When Bookbuilding Meets IPOs*

Amit Bubna
Indian School of Business
ISB Campus, Gachibowli
Hyderabad, India 500032
+91 40 2318 7133
amit_bubna@isb.edu

N. R. Prabhala
R H Smith School of Business
University of Maryland
College Park, MD 20742
(301) 405 2165
prabhala@rhsmith.umd.edu

September 6, 2007
JEL Classification: G15, G24, G28, G30

* We thank Viral Acharya, Sankar De, Jerry Hoberg, Mudit Kapoor, Alexander Ljungqvist, Raghuram Rajan and seminar participants at Hong Kong University of Science and Technology, Indian School of Business, University of Maryland, Wharton, and conference participants at the Asian Finance Association meetings and The Second Summer Conference at CAF, for helpful comments on the paper. We also thank Prithvi Haldea, Jyoti Jaipuria, Vinay Mittal, and individuals at the stock exchanges for helpful discussions on the Indian IPO process and Deepika Luke, Laxmi Natarajan, Abhishek Sehgal and B. Suhasini for excellent research assistance. Much of the research was carried out when the second author was visiting International Center for Finance at Yale, whom we thank for their generous hospitality. We retain responsibility for any errors that remain.

When Bookbuilding Meets IPOs

ABSTRACT

Bookbuilding, the dominant offering mechanism for IPOs in the U.S. and other markets, is controversial because of the power it gives underwriters over IPO allocations. Critics point to the fact that allocations could be abused to generate kickbacks for underwriters while proponents argue that allocation power could improve pre-market price discovery. We examine the effect of varying underwriter power over IPO allocations in the Indian IPO market, exploiting its natural variation due to regulatory changes. When underwriters control allocations, bookbuilding is associated with lesser underpricing, but this effect quickly dissipates when regulations bar allocation discrimination. Using a proprietary dataset of IPO books, we find that allocation discrimination is pervasive, economically significant, and is used to differentiate between institutional investors based on hard information in bids, issue and bidder characteristics and soft information possessed by underwriters. Our evidence supports bookbuilding theories in which discretion in allocation helps in pre-market price discovery.

1 Introduction

The decision to go public, or make an initial public offering (IPO) of equity, is an important landmark in a firm's life cycle. Investment banks act as partners of firms during the IPO process. They advise firms on how to structure the offering, how it should be marketed to investors, organize the related road shows, and perhaps most crucially, help set the offer price for the issue. The process by which the issue manager determines the price varies across markets and depends on the type of the offering mechanism. In "bookbuilding," an IPO manager solicits demand information from prospective investors. This information is used by underwriters to set an offer price and allocate shares to investors. The key feature – indeed, the defining feature – of bookbuilding is that the pricing and allocation decisions are not defined by preset rules but left to the subjective discretion of the IPO manager. Bookbuilding is the predominant mechanism in the U.S., and it has come to dominate most markets in which it is allowed. The trend in favor of bookbuilding and potential explanations is the focus of Sherman (2002, 2005) and Jagannathan and Sherman (2005, 2006).

Even as bookbuilding continues to expand its reach, it often faces criticism for the power it gives underwriters over the IPO process. At the heart of this criticism is the latitude in allocating IPO shares enjoyed by underwriters of bookbuilt IPOs. Given that IPOs are underpriced, i.e., they tend to appreciate above the offer price once trading begins, the power to allocate shares effectively grants IPO underwriters the ability to distribute large profits to investors. For instance, in the U.S., the money left on the table equals $106 billion for IPOs brought to the market between 1980 and 2000 (Ritter and Welch (2002)). With such money at stake, power over allocations appears to be a recipe for cronyism and corruption. While there is little direct evidence of such abuse, there is anecdotal evidence of practices such as "spinning," although even this is somewhat mixed.[1] On the other side of the debate, bookbuilding proponents

[1] Allegations of abuse of allocation power include "spinning," in which underwriters give share allocations in exchange for inflated brokerage for future trades (Smith and Pulliam (2000), Gasparino, Schroeder and Kranhold (2000)). However, the high profile case of Frank Quattrone and CSFB has failed to result in a prosecution. On the other hand, the evidence in Nimalendran, Ritter, and Zhang (2006) suggest that trading and allocations are not dissociