a legal requirement to do so. Since I lack data on the bid-ask spreads paid to market makers, and lack data on some explicit brokerage commission payments as well, the brokerage commission payments I observe are best viewed as noisy measures of the total brokerage business directed to each investment bank by each mutual fund family.

As the final step in the construction of the sample, I merge the brokerage commission payment data with the IPO holdings data. In my sample there are 218 unique investment banks listed in SDC as lead underwriters of IPOs and 568 unique investment banks listed in NSAR filings as having received brokerage commission payments from mutual fund families. Of the 218 lead underwriters listed in SDC, I do not observe any brokerage commission payments to 76 of them. These 76 lead underwriters consist primarily of regional investment banks that manage less than one IPO per year on average and may lack the ability to execute large institutional trades. The remaining 142 lead underwriters include each of the top thirty lead underwriters and their IPOs account for 98.7% of the dollars raised within the sample of 1,868 IPOs.[9] Brokerage payments to these 142 lead underwriters account for 72.0% of total brokerage payments reported by mutual fund families over the four years. Therefore, by focusing on the 1,722 IPOs for which I observe brokerage commission payments to lead underwriters, I focus the tests for favoritism on the allocation practices of medium and large investment banks.

B. IPO Characteristics and Reported Holdings

Table I presents descriptive statistics for the 1,868 IPOs that occurred between January 1996 and December 1999, as well as for the subset of 1,722 IPOs that I use to test for favoritism. Within this subset, the average first-day return is 30.6%. The average amount raised was approximately $91.0 million with an additional $29.3 million left on the table in the form of first-day returns for investors who received allocations in the IPO. In total, there were approximately $50.4 billion left on the table in these 1,722 IPOs (and another $594 million left on the table in the 146 IPOs that I exclude from my analysis).

[9]Following Megginson and Weiss (1991), I use the dollar proceeds of the IPOs for which the underwriter was the lead underwriter between 1996 and 1999 to identify the top thirty lead underwriters.

Mutual fund families reported holding shares in 1,221 (70.9%) of the 1,722 IPOs. As shown in the third panel of Table I, these 1,221 IPOs earned significantly higher first-day returns (36.1% versus 17.3%) and 4-week returns (48.9% versus 21.0%) than IPOs with no reported holdings. Consistent with Hanley (1993), the IPOs with the higher first-day returns were more likely to have been priced above the initial price range (36.9% versus 10.4%) and less likely to have been priced below the initial price range (18.1% versus 37.1%). In contrast, mutual fund families only reported holding shares in 17 (11.6%) of the 146 IPOs underwritten by lead underwriters to whom the mutual fund families (as a group) did not report paying any brokerage commissions. Given the smaller size and relatively poor performance of these 146 IPOs, this fact is consistent with mutual fund families directing brokerage payments to larger investment banks because they underwrite larger, better performing IPOs.

The fourth panel of Table I compares the small number of IPOs with multiple lead underwriters to those with a single lead underwriter. The 73 IPOs with multiple lead underwriters have higher offer prices ($17.11 versus $13.10), more shares (14.98 million versus 5.00 million), and substantially higher first-day returns (69.5% versus 28.9%), but none of the analysis that follows is sensitive to their inclusion. The final panel in Table I examines the characteristics of IPOs across years. The average first-day return of 30.6% in the sample of 1,722 IPOs is driven, in large part, by the average first-day return of 72.7% in 1999. Excluding 1999, the average first-day return falls to 16.1%. The number of dollars left on the table in 1999 is approximately seven times the average number of dollars left on the table in 1996–1998.

Table II divides the 1,722 IPOs into categories based on first-day returns and examines reported mutual fund holdings across these categories. Following Aggarwal, Prabhala, and Puri (2002), I focus on IPOs with negative first-day returns, first-day returns between 0 and 20%, and first-day returns in excess of 20%. The percent of IPOs belonging to each category is 9.9, 52.1, and 38.0, respectively. Mutual fund families reported holding shares in 46.8% (80 divided by 171) of the IPOs with negative returns, 66.0% of the IPOs with returns between 0 and 20%, and 83.9% of the IPOs with returns in excess of 20%. To the extent that reported holdings proxy for initial allocations, these patterns are consistent with those in Aggarwal, Prabhala, and Puri (2002), and suggest that mutual funds as a group earn above average first-day returns on their IPO allocations, whether measured by equal-weighted average returns (36.5% versus 30.6%) or median returns (16.3% versus 12.5%). However, because I focus on reported IPO holdings rather than allocations, the findings in Table II are also consistent with mutual funds buying hot IPOs and selling cold IPOs within the first several days of trading. In section II, I provide evidence that my tests based on the relationship between reported holdings and brokerage commission payments to lead underwriters do not suffer from such ambiguities.

C. Summary Statistics for Reported Holdings and Brokerage Commissions

Table III summarizes my combined IPO holdings and brokerage commission data, as well as the control variables discussed in section II.B.. Each observation contains the reported number of shares of IPO i held by mutual fund family j and the estimated monthly brokerage commissions paid by family j to the lead underwriter of IPO i. There are 185,032 observations in total, or an average of 107.5 observations per IPO. For the 73 IPOs with multiple lead underwriters, the brokerage commission variable equals the sum of the brokerage commissions paid to all lead underwriters.

Based on the subset of funds that report equity holdings during the month of each IPO, I observe positive reported IPO holdings in 6,291 (3.4%) of the observations. Aggregating reported holdings across families, these 6,291 observations account, on average, for 6.8% of the shares issued in the 1,722 IPOs and 9.6% of the shares issued in the 1,221 IPOs with positive reported holdings. The average holding size per family with positive IPO holdings is 113,259 shares, with a standard deviation of 408,683 shares. Conditional on observing equity holdings for any of family j's equity funds, on average, I observe equity holdings for 58.8% of its funds. Therefore, the average positive holding size of 113,259 shares may significantly underestimate actual family level holdings. I define $HoldFrac_{ij}$ as family j's reported holdings of IPO i divided by the number of shares issued at the time of the IPO and use this measure as the dependent variable in my tests for favoritism. Conditional on holding shares in IPO i, the average family held 1.87% of the shares issued.

I observe positive payments to lead underwriters in 73,088 (39.5%) of the observations. For families reporting a positive payment to the lead underwriter during calendar year t, the average monthly payment is \$95,310, or approximately \$1.14 million per year. To measure how important the brokerage commission payments made by family j are to the investment bank underwriting IPO i, I normalize family j's payments in calendar year t by the total brokerage commission payments that the lead underwriter of IPO i received from all mutual funds in calendar year t. I denote this measure $BrokerageFrac_{ij}$. Conditional on paying brokerage commissions to the lead underwriter of IPO i, the average value of $BrokerageFrac$ equals 1.42% of the total commissions that the lead underwriter received from mutual funds during calendar year t.

II. Tests for Favoritism Using IPO-Level Data

A. Empirical Framework

I define favoritism as a positive association between the level of brokerage business that institutional investors direct to lead underwriters and the number of underpriced shares allocated to these investors, controlling for other potential determinants of IPO allocations. Formally, let the allocation of IPO i to mutual fund family j be given by:

$$AllocationFamily_{ij} = \begin{cases} \beta\mathbf{B}_{ij} + \Gamma\mathbf{Z}_{ij} + \varepsilon_{ij} & \text{if } \beta\mathbf{B}_{ij} + \Gamma\mathbf{Z}_{ij} + \varepsilon_{ij} > 0 \\ 0 & \text{if } \beta\mathbf{B}_{ij} + \Gamma\mathbf{Z}_{ij} + \varepsilon_{ij} \leq 0 \end{cases} \quad (1)$$

where $\mathbf{B}_{ij}$ contains one or more measures of the brokerage fees paid by family j to the lead underwriter in the calendar year of IPO i, $\mathbf{Z}_{ij}$ contains other determinants of IPO allocations (and a constant term), and ε_{ij} is a normally distributed error term. When β is positive, IPO allocations respond to the level of brokerage business directed to the lead underwriter. Hence, my tests for favoritism focus on whether β is positive.

To test for favoritism, I estimate a version of equation (1) via Tobit. Lacking data on IPO allocations, I use reported IPO holdings ($HoldFrac$) to proxy for IPO allocations. This proxy complicates the tests for favoritism in two ways. First, $HoldFrac_{ij}$ only reflects the IPO holdings of the subset of family j's equity funds that report their equity holdings during the month of IPO i. Consider a family that receives an allocation of IPO i. Under the assumption that family j allocates IPOs proportionally across its equity funds, the allocation of IPO i going to the fraction of family j's equity funds that report their holdings in the month of the IPO is given by:

$$\begin{aligned} AllocationFrac_{ij} &= AllocationFamily_{ij} \times \phi_{ij} \\ &= [\beta\mathbf{B}_{ij} + \Gamma\mathbf{Z}_{ij} + \varepsilon_{ij}] \times \phi_{ij} \\ &= \beta[\mathbf{B}_{ij} \times \phi_{ij}] + \Gamma[\mathbf{Z}_{ij} \times \phi_{ij}] + [\varepsilon_{ij} \times \phi_{ij}] \\ &\equiv \beta\tilde{\mathbf{B}}_{ij} + \Gamma\tilde{\mathbf{Z}}_{ij} + \tilde{\varepsilon}_{ij}. \end{aligned}$$

where ϕ_{ij} denotes the fraction of family j's equity funds that report their holdings in the month of IPO i.[10] In other words, to control for variation in reported IPO holdings that is driven by variation in the fraction of family j's equity funds reporting their holding each month, I scale the variables in $\mathbf{B}$ and $\mathbf{Z}$ by ϕ_{ij}.[11]

Second, reported IPO holdings reflect both IPO allocations and any trading between the date of the IPO and the date that funds report their equity holdings.

$$\begin{aligned} HoldFrac_{ij} &= AllocationFrac_{ij} + \tilde{\Delta}_{ij} \\ &= \beta\tilde{\mathbf{B}}_{ij} + \Gamma\tilde{\mathbf{Z}}_{ij} + \tilde{\epsilon}_{ij} + \tilde{\Delta}_{ij} \end{aligned}$$

where $\tilde{\Delta}_{ij}$ measures trading of IPO i (by the fraction of family j's equity funds that report their holdings) in the days following the IPO, but is not observed. Therefore, I estimate the following equation via Tobit:

$$HoldFrac_{ij} = \begin{cases} \beta\tilde{\mathbf{B}}_{ij} + \Gamma\tilde{\mathbf{Z}}_{ij} + \tilde{\varepsilon}_{ij} + \tilde{\Delta}_{ij} & \text{if } \beta\tilde{\mathbf{B}}_{ij} + \Gamma\tilde{\mathbf{Z}}_{ij} + \tilde{\varepsilon}_{ij} + \tilde{\Delta}_{ij} > 0 \text{ and } \phi_{ij} > 0 \\ 0 & \text{if } \beta\tilde{\mathbf{B}}_{ij} + \Gamma\tilde{\mathbf{Z}}_{ij} + \tilde{\varepsilon}_{ij} + \tilde{\Delta}_{ij} \leq 0 \text{ and } \phi_{ij} > 0 \\ \text{missing} & \text{if } \phi_{ij} = 0 \end{cases} \tag{2}$$

and treat observations with ϕ_{ij} equal to zero as being missing at random.

Note that when $\tilde{\Delta}$ is uncorrelated with the brokerage fee measures in $\tilde{\mathbf{B}}$, variation in $HoldFrac$ due to trading lowers the statistical power of tests for favoritism without inducing bias. However, when $\tilde{\Delta}$ is correlated with the brokerage fee measures in $\tilde{\mathbf{B}}$, tests for favoritism based on those brokerage fee measures suffer from an omitted variable bias, with the direction of the bias determined by the nature of the correlation between $\tilde{\Delta}$ and $\tilde{\mathbf{B}}$. For example, if $\tilde{\Delta}$ is positively correlated with $BrokerageFrac$, the estimated correlation between $HoldFrac$ and $BrokerageFrac$ will overstate the true correlation between $AllocationFrac$ and $BrokerageFrac$. In section II.C.2., I use variation in the number of trading days between the date of the IPO and the date funds report their holdings to show that the correlation between $HoldFrac$ and $BrokerageFrac$ in my sample is negative in the days immediately following the IPO.

[10]While mutual fund families may have an incentive to allocate underpriced IPOs strategically across their equity funds (see, for example, Gaspar, Massa, and Matos (2004)), mutual fund managers who direct brokerage fees to an investment bank have a fiduciary responsibility to make sure that their investors are the ones who benefit from any resulting IPO allocations. If I instead assume that family j's allocation of IPO i equals its reported holdings of IPO i, the correlation between the level of reported IPO holdings and the level of brokerage commissions declines but remains statistically and economically significant.

[11]I define ϕ_{ij} as the fraction of family j's equity funds that report their holdings in the month of IPO i. Redefining ϕ_{ij} based on the fraction of family j's assets under management that report their equity holdings each month reduces the sample size (because of missing data on assets under management in Thomson Financial's equity holdings data) but yields similar results. The correlation between the two measures is 0.8730.

B. Distinguishing Favoritism from Alternative Hypotheses

The favoritism hypothesis is not necessarily mutually exclusive to existing theories of how IPOs are allocated across investors. Consider a lead underwriter who learns during the bookbuilding process that there is high demand for the IPO. According to bookbuilding theories like Benveniste and Spindt (1989), the lead underwriter will set the offer price above the initial price range but below the price at which he expects the issue to trade. He will then allocate shares to investors whose bids provide useful information about demand for the IPO, with the offer price and number of shares set to compensate these investors for their private information. He will also allocate shares to investors who accept allocations of cold IPOs and who routinely participate in the bookbuilding process (Sherman and Titman (2002)). If the lead underwriter restricts allocations to these investors he can minimize the level of underpricing required to compensate the investors for their services, thereby maximizing proceeds for the issuer. However, if the lead underwriter increases underpricing further he can use shares in the underpriced IPO to favor institutions that direct significant brokerage business to his investment bank. More generally, by using brokerage business to allocate underpriced IPOs across investors, the lead underwriter may be able to earn incremental brokerage business from investors seeking shares in the IPO, thereby capturing some of the dollars left on the table.

Now consider estimating equation (2) via Tobit when $\mathbf{B}_{ij}$ equals $BrokerageFrac_{ij}$, the continuous measure of the brokerage fees paid by family j to the underwriters of IPO i in the calendar year of IPO i (introduced in section I.C.). Favoritism implies that β is positive, such that IPO allocations to family j increase in the strength of the business relationship with family j. However, to distinguish favoritism from alternative hypotheses, I must distinguish allocations as rewards for brokerage business from allocations as rewards for private information or other services that institutional investors provide to lead underwriters. Specifically, I must control for other determinants of IPO allocations that might be positively correlated with $BrokerageFrac$.

Since bookbuilding theories predict that underwriters will use allocations of underpriced IPOs to compensate investors for sharing private information during the bookbuilding process, a first concern is that brokerage fees may proxy for the production of private information. To the extent that the mutual fund families generating brokerage commissions are also generating research, one might expect the level of brokerage commissions paid to any given underwriter to be positively correlated with the overall level of information production within the family. To address this concern, I include a measure of family j's private information about IPO i in $\mathbf{Z}$. Here I make use of the SIC codes from SDC. For each family j and IPO i, I examine family j's other reported IPO holdings during year t and define $FracSameSIC_{ij}$ to be the fraction of those holdings that are in the same industry as IPO i. I construct industries based on the following sets of 2-digit SIC codes: Agriculture, Forestry, Fishing (02-09), Mining (10-14), Construction (15-17), Manufacturing (20-39), Transportation (40-49), Wholesale (50-51), Retail (52-59), Finance, Insurance, Real Estate (60-67), Services (70-89), Public Administration (91-97), and Unclassified (99).[12] $FracSameSIC$ has a mean of 0.1486 and a standard deviation of 0.2595. If IPO allocations respond to private information, family j's holdings of other IPOs within the same industry (and year) as IPO i should proxy for family j's expertise in that industry, and the expected sign of the coefficient on $FracSameSIC$ is positive.

The fact that $BrokerageFrac$ takes on a value of zero for 60.5% of the observations raises a second concern. Specifically, the subset of families making positive brokerage payments to an investment bank may be those asked to participate in the bookbuilding process, given the opportunity to receive allocations of hot IPOs in exchange for accepting allocations of cold IPOs, or given the opportunity to receive allocations of hot IPOs in exchange for committing to be stable investors who will not flip shares in the aftermarket. However, conditional on being included in the bookbuilding process, the level of IPO allocations may not respond to the strength of the business relationship between family j and underwriter i. To ensure that identification of β comes from variation in the strength of the business relationship rather than the mere existence of the relationship, $\mathbf{B}$ includes $BrokerageDummy$, a dummy variable that equals one when $BrokerageFrac$ is positive and zero otherwise. The expected sign of the coefficient on $BrokerageDummy$ is positive.

Given the average first-day return of 30.6% between 1996 and 1999, institutions would have earned economically significant returns from increased access to IPOs even if underwriters had chosen to bundle allocations in cold IPOs with allocations in hot IPOs. However, tests for favoritism that ask whether brokerage payments increase access equally to both hot and cold IPOs lack power against bookbuilding alternatives. Therefore, rather than simply ask whether the coefficient on $BrokerageFrac$ is positive, I test

[12] My results are qualitatively similar if I treat each 2-digit SIC code as a distinct industry and calculate the fraction of holdings in IPOs with the same 2-digit SIC code.

for a stronger form of favoritism, by asking whether the positive correlation between reported holdings and the strength of business relationships is limited to IPOs with nonnegative returns.

B.1. Allocations to Affiliated Families

The fact that some mutual fund families are affiliated with investment banks allows me to test whether IPO allocations to affiliated fund families differ systematically from those to non-affiliated fund families. To do so, I include a dummy variable in $\mathbf{Z}$ that indicates whether mutual fund family j is affiliated with the lead underwriter of IPO i at the time of the IPO. For example, this dummy variable equals one whenever Merrill Lynch is both the lead underwriter of IPO i and the adviser of mutual fund family j. There are 596 observations (0.3%) in which the affiliated mutual fund dummy variable equals one (and only 28 observations in which the affiliated family reports positive IPO holdings). The coefficient on this dummy variable asks whether lead underwriters allocate more or less shares to affiliated mutual fund families than the level of brokerage business with the investment bank (and other control variables) would predict.

Whether lead underwriters will favor affiliated mutual funds is unclear. On the one hand, affiliated funds may be favored because they are part of the same firm.[13] On the other hand, favoritism may be limited by internal agency problems or the need to appear unbiased. Favoritism may also be limited by the fact that affiliated mutual funds are less likely to trade through non-affiliated banks. Within my sample, affiliated mutual funds pay a disproportionate share of their brokerage commissions to affiliated investment banks. To the extent that IPO allocations are used to compete for incremental brokerage business, and affiliated mutual fund families are relatively less likely to move their trades to non-affiliated investment banks, the predicted sign on the affiliated family dummy variable is negative.

B.2. Other Control Variables

In addition to the variables mentioned above, $\mathbf{Z}$ includes a number of other control variables. First, under the assumption that larger mutual fund families have both more pricing expertise across industries and more demand for IPOs, I include the natural logarithm of the average dollars under management by family j's equity funds during the calendar year of IPO i. The expected sign of this coefficient is positive.

[13] Aaron Lucchetti's article "Mutual Funds and IPO Bankers Danced Close" in the March 12, 2003 edition of the *Wall Street Journal* discusses instances in which mutual funds received favorable IPO allocations from affiliated investment banks.

Second, as an additional control for the possibility that allocations of hot IPOs are rewards for accepting allocations of cold IPOs, $\mathbf{Z}$ includes a dummy variable $HeldColdIPO_{ij}$ that indicates whether family j reported holding shares in a cold IPO by the same lead underwriter and in the same calendar year as IPO i (interacted with a dummy variable that indicates whether the first-day return of IPO i is nonnegative). The expected sign on $HeldColdIPO$ is positive. Third, to control for the availability of IPO i, I include the natural logarithm of the number of shares issued. I expect IPOs that involve more shares will be more widely held. Fourth, to control for the desirability of IPO i, I include dummy variables that indicate whether the offer price is above or below the initial price range, and dummy variables that indicate whether the first-day return of IPO i is negative, between 0 and 20%, or greater than 20%. To the extent that price revisions are predictive of first-day returns (Hanley (1993)) and that actual first-day returns proxy for the level of oversubscription, I expect IPOs with positive price revisions and IPOs with the highest first-day returns to have the highest institutional demand. Finally, recall that in equation (2), all of the variables in $\mathbf{B}$ and $\mathbf{Z}$ are scaled by ϕ_{ij}, the fraction of family j's equity funds that report their holdings during the month of IPO i.

C. Tobit-Based Tests for Favoritism

I conduct the IPO-level tests for favoritism via Tobit. To determine whether mutual fund families that have a stronger business relationship with the lead underwriter of an IPO receive larger allocations of the IPO, I begin by estimating the following version of equation (2):

$$HoldFrac_{ij} = \beta[BrokerageFrac_{ij} \times \phi_{ij}] + \theta[BrokerageDummy_{ij} \times \phi_{ij}] + \Gamma\tilde{\mathbf{Z}}_{ij} + \tilde{\varepsilon}_{ij} + \tilde{\Delta}_{ij}$$

where $HoldFrac_{ij}$ measures family j's reported holdings of IPO i as a fraction of the shares issued at the time of the IPO, $BrokerageFrac_{ij}$ measures family j's annual brokerage payments to the lead underwriter of IPO i as a fraction of total annual brokerage payments the lead underwriter received from mutual funds, $BrokerageDummy$ is a dummy variable that equals one when $BrokerageFrac$ is positive, $\mathbf{Z}$ contains the control variables described in section II.B., and all of the independent variables are scaled by ϕ_{ij}, the fraction of family j's equity funds that reported their holdings during the month of IPO i. The results are reported in column (1) of Table IV.

The estimated coefficient on $BrokerageFrac$ is 0.1302 and statistically significant at the 1–percent level. Based on this estimated value for β, and conditional on already making positive brokerage payments, a one standard deviation increase in $BrokerageFrac$ is associated with an increase of 0.66% in the fraction of shares issued in IPO i that are held by family j. In comparison, the average positive reported IPO holding in my sample equals 1.87% of the shares issued at the time of the IPO. Therefore, the business relationships families have with lead underwriters appear to be economically significant determinants of IPO allocations. Moreover, because this analysis is at the IPO-level, the estimated increase applies to each of the IPOs managed by the lead underwriter in calendar year t.

However, the fact that the coefficients on $BrokerageDummy$, $FracSameSIC$, and $HeldColdIPO$ are all positive and statistically significant at the 1–percent level provides support for bookbuilding theories as well. For example, assuming that mutual fund families have relatively more pricing expertise in the industries of the IPOs they report holding, $FracSameSIC_{ij}$ is a reasonable proxy for the private information that family j could provide the lead underwriter of IPO i. The coefficient of 0.0423 on $FracSameSIC$ is consistent with informed investors receiving larger IPO allocations. In fact, a one standard deviation increase in $FracSameSIC$ is associated with an increase of 1.10% in $HoldFrac$. However, because the correlation between $FracSameSIC$ and $BrokerageFrac$ is only 0.029, removing $FracSameSIC$ from the specification has little impact on the size or significance of the coefficient on $BrokerageFrac$.

The coefficient on the affiliated fund family dummy is a statistically and economically insignificant 0.0002, suggesting that IPO allocations to affiliated mutual fund families are no different than to non-affiliated mutual fund families.[14] The coefficients on the other control variables are largely as expected. For example, mutual fund families report larger holdings of IPOs with higher first-day returns, with offer prices above the upper bound of the initial price range, and involving more shares.[15] Reported IPO holdings are also increasing in the dollars under management in family j's equity funds (as predicted), but decreasing in the fraction of family j's equity funds that report their holdings. Since larger mutual fund families are more

[14]To determine whether allocations to affiliated mutual fund families differ across hot and cold IPOs, I interacted the affiliated family dummy with dummy variables for the three return categories. In unreported results, I found that affiliated families are no more likely to report holding shares of IPOs with nonnegative returns than other families. However, in none of the 50 (out of 596) observations with a negative first-day return, does the affiliated family report holding shares of the IPO, suggesting that affiliated families are able to avoid allocations of cold IPOs. While this increases the estimated first-day returns that families earn on IPOs from affiliated lead underwriters, in section III.A., I nevertheless find that affiliated families earn lower total first-day returns than the (high) level of their brokerage commission payments to the affiliated underwriter would predict.

[15]Hanley (1993) and Aggarwal, Prabhala, and Puri (2002) use the percentage difference between the midpoint of the initial filing range and the offer price to proxy for premarket demand. My results are unchanged when I include this measure instead of the priced–below–range and priced–above–range dummy variables.

likely to have mutual funds with fiscal years that end in months other than June and December, observations with smaller values of ϕ are more likely to belong to larger mutual fund families. The negative coefficient on ϕ can be interpreted as additional evidence that larger families receive relatively larger IPO allocations.

The estimated coefficient on $BrokerageFrac$ in column (1) is consistent with stronger brokerage business relationships between mutual fund families and lead underwriters increasing access to both hot and cold IPOs. In the remaining columns of Table IV, I test for a stronger form of favoritism. Specifically, I test whether the positive correlation between reported holdings and brokerage payments is restricted to IPOs with nonnegative first-day returns. I estimate the following specification via Tobit:

$$\begin{aligned} HoldFrac_{ij} &= \sum_k \beta^k [BrokerageFrac_{ij} \times ReturnCategory_i^k \times \phi_{ij}] \\ &\quad + \theta[BrokerageDummy_{ij} \times \phi_{ij}] + \Gamma\tilde{\mathbf{Z}}_{ij} + \tilde{\varepsilon}_{ij} + \tilde{\Delta}_{ij} \end{aligned}$$

where $BrokerageFrac$ is now interacted with dummy variables that indicate whether the first-day return of IPO i is negative (β^-), between 0 and 20% (β^0), or greater than 20% (β^+). To the extent that lead underwriters are able to rank IPOs by their expected returns, the stronger form of favoritism implies that larger brokerage payments should lead to smaller allocations (or a lack of allocations) of IPOs with the lowest expected returns and larger allocations of IPOs with the highest expected returns. To the extent that actual first-day returns are good proxies for expected first-day returns, favoritism then predicts that β^- will be negative or zero and both β^0 and β^+ will be positive.[16] Because this test asks whether holdings of the better performing IPOs are increasing with brokerage payments, it has power against the bookbuilding alternative that investors paying brokerage commissions may be asked to participate in the bookbuilding process, but then earn allocations in hot IPOs by accepting allocations in cold IPOs.

Next, I divide the IPOs into three sample periods and ask within each sample period whether stronger business relationships increase access only to those IPOs with nonnegative first-day returns. The coefficients in column (2) are estimated using the full sample of IPOs between 1996 and 1999. The estimated values of β^0 and β^+ are 0.1133 and 0.2120, respectively. Both coefficients are statistically significant at the 1–percent level, suggesting that allocations of shares in IPOs with the highest expected returns increase in the level

[16] Jenkinson and Jones (2004) argue that the level of oversubscription is a better measure of the *ex ante* demand for an IPO than its actual first-day return, but acknowledge that the two measures are highly positively correlated.

of brokerage payments made to the lead underwriter. Based on the estimated value of β^+, a one standard deviation increase in $BrokerageFrac$ is associated with an increase of 1.08% in the fraction of shares of IPO i held by family j when IPO i has a first-day return greater than 20%. In contrast, the estimated value of β^- is -0.0625 and statistically indistinguishable from zero. Consistent with the stronger form of favoritism, I can reject at the 1–percent level the hypothesis that β^-, β^0 and β^+ are all equal. In contrast, the estimated coefficient of 0.1302 on $BrokerageFrac$ in column (1) constrained the sensitivity of reported IPO holdings to brokerage payments to be equal across the three return categories.

The coefficients in columns (3) and (4) are estimated using the samples of IPOs from 1996–1998 and 1999, to see whether allocation practices differed in 1999. The estimated values of β^0 and β^+ continue to be positive and statistically significant, and the estimated values of β^- continue to be negative but statistically indistinguishable from zero. However, in 1999, I cannot reject the hypothesis that β^-, β^0, and β^+ are equal at conventional significance levels (the p-value is 0.1375). In addition, the estimated value of β^+ of 0.1375 in 1999 is about half the estimated value of 0.2495 in 1996–1998, but still significant at the 1–percent level. Coefficients on the other variables in columns (2) through (4) are similar to those obtained in column (1).

Overall, the results of these three Tobit-based tests are consistent with the stronger form of favoritism. They suggest that allocations of the IPOs with nonnegative first-day returns respond to the strength of the business relationship between mutual fund families and lead underwriters whereas allocations of the IPOs with negative first-day returns do not. Interestingly, the evidence of favoritism is weakest in 1999. The lower estimated sensitivity of reported holdings for IPOs with the highest first-day returns to brokerage payments in 1999 likely reflects increased demand for IPOs from other institutional investors in 1999, when underpricing was at its peak. Nevertheless, in section III.A., I document that the substantially higher average first-day returns in 1999 increased the dollar returns that mutual fund families realized from favoritism in 1999 well above the dollar returns in 1996–1998.

C.1. Tests for Favoritism Based on Additional Subsets of IPOs or Families

Having found evidence of favoritism across the three sample periods, I subject the results for 1996–1999 to three (related) robustness tests. In each case, the coefficients on the control variables are qualitatively similar to those obtained for the full sample, so I limit my discussion to the coefficients on the interaction terms. First, column (5) excludes the five mutual fund families that reported holding the largest number of IPOs.[17] There are two reasons for limiting the sample in this way. The largest mutual fund families, by virtue of their size, may have relatively more bargaining power over underwriters, allowing them to obtain IPO allocations even when the strength of their relationship with the lead underwriter is weak. Also, due to their size, the largest families may simply happen to both direct brokerage commissions to a large number of underwriters and report holding a large number of IPOs. Consistent with both explanations, in column (5), the estimated value of β^0 declines from 0.1133 to 0.0848 and the estimated value of β^+ declines from 0.2120 to 0.0973. Nevertheless, the estimated coefficients on β^0 and β^+ remain positive and statistically significant at the 1–percent level.

Second, in column (6), I restrict the sample to IPOs managed by the top 30 lead underwriters. Following Megginson and Weiss (1991), I rank lead underwriters based on the total dollar proceeds of the IPOs they managed between 1996 and 1999. By this metric, the top 30 lead underwriters account for 72.5% of my observations. Because the top 30 lead underwriters tend to be the larger investment banks, they also tend to be the investment banks that receive the most brokerage payments. To the extent that the top 30 underwriters are more likely to show up among the ten investment banks to which mutual funds make the most brokerage payments, reported payments to the top 30 lead underwriters should contain less noise than reported payments to smaller investment banks. Alternatively, the larger investment banks may, by virtue of underwriting more (and more desirable) IPOs, have relatively more bargaining power over institutional investors, such that stronger business relationships with the largest banks are necessary for a given allocation. Consistent with the measurement error hypothesis, I find that the coefficients on the interaction terms in the full sample are attenuated relative to the sample of IPOs managed by the top 30 lead underwriters. In fact, the values of β^0 and β^+ estimated in column (6) are approximately twice those estimated in column (2). Since the estimated coefficients relate the level of annual brokerage business to reported holdings of each of the lead underwriter's IPOs that year, the fact that the top 30 lead underwriters underwrite more IPOs per year than other lead underwriters further magnifies the economic significance of these coefficients.

Finally, in column (7), I both restrict the sample to IPOs managed by the top 30 lead underwriters

[17]These families are Fidelity (with 459 IPOs), Massachusetts Financial Services (294), Morgan Stanley Dean Witter (192), USAA (175), and State Street (163).

and exclude the five mutual fund families that reported holding the largest number of IPOs. Within this sample, the estimated coefficients on β^0 and β^+ are similar to those estimated in the full sample in column (2), and the estimated coefficient on β^- remains statistically indistinguishable from zero. I can reject the hypothesis that β^-, β^0, and β^+ are equal at the 10–percent level. Hence, I conclude that the evidence of favoritism is not being driven by the inclusion of those families that reported holding the most IPOs.

C.2. Tests for Favoritism Based on Number of Trading Days Since the IPO

The prior tests for favoritism do not distinguish between IPO holdings that are reported 22 trading days after an IPO occurs and IPO holdings that are reported on the date of the IPO. However, as discussed in section II.A., if aftermarket trading of IPO i by family j (Δ_{ij}) is positively correlated with the level of brokerage payments ($BrokerageFrac_{ij}$), an omitted variable bias will cause the estimated correlation between holdings and brokerage payments in the full sample of IPOs to overstate the true correlation between allocations and brokerage payments. In the final set of robustness tests, I use variation in the timing of IPOs within each month to better identify the correlation between IPO allocations and the level of brokerage payments.

For each IPO in my sample, I calculate the average number of trading days between the IPO and the last trading day of the month, when most mutual funds report their equity holdings. The average number of trading days is 9.8, but ranges from 0 to 22. I then estimate the relation between reported IPO holdings and brokerage payments for subsets of IPOs based on the average number of trading days between the IPO and the end of the month. Column (1) of Table V reports coefficients estimated using the full sample of IPOs. Column (2) reports coefficients estimated using the subset of IPOs that occur on the last trading day of the month, when reported holdings are likely to best proxy for allocations. Since only 62 of the 1,722 IPOs occur on the last trading day of the month, the number of observations declines sharply from 183,187 to 5,605. Within this smaller sample, the estimated value of β^+ is 0.8414 — approximately four times the value of 0.2120 estimated using the full sample of IPOs — and statistically significant at the 1–percent level. Obviously, the coefficient of 0.8414 implies a much stronger correlation between the allocations of IPOs with the highest first-day returns and the level of brokerage payments than seen in tests based on noisier proxies for IPO allocations. The estimated value of β^0 is 0.1716, which is within the range of values seen in

Table IV, and statistically significant at the 5–percent level. In contrast, the estimated value of β^- is quite imprecisely estimated at -25.0653, with a standard error of 23.3690 (reflecting the fact that only 2 of the 5,605 observations involve positive reported holdings of IPOs with negative first-day returns).

The remaining columns of Table V focus on different subsets of IPOs. Column (3) focuses on IPOs that occur on either of the last two trading days of the month; column (4) focuses on IPOs that occur on any of the last five trading days of the month; column (5) focuses on IPOs that occur on any of the last ten trading days of the month; and column (6) focuses on IPOs that occur more than ten trading days before the end of the month. Therefore, moving from column (2) to column (6) increases the expected level of noise in my IPO allocation proxy due to subsequent trading. The differences between columns (2) and (3) highlight the possibility that reported holdings diverge rapidly from allocations. Consistent with families with stronger business ties to lead underwriters being relatively more likely to flip shares on the second day of trading, the estimated value of β^+ declines from 0.8414 to 0.2920 while the estimated value of β^0 declines from 0.1716 to 0.0948 and becomes statistically indistinguishable from zero. Comparing columns (3) and (4), the estimated value of β^+ falls further to 0.1601 while the estimated value of β^0 remains zero. I interpret these patterns as evidence that flipping in the days immediately following the IPO induces a strong negative correlation between Δ and $BrokerageFrac$, attenuating the tests for favoritism based on the full sample of IPOs.[18] However, the fact that β^0 and β^+ both increase between columns (4) and (6) suggests that there also may be a (partially) countervailing positive correlation between aftermarket purchases and $BrokerageFrac$ in the weeks following IPOs with nonnegative first-day returns.[19]

Looking across the columns in Table V, the coefficients on $BrokerageDummy$ are similar to those in Table IV. The coefficient on the affiliated family dummy variable in column (2) bounces between positive and negative values, but is always statistically indistinguishable from zero, providing no evidence that affiliated families receive disproportionately larger or smaller IPO allocations than do other mutual fund families. The coefficients on other control variables are similar to those in Table IV and not reported in Table V.

[18] In a sample of IPOs from May 1997 to June 1998, Aggarwal (2003) finds that during the first two days of trading institutional investors collectively flip 25.8% of the shares they are allocated.

[19] For example, as argued in Zhang (2004), some of the institutions receiving allocations may acquire additional shares in the aftermarket to meet minimum holding size targets.

III. On the Returns to Favoritism

A. From the Perspective of the Mutual Fund Family

The tests for favoritism in the previous section were conducted using IPO-level data. Overall, the results are consistent with the view that business relationships between mutual fund families and lead underwriters, as measured by the level of brokerage commission payments directed to lead underwriters, influence IPO allocations. In this section, I attempt to quantify the economic magnitude of the observed correlation between brokerage commission payments and IPO allocations. Specifically, I take reported IPO holdings as proxies for IPO allocations and ask how the first-day returns that mutual fund families earned on IPOs relate to brokerage commissions paid to each lead underwriter each year. This approach allows me to quantify the benefits of a stronger business relationship with the lead underwriter, recognizing that the lead underwriter can favor investors with either small allocations of each underpriced IPO or large allocations of a few underpriced IPOs.

For each mutual fund family, I begin by multiplying the reported holdings of each IPO by its offer price and first-day return. This yields the dollar return that family j would have earned on its reported holdings of IPO i on its first day of trading. Of course, calculating family-level dollar returns from reported holdings implicitly assumes mutual funds that do not report equity holdings in the month of an IPO did not receive an allocation of the IPO. For example, if family j reports holdings for one-sixth of its funds each month, my dollar return for any given IPO ignores the unreported holdings of five-sixth of family j's funds. Alternatively, if family j reports holdings for all of its funds on the same two months, say June and December, the dollar returns are reasonable estimates of actual dollar returns earned on IPOs in June and December, but estimated to be zero for all of the IPOs that occur in the other ten months of the year. In other words, because the vast majority of mutual funds only report their holdings twice per year, I expect the actual dollar return earned by each family in each year to be approximately six times the dollar return that I estimate from reported holdings. Consequently, to estimate the total dollar return that family j earned on all of the IPOs underwritten by a given investment bank in a given year, I sum the dollar returns based on reported holdings across IPOs and months and then multiply by twelve divided by the average number of times that family j's funds reported their holdings in year t. This algorithm yields 62,917 observations, one for each mutual fund family and lead underwriter pair each year (so long as the family reports holdings in at least one of the months that the lead underwriter manages an IPO).[20]

Across the 62,917 observations, the average dollar return earned by family j on the reported holdings of lead underwriter i's IPOs in year t is only estimated to be \$332,034. However, among the 3,553 observations with positive reported IPO holdings, the average dollar return is \$5.9 million. Of the 505 mutual fund families in my sample, 252 report positive IPO holdings. These 252 families earned an average return of \$82.9 million on underpriced IPOs over the four years, with returns ranging from -\$1.1 million (Perkins Capital Management) to \$2.8 billion (Fidelity). Summing across families, I estimate that mutual funds received as much as \$20.9 billion of the \$50.4 billion left on the table in my sample of 1,772 IPOs, with returns of \$3.0 billion in 1996, \$2.8 billion in 1997, \$2.6 billion in 1998, and \$12.5 billion in 1999.

In Table VI, I regress the estimated dollar return that mutual fund family j earned on lead underwriter i's IPOs in year t ($DollarReturn_{ijt}$) on family j's brokerage payments to lead underwriter i in year t ($AnnualBrokerage_{ijt}$). In addition to $AnnualBrokerage$, I include $AnnualBrokerage$ squared to test for possible nonlinearities in the relationship between IPO returns and brokerage payments, and I include $AnnualBrokerageDummy$ to determine how much of the relation between dollar returns and brokerage payments comes from having made any positive brokerage payment. I also include total brokerage payments to other lead underwriters in year t ($OtherBrokerage_{ijt}$) to control for the possibility that higher brokerage payments proxy for more information production by family j. Other independent variables include a dummy variable that indicates whether family j is affiliated with lead underwriter i ($AffiliatedDummy_{ijt}$); the fraction of the lead underwriter's IPOs that were priced below (above) the lower (upper) bound of the initial price range in year t; the natural logarithm of the total number of shares of all of the lead underwriter's IPOs during year t as a measure of supply; and the natural logarithm of the average dollars under management in family j's equity funds during year t (measured in millions of dollars) as a measure of family j's size. Estimated standard errors are robust to heteroscedasticity and cluster on lead underwriter.

Columns (1), (2), and (3) focus on 1996–1999, 1996–1998, and 1999, respectively. In each specification, the estimated coefficient on $AnnualBrokerage$ is positive and statistically significant at the 5–percent level.

[20]The fact that reported holdings may differ from allocations adds noise to my estimated dollar returns, but for reasons discussed in section II.C.2., this noise is unlikely to be positively correlated with the level of brokerage payments.

The coefficient of 2.3399 in the full sample says that for every $1.00 a mutual fund family paid a lead underwriter in brokerage commissions it earned approximately $2.34 through first-day returns on underpriced IPOs. In other words, the strength of the business relationship between the mutual fund family and the lead underwriter appears to be an economically significant determinant of access to underpriced IPOs. Of course, explicit brokerage commissions only measure one dimension of this business relationship. If mutual fund families tend to pay as much in bid-ask spreads as they do in explicit brokerage commissions, my measure of the business relationship between family j and underwriter i will understate the true strength of this relationship by a factor of two. Also, to the extent that families tend to concentrate IPO allocations within a small number of their funds, my estimated first-day returns will overstate actual first-day returns. In both cases, the coefficient on $AnnualBrokerage$ is likely to overstate the true correlation between brokerage business and first-day returns (but to remain economically significant even if adjusted).

Interestingly, the coefficient on $AnnualBrokerage$ varies from 1.2086 in 1996–1998 to 5.7463 in 1999. This implies that the benefit of a strong business relationship with a lead underwriter was much higher in 1999 than in 1996–1998. In contrast, in the IPO-level tests for favoritism, I found that the link between brokerage commissions and reported holdings of IPOs with first-day returns in excess of 20% was weakest in 1999. The much larger coefficient on $AnnualBrokerage$ in 1999 implies that the lower estimated sensitivity of IPO allocations to brokerage business in 1999 was more than offset by the larger number of IPOs with significant first-day returns. In none of the three specifications is the coefficient on $AnnualBrokerageDummy$ statistically distinguishable from zero. Therefore, it is the strength of the business relationship between the mutual fund family and the lead underwriter—rather than the existence of a relationship—that appears to determine the returns from allocations of underpriced IPOs.

The remaining columns of Table VI either restrict the sample of IPOs used to calculate the annual dollar returns or restrict the set of mutual fund families. Excluding the five families that reported holding the most IPOs (column (4)), and restricting the sample to the top 30 lead underwriters (column (5)) result in coefficients on $AnnualBrokerageFee$ that range from 1.7435 to 2.0296, and remain statistically significant at the 5–percent level. In column (6), I restrict the sample to the top 30 lead underwriters (as in column (5)), but include a fixed effect for each family-by-underwriter pair. This specification uses time-series variation in the level of brokerage payments within each family-by-underwriter pair to identify the correlation between *DollarReturn* and *AnnualBrokerageFee*. The estimated coefficient on *AnnualBrokerageFee* is 2.6357. Although this coefficient is only statistically significant at the 11–percent level, it suggests that allocations of underpriced IPOs may respond to annual fluctuations in the strength of the business relationship between a given mutual fund family and lead underwriter. Finally, in column (7), I restrict the sample to mutual fund families that made positive brokerage payments to the lead underwriter of IPO i in the year of the IPO and find that the coefficient on *AnnualBrokerageFee* is 1.8943. This specification provides additional evidence that the correlation between dollar returns and brokerage commission payments is driven by variation in the strength of the business relationship between a mutual fund family and lead underwriter rather than the existence of a business relationship. Overall, the estimated coefficients on *AnnualBrokerageFee* in Table VI imply that the positive correlation between brokerage commission payments and first-day IPO returns is economically significant and robust.[21]

Turning to the control variables, the estimated coefficients on *OtherBrokerage* are uniformly positive, but quite small and only statistically significant at the 10–percent level in four of the seven specifications. This suggests that the level of family j's total brokerage payments may be a poor proxy for the amount of private information that family j shares with lead underwriters. Finally, the coefficients on *AffiliatedDummy* are uniformly negative and statistically significant in all but one of the specifications, suggesting that affiliated families tend to earn slightly lower first-day returns on IPOs than the level of their brokerage commission payments to the affiliated underwriter would predict.

B. From the Perspective of the Lead Underwriter

The results in the previous section suggest that strong business relationships with lead underwriters increase mutual fund family access to underpriced IPOs. In fact, mutual fund families appear to have received a substantial fraction of the first-day returns on IPOs between 1996 and 1999. Whether lead underwriters were able to recapture a significant fraction of these dollars through increased margins on

[21]Repeating the analysis with returns through the first four weeks of trading yields uniformly higher estimates than those based on first-day returns. For example, the coefficient for 1996–1999 increases from 2.34 to 3.10 and the coefficient for 1999 increases from 5.75 to 7.46. These increases reflect the fact that the average IPO in my sample earned a positive return from trading day two through twenty two. Since these returns were available to investors who purchased shares in the aftermarket, I exclude them from my calculations.

brokerage commissions or increased brokerage business remains an open question.

Loughran and Ritter (2002) conjecture that lead underwriters benefit from the trading behavior of investors seeking shares in underpriced IPOs, but lack the data needed to test this hypothesis. I possess data on brokerage commission payments to individual investment banks, but lack data on the volume of shares mutual funds traded through these banks. Therefore, I am unable to ask whether IPO allocations responded to the margins paid to lead underwriters, or whether the margins paid to underwriters increased relative to those paid to non-underwriters. However, I am able to examine the total brokerage commissions paid each year by mutual fund families to underwriters and non-underwriters.

In Table VII, I classify an investment bank as an underwriter if it underwrote one or more IPOs at any point between 1996 and 1999 (or was acquired by an underwriter during this period); otherwise, I classify it as a non-underwriter. The fraction of brokerage commissions paid by mutual fund families to underwriters increased from 74.6% to 78.4% between 1998 and 1999. Interpreted in isolation, this increase is consistent with underwriters using shares in underpriced IPOs to increase the market shares of their trading desks during the hot IPO market of 1999. However, the fact that the fraction of brokerage commissions being paid by mutual fund families to underwriters increased from 60.1% to 74.6% between 1996 and 1998, when the number of dollars being left on the table each year was approximately constant, suggests that there may be other explanations for the increased share of brokerage commissions going to underwriters over my sample period. Moreover, between 1998 and 1999, when the average level of underpricing increased by 244.3% (from 21.2% to 73.0%), total brokerage payments by mutual fund families to underwriters increased by a much smaller 17.4%. Focusing instead on changes in the brokerage payments made to the top 10 underwriters based on total dollars left on the table each year, brokerage payments increased by 28.1% between 1998 and 1999. Certainly, these increases are consistent with underwriters recapturing some of the IPO underpricing through incremental brokerage business. However, unless the (unobserved) bid-ask spreads paid to underwriters increased by substantially more than 28.1%, these patterns suggest that the majority of the additional dollars left on the table in 1999 were retained by mutual fund families.

IV. Conclusion

This paper tests for favoritism in the allocation of IPOs across U.S. mutual fund families. Using IPO holdings reported by mutual funds within the month of each IPO to proxy for initial allocations, I document a robust positive correlation between the annual brokerage payments that mutual fund families make to lead underwriters between 1996 and 1999 and the reported holdings of their underpriced IPOs. Moreover, I find that the correlation between the level of brokerage payments and the level of reported holdings is strongest for IPOs that occur shortly before mutual funds report their holdings, when reported holdings best reflect allocations. I interpret these findings as evidence that the strength of the business relationships with lead underwriters is an economically significant determinant of how IPOs are allocated across institutional investors. In contrast, I find little evidence that lead underwriters favor affiliated mutual funds.

The economically significant relation between annual brokerage payments to lead underwriters and the estimated first-day returns earned on their IPOs, suggests that mutual fund families benefited significantly from favoritism between 1996 and 1999. In total, I estimate that mutual fund families may have received as much as $20.9 billion of the $50.4 billion left on the table during these four years. In addition, families directing large brokerage commission to lead underwriters in exchange for shares in underpriced IPOs then had the option to strategically allocate those shares across their funds, an option studied by Gaspar, Massa, and Matos (2004). Whether the observed link between brokerage business and IPO allocations is as strong in other years awaits additional data and analysis.

Overall, my findings lend empirical support to explanations of underpricing like Baron (1979) and Loughran and Ritter (2002) that highlight a particular agency conflict between underwriters and issuers. The documented link between IPO allocations and brokerage payments suggests that lead underwriters are able to capture some fraction of the dollars left on the table by underpricing through incremental brokerage business from investors seeking shares in IPOs. On the margin, this ability to capture dollars left on the table through incremental brokerage business then provides underwriters with an incentive to place their interests above those of the issuer and to set lower offer prices than predicted by the bookbuilding theories of underpricing. For example, my findings are suggestive that IPO allocations to venture capitalists and CEOs might have been used to increase investment banking business or reduce issuer incentives to prevent underpricing, as argued in Loughran and Ritter (2004). Clearly, everything else equal, excess underpricing harms the issuer. However, if issuers use underpricing to reduce direct fees or purchase additional services, they may decrease the costs of this agency conflict. Along these lines, Cliff and Denis (2004) provide evidence that issuers used underpricing to acquire coverage by all-star analysts. Moreover, the discretion that makes favoritism possible has been shown to benefit issuers through increased price discovery during the bookbuilding period (Ljungqvist and Wilhelm (2002)). While my study documents favoritism in the allocation of underpriced IPOs, the extent to which favoritism harms issuers through excess underpricing remains an important open question.

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Table I

IPO Sample Summary Statistics

		Mean											Total
Sample	N	Offer Price	Close Price	Return 1 day	Return 4 week	Return 90 days	Below Range	Above Range	Shares (000s)	# of Lead	NYSE	Nasdaq	Dollars Left on the Table
IPOs in SDC & CRSP	1,868	12.80	17.61	30.0%	39.3%	48.4%	22.7%	28.2%	5,121.1	1.04	12.4%	82.7%	51,017
Lead not listed in NSARs	146	7.23	9.10	23.1%	21.6%	5.8%	11.6%	15.7%	1,586.2	1.01	2.7%	84.3%	594
Lead listed in NSARs	1,722	13.27	18.34	30.6%	40.7%	52.0%	23.6%	29.2%	5,420.8	1.04	13.2%	82.5%	50,423
Reported Holdings = 0	501	10.44	12.74	17.3%	21.0%	27.2%	37.1%	10.4%	3,374.5	1.03	5.6%	88.8%	5,830
Reported Holdings > 0	1,221	14.43	20.63	36.1%	48.9%	62.3%	18.1%	36.9%	6,260.4	1.05	16.4%	79.9%	44,594
Single Lead	1,649	13.10	17.77	28.9%	38.8%	50.7%	24.1%	28.7%	4,997.4	1.00	12.4%	83.2%	43,126
Multiple Lead	73	17.11	31.08	69.5%	86.1%	81.9%	13.7%	41.1%	14,983.7	2.03	31.5%	67.1%	7,297
1996	608	12.68	14.93	15.4%	19.5%	24.7%	24.3%	24.0%	4,121.9	1.01	12.2%	81.1%	6,415
1997	412	12.39	14.29	13.5%	14.8%	20.3%	30.8%	23.8%	4,320.5	1.01	16.5%	78.9%	4,109
1998	260	13.02	16.04	21.2%	26.3%	21.9%	27.3%	22.3%	7,204.9	1.05	18.9%	77.3%	4,548
1999	442	15.05	28.15	73.0%	103.6%	138.3%	13.8%	45.5%	7,183.6	1.12	8.4%	91.0%	35,351

The full sample of IPOs in SDC & CRSP consists of 1,868 IPOs that SDC lists as occurring between 1996 and 1999, that have offer prices greater than or equal to \$5, and that CRSP lists as trading on AMEX, NYSE, or Nasdaq within 5 days of SDC's IPO date. It excludes unit investment trusts, unit offerings, closed-end mutual funds, real estate investment trusts, and American Depository Receipts. The sample is divided into IPOs whose lead underwriters are listed in NSAR filings as having received brokerage commission payments from one or more mutual fund families during (any part of) the period 1996–1999, and IPOs whose lead underwriters do not appear in any NSAR filings. The sample of 1,722 IPOs whose lead underwriter received brokerage commission payments from mutual fund families is then divided based on whether one or more mutual fund family reported holding the IPO within the month of the IPO, whether the IPO had multiple lead underwriters, and the year of the offering. The columns report the means for offer price; market price at the close of the first day of trading (as reported by SDC and supplemented by CRSP); first-day, four–week and 90–day returns (calculated from the offer price); fraction of IPOs priced below (above) the lower (upper) bound of the initial price range; number of shares issued (excluding the overallotment option); number of lead underwriters; the fraction of IPOs listed on NYSE and Nasdaq (based on CRSP's exchange code variable); and the number of dollars left on the table, calculated as the number of shares issued (excluding the overallotment option) times the offer price times the first-day return, and reported in millions of dollars.

Table II
IPO Returns and Reported Holdings

First–Day Return Category	Full Sample	IPO held by one or more family? No	IPO held by one or more family? Yes
Number of IPOs within Category			
Return $< 0\%$	171	91	80
Return $\in [0\%, 20\%]$	897	305	592
Return $> 20\%$	654	105	549
All IPOs	1,722	501	1,221
Fraction of IPOs within Category			
Return $< 0\%$	9.9%	18.2%	6.6%
Return $\in [0\%, 20\%]$	52.1%	60.8%	48.4%
Return $> 20\%$	38.0%	21.0%	45.0%
All IPOs	100.0%	100.0%	100.0%
Mean Return within Category			
Return $< 0\%$	-8.7%	-8.9%	-8.4%
Return $\in [0\%, 20\%]$	6.7%	5.4%	7.4%
Return $> 20\%$	73.7%	74.8%	73.5%
All IPOs	30.6%	17.3%	36.1%
Median Return within Category			
Return $< 0\%$	-6.2%	-6.2%	-6.3%
Return $\in [0\%, 20\%]$	5.3%	3.6%	6.5%
Return $> 20\%$	43.2%	43.2%	43.3%
All IPOs	12.5%	3.8%	16.3%

The sample consists of the 1,722 IPOs whose lead underwriters received brokerage commission payments from mutual fund families during (any part of) the period 1996–1999. It is divided into the 501 IPOs that no mutual fund family reported holding within the month of the IPO and the 1,221 IPOs that one or more mutual fund family reported holding in the month of the IPO. Return categories are based on first-day returns as reported by SDC and supplemented by CRSP. The mean return within each return category is calculated as an equal–weighted average.

Table III
Summary Statistics

Variable *(Units)*	All Observations *N*	Mean	Std. Dev.	Subset of Observations with Positive Values *N*	Mean	Std. Dev.
IPO–Level Observations						
Reported Holdings *(000s)*	1,722	413.8	1392.1	1,221	583.6	1,623.1
Reported Holdings as Fraction Shares Issued	1,722	0.0681	0.0978	1,221	0.0961	0.1039
Number Families Reporting Holdings	1,722	3.6533	5.6565	1,221	5.1523	6.1161
Aggregate Brokerage Fee *($000s)*	1,722	6,362.6	7,755.0	1,608	6,813.9	7,831.4
IPO–by–Family–Level Observations						
Reported Holdings *(000s)*	185,032	3.8518	78.0967	6,291	113.2594	408.6830
Reported Holdings as Fraction Shares Issued	185,032	0.0006	0.0080	6,291	0.0187	0.0391
Brokerage Fee *($000s)*	185,032	37.7	226.2	73,088	95.4	352.1
Brokerage Fee Dummy	185,032	0.3950	0.4889	73,088	1.0000	0.0000
Brokerage Fee Fraction	185,032	0.0056	0.0327	73,088	0.0142	0.0501
Aggregate Brokerage Fee *($000s)*	185,032	871.6	2,320.1	179,959	896.2	2,347.9
Affiliated Family Dummy	185,032	0.0032	0.0567			
Held Cold IPO Dummy	185,032	0.0113	0.1055			
Fraction IPO Holdings Same Industry	185,032	0.1486	0.2595			
TNA of Family's Equity Funds *($ millions)*	183,187	2,707.5	14,731.1			
Fraction Family's Equity Funds Reporting	185,032	0.5877	0.3757			
Number of Shares Issued *(000s)*	185,032	5,306.3	9,679.3			
Offer Price *($)*	185,032	13.2888	5.1115			
Price Below Initial Range Dummy	185,032	0.2299	0.4208			
Price Above Initial Range Dummy	185,032	0.2904	0.4539			
First-Day Return $< 0\%$ Dummy	185,032	0.0974	0.2964			
First-Day Return $\in [0\%, 20\%]$ Dummy	185,032	0.5179	0.4997			
First-Day Return $> 20\%$ Dummy	185,032	0.3848	0.4865			
Top 10 Underwriter Dummy	185,032	0.3905	0.4879			
Top 30 Underwriter Dummy	185,032	0.7249	0.4466			
Multiple Lead Underwriter Dummy	185,032	0.0435	0.2040			
Trading Days from IPO to Holdings	185,032	9.8049	6.0805			

The IPO-Level Observations panel reports summary statistics for the 1,722 IPOs whose lead underwriters received brokerage commission payments from mutual fund families during (any part of) the period 1996–1999 (the same IPOs summarized in Table II). *Reported Holdings* measures the total number of shares of IPO i held by mutual funds reporting their holdings during the month of (and after) IPO i. *Reported Holdings as Fraction Shares Issued* measures the fraction of shares issued in IPO i that are held by mutual funds reporting their holdings during the month of (and after) IPO i. *Number of Families Reporting Holdings* measures the number of families reporting positive holdings of IPO i. *Aggregate Brokerage Fee* measures the average monthly brokerage commission payment received by the lead underwriter of IPO i.

In the IPO–by–Family–Level Observations panel, there is one observation per IPO i per mutual fund family j that reported holdings for one or more of its mutual funds during the month (and after the date) that IPO i occurred. *Reported Holdings* indicates the number of shares that family j reported holding of IPO i; it equals zero if family j reported holdings for one or more mutual funds but did not report holding any shares of IPO i. *Reported Holdings as Fraction Shares Issued* divides *Reported Holdings* by the *Number of Shares Issued* (excluding the overallotment option). It ranges from zero to one. *Brokerage Fee* is the average monthly brokerage commission payment made by mutual fund family j to the lead underwriter of IPO i in the calendar year of IPO i. *Brokerage Fee Dummy* equals one if Brokerage Fee is positive and zero otherwise. *Brokerage Fee Fraction* equals *Brokerage Fee* divided by the sum of *Brokerage Fee* across all of the mutual fund families in year t making brokerage payments to lead underwriter i; it is set to zero when the lead underwriter of IPO i did not receive any reported brokerage commissions in year t. *Aggregate Brokerage Fees* aggregates *Brokerage Fee* over all of the lead underwriters to whom family j reported making brokerage commission payments. *Affiliated Family Dummy* equals one if mutual fund family j is affiliated with the lead underwriter of IPO i (during the month of the IPO) and zero otherwise. *Held Cold IPO Dummy* equals one if family j reported holding shares in another of the lead underwriter's IPOs in year t, that IPO had a negative first-day return, and the first-day return of IPO i is positive. *Fraction IPO Holdings Same Industry* measures the fraction of the other IPOs that family j reported holding in calendar year t that were in the same industry as IPO i. (The industry classification is based on SIC codes and described in the text.)

TNA of Family's Equity Funds measures the average dollars under management in all of family j's equity funds during the calendar year of IPO i (not just those equity funds that report their holdings in the month of IPO i); it is missing when Thomson Financial failed to report the size of one or more of family j's equity funds during the calendar year of IPO i. *Fraction Family's Equity Funds Reporting* (ϕ) indicates the fraction of the equity funds in family j that reported their holdings in the month of IPO i. *Number of Shares Issued* in IPO i excludes the overallotment option. *Offer Price* is the price the lead underwriter charges investors for shares before the issue begins trading. *Price Below (Above) Range Dummy* equals one if the *Offer Price* is below (above) the lower (upper) bound of the initial price range and zero otherwise. The *First-Day Return Dummies* indicate whether the first day return of IPO i was negative, between 0 and 20%, or greater than 20%. *Top 10 (30) Underwriter Dummy* equals one if the market share of underwriter of IPO i (measured by the amount of money they raised for issuers between 1996–1999) places it in the top 10 (30). *Multiple Lead Underwriter Dummy* equals one for the 73 IPOs for which SDC lists two or more investment banks as being lead underwriters. *Trading days from IPO to Reported Holdings* measures the number of trading days from IPO i to the date family j reported holdings for its funds; it ranges from 0 to 22 trading days.

Table IV
Tobit Analysis of Reported IPO Holdings

Dependent Variable:		= Family j reported holdings of IPO i divided by shares issued						
Sample:		1996–1999	1996–1999	1996–1998	1999	1996–1999		
						Excl. Top 5 Families	Top 30 Lead Only	Top 30 Lead & Excl. Top 5 Families
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Brokerage Fee Fraction		0.1302***						
		[7.96]						
Brokerage Fee Fraction $\times\ I_{\{\text{Return}<0\%\}}$	β^-		-0.0625	-0.0847	-0.0416	-0.1447	-0.0670	-0.1706
			[-0.68]	[-0.52]	[-0.47]	[-0.90]	[-0.47]	[-0.91]
Brokerage Fee Fraction $\times\ I_{\{\text{Return}\in[0\%,20\%]\}}$	β^0		0.1133***	0.1230***	0.1529***	0.0848***	0.2445***	0.1563***
			[4.92]	[4.34]	[2.57]	[3.43]	[5.88]	[3.59]
Brokerage Fee Fraction $\times\ I_{\{\text{Return}>20\%\}}$	β^+		0.2120***	0.2495***	0.1375***	0.0973***	0.4322***	0.2232***
			[7.88]	[6.34]	[4.37]	[3.02]	[10.80]	[5.02]
Brokerage Fee Dummy		0.0181***	0.0180***	0.0204***	0.0132***	0.0189***	0.0124***	0.0139***
		[13.12]	[12.99]	[10.37]	[7.78]	[13.78]	[9.03]	[10.60]
Affiliated Family Dummy		0.0002	0.0002	-0.0312	0.0168	-0.0014	-0.0030	-0.0024
		[0.02]	[0.01]	[-1.02]	[1.36]	[-0.09]	[-0.22]	[-0.18]
Held Cold IPO Dummy		0.0475***	0.0473***	0.0611***	0.0322***	0.0343***	0.0419***	0.0294***
		[11.78]	[11.74]	[8.71]	[8.52]	[7.56]	[11.47]	[7.47]
Fraction IPO Holdings In Same Industry		0.0423***	0.0423***	0.0399***	0.0423***	0.0422***	0.0399***	0.0382***
		[19.61]	[19.58]	[12.24]	[17.11]	[19.94]	[18.94]	[19.26]
Return $\in [0\%, 20\%]$ Dummy		0.0136***	0.0122***	0.0115***	0.0050	0.0114***	0.0076**	0.0077**
		[4.57]	[4.04]	[2.56]	[1.35]	[3.77]	[2.43]	[2.52]
Return $> 20\%$ Dummy		0.0220***	0.0199***	0.0264***	0.0104***	0.0194***	0.0129***	0.0135***
		[7.06]	[6.32]	[5.59]	[2.90]	[6.12]	[3.97]	[4.28]
Priced Below Range Dummy		-0.0106***	-0.0106***	-0.0106***	-0.0141***	-0.0078***	-0.0108***	-0.0079***
		[-5.00]	[-4.97]	[-3.85]	[-4.04]	[-3.74]	[-4.91]	[-3.80]
Priced Above Range Dummy		0.0216***	0.0218***	0.0240***	0.0169***	0.0200***	0.0195***	0.0174***
		[14.06]	[14.15]	[10.90]	[8.91]	[13.09]	[12.93]	[12.14]
Ln(Number of Shares Issued)		0.0187***	0.0187***	0.0233***	0.0135***	0.0173***	0.0159***	0.0145***
		[20.91]	[20.92]	[19.03]	[10.55]	[19.49]	[18.21]	[17.32]
Ln(TNA of Family's Equity Funds)		0.0169***	0.0169***	0.0196***	0.0124***	0.0151***	0.0155***	0.0135***
		[44.75]	[44.67]	[34.94]	[28.34]	[40.54]	[41.09]	[37.90]
Fraction Family's Equity Funds Reporting		-0.2845***	-0.2826***	-0.3301***	-0.2162***	-0.2486***	-0.2478***	-0.2148***
		[-31.94]	[-31.76]	[-27.26]	[-17.04]	[-28.15]	[-27.82]	[-25.18]
N		183,187	183,187	134,121	49,066	175,536	132,897	127,432
Pseudo R-squared		0.3882	0.3892	0.3056	0.7555	0.3710	0.4536	0.4318
H_0: $\beta^- = \beta^0 = \beta^+$			0.0013	0.0098	0.1375	0.3322	0.0001	0.0888

This table reports coefficients estimated via Tobit. The sample is restricted to the 1,722 IPOs whose lead underwriters received brokerage commission payments from mutual fund families during (any part of) the period 1996–1999. There is one observation per IPO i per mutual fund family j that reported holdings for one or more of its mutual funds during the month of IPO i. The dependent variable is the fraction of shares issued in IPO i that family j reported holding. The independent variables are defined in the notes to Table III. As discussed in the text, all of the independent variables are scaled by the fraction of family j's equity funds that report holdings during the month of IPO i (except for Fraction Family's Equity Funds Reporting). Columns (2) through (4) focus on the periods 1996–1999, 1996–1998, and 1999, respectively. Columns (5) and (7) exclude the the five mutual fund families that report holding the most IPOs (Fidelity (with 459 IPOs), Massachusetts Financial Services (294), Morgan Stanley Dean Witter (192), USAA (175), and State Street (163)). Columns (6) and (7) restrict the sample to the top 30 lead underwriters (based on the market shares of the IPOs they managed between 1996 and 1999). A constant term is included in each regression but not reported. Z-statistics are reported in brackets. Coefficients statistically significant from zero at the 10- and 5- and 1–percent levels (based on critical values from a two-sided hypothesis test) are indicated by *, **, and ***, respectively. The last row reports p-values for the null hypothesis that the estimated values of β^-, β^0, and β^+ are equal.

Table V
Tobit Analysis of Reported IPO Holdings over Different Holding Periods

Dependent Variable:		= Family j reported holdings of IPO i divided by shares issued					
Sample:		1996–1999 (Baseline) (1)	Report On Day of IPO (2)	Within 1 Day of IPO (3)	Within 5 Days of IPO (4)	Within 10 Days of IPO (5)	More Than 10 Days (6)
Brokerage Fee Fraction $\times I_{\{\text{Return}<0\%\}}$	β^-	-0.0625	-25.0653	-0.6297	-0.3612	-0.0302	-0.1464
		[-0.68]	[-1.07]	[-1.21]	[-1.02]	[-0.35]	[-0.62]
Brokerage Fee Fraction $\times I_{\{\text{Return}\in[0\%,20\%]\}}$	β^0	0.1133***	0.1716**	0.0948	0.0524	0.1221***	0.1059***
		[4.92]	[2.03]	[1.16]	[0.99]	[3.51]	[3.19]
Brokerage Fee Fraction $\times I_{\{\text{Return}>20\%\}}$	β^+	0.2120***	0.8414***	0.2920***	0.1601***	0.1741***	0.2851***
		[7.88]	[3.35]	[3.37]	[4.73]	[5.83]	[5.43]
Brokerage Fee Dummy		0.0180***	0.0199**	0.0042	0.0128***	0.0160***	0.0206***
		[12.99]	[2.30]	[1.37]	[6.65]	[9.58]	[8.71]
Affiliated Family Dummy		0.0002	-0.0197	0.0044	0.0096	0.0113	-0.0378
		[0.01]	[-0.37]	[0.14]	[0.56]	[0.75]	[-1.05]
Controls from Table IV?		Yes	Yes	Yes	Yes	Yes	Yes
N		183,187	5,605	15,982	54,409	100,130	83,057
Pseudo R-squared		0.3892	0.4199	0.5585	0.5000	0.4342	0.3534
H_0: $\beta^- = \beta^0 = \beta^+$		0.0013	0.0179	0.0684	0.0869	0.0641	0.0063

This table extends the analysis of Table IV to subsets of IPOs based on the number of trading days between the IPO and the date family j reported its holdings. Column (1) repeats column (2) from Table IV. Columns (2) through (6) restrict the sample of 1,722 IPOs to those occurring on the day family j reported its holdings, within one trading day, within five trading days, within ten trading days, and all other IPOs. The set of control variables from Table IV are included in each regression but are not reported. Z-statistics are reported in brackets. Coefficients statistically significant from zero at the 10- and 5- and 1–percent levels (based on critical values from a two-sided hypothesis test) are indicated by *, **, and ***, respectively. The last row reports p-values for the null hypothesis that the estimated values of β^-, β^0, and β^+ are equal.

Table VI
Regression Analysis of Dollars Earned on Underpriced IPOs

Dependent Variable:	= Family j dollar returns on IPOs from lead underwriter i during year t ($000)						
Sample:	1996–1999	1996–1998	1999	1996–1999			
				Excl. Top 5 Families	Top 30 Lead Only	Top 30 Lead Only	Positive Brokerage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Brokerage Payments to Lead Underwriter	2.3399**	1.2086***	5.7463**	1.7435***	2.0296**	2.6357	1.8943**
	[2.57]	[3.30]	[2.43]	[3.77]	[2.23]	[1.59]	[2.16]
Brokerage Payments to Lead Underwriter^2	0.00000	-0.00002	-0.00003	-0.00005***	0.00001	-0.00006	0.00001
	[0.12]	[-1.53]	[-0.68]	[-5.16]	[0.20]	[-0.64]	[0.37]
Brokerage Payments to Lead Dummy	-383.07	-38.60	-1,445.14	-89.13	-570.01*	-164.59	
	[-1.40]	[-0.58]	[-1.59]	[-1.07]	[-1.77]	[-0.66]	
Brokerage Payments to Other Leads	0.0147**	0.0016	0.0466*	0.0040	0.0624**	0.2317	0.0503*
	[2.04]	[1.46]	[1.77]	[1.22]	[2.25]	[1.42]	[1.94]
Affiliated Fund Family Dummy	-1,657.52**	-992.87**	-3,855.97	-1,286.71***	-1,784.04*		-1,994.11*
	[-2.11]	[-2.34]	[-1.35]	[-3.56]	[-1.97]		[-1.96]
Fraction of Lead's IPOs Priced Below Range	-84.45	-114.15***	-1924.97**	-70.30	-573.74	-697.77	-175.21
	[-0.83]	[-2.84]	[-2.49]	[-1.21]	[-1.15]	[-0.66]	[-0.28]
Fraction of Lead's IPOs Priced Above Range	592.21***	158.34**	1,467.39	364.32***	1,562.24**	1,856.20	3,273.50***
	[2.60]	[2.21]	[1.39]	[2.82]	[2.50]	[1.25]	[2.89]
Ln(Number of Shares Issued (All IPOs))	123.27***	77.74***	277.21	93.03***	451.02***	790.83***	486.96***
	[4.56]	[5.87]	[1.66]	[4.66]	[6.04]	[2.69]	[3.92]
Ln(TNA of Family's Equity Funds)	10.11	32.55***	-43.12	46.93***	16.08	-45.94	-5.05
	[0.37]	[4.79]	[-0.32]	[4.47]	[0.24]	[-0.45]	[-0.04]
Year Fixed Effects?	Yes	Yes	–	Yes	Yes	Yes	Yes
Family-by-Lead FEs?	–	–	–	–	–	Yes	–
N	62,425	50,244	12,181	60,796	27,086	27,086	12,390
R-squared	0.1061	0.0906	0.1893	0.0712	0.1150	0.3913	0.1120

This table analyzes the estimated dollar returns that family j earned on the IPOs managed by lead underwriter i in year t. The sample consists of one observation per mutual fund family per lead underwriter per year (if the family reported holdings during one or more of the months that the lead underwriter managed an IPO) and the dependent variable is the estimated dollar returns earned by family j on the IPOs managed by lead underwriter i in calendar year t ($000). Independent variables include the brokerage payments made by family j to lead underwriter i in year t ($000), brokerage payments to the lead underwriter squared, total brokerage payments to other lead underwriters during year t ($000), a dummy variable that indicates whether family j is affiliated with lead underwriter i, the fraction of the lead underwriter's IPOs that were priced below the lower bound of the initial price range in year t, the fraction of the lead underwriter's IPOs that were priced above the upper bound of the initial price range in year t, the natural logarithm of the total number of shares of all of the lead underwriter's IPOs during year t, and the natural logarithm of the average dollars under management in family j in year t, measured in millions of dollars. Columns (1) through (3) focus on the periods 1996–1999, 1996–1998, and 1999. Columns (4) through (8) focus on the period 1996–1999 but either restrict the sample of IPOs used to calculate the annual dollar returns from IPOs or restrict the set of mutual fund families. Column (4) excludes the 73 IPOs with multiple lead underwriters. Column (5) excludes the five mutual fund families that report holding the most IPOs (Fidelity (with 459 IPOs), Massachusetts Financial Services (294), Morgan Stanley Dean Witter (192), USAA (175), and State Street (163)). Columns (6) and (7) restrict the sample to the top 30 lead underwriters (based on the market shares of the IPOs they managed between 1996 and 1999), and column (7) includes mutual fund family-by-lead underwriter fixed effects. Column (8) restricts the sample to fund family-by-lead underwriter pairs with positive reported brokerage payments. Year fixed effects are included in every specification except column (3). Standard errors cluster on lead underwriter; t-statistics are reported in brackets beneath point estimates. Coefficients statistically significant from zero at the 10- and 5- and 1–percent levels (based on critical values from a two-sided hypothesis test) are indicated by *, **, and ***, respectively.

Table VII
Annual Brokerage Commission Payments to Underwriters Versus Other Investment Banks, 1996–1999

	Dollars ($ millions)				Market Share			
	1996	1997	1998	1999	1996	1997	1998	1999
Total Brokerage Commission Payments								
All Underwriters	$1,546	$1,602	$2,120	$2,489	60.1%	69.5%	74.6%	78.4%
Top 10 — Dollars Raised	$921	$1,039	$1,515	$1,852	59.6%	64.9%	71.5%	74.4%
Top 10 — Dollars Left on the Table	$805	$1,026	$1,446	$1,853	52.1%	64.0%	68.2%	74.4%
Other Investment Banks	$1,029	$703	$721	$686	39.9%	30.5%	25.4%	21.6%
All Investment Banks	$2,575	$2,305	$2,841	$3,175				

This table uses the brokerage commission data collected from NSAR filings for 1996–1999 to calculate the annual market share of the brokerage payments going to investment banks that underwrite IPOs versus all other investment banks. For the set of All Underwriters, I define an investment bank as an underwriter if it underwrote one or more of the IPOs in my sample or was acquired by an investment bank that underwrote IPOs between 1996 and 1999. I also report brokerage commission payments to the Top 10 Underwriters based on total dollars raised and total dollars left on the table each year. Market shares for the Top 10 Underwriters are calculated among the set of All Underwriters.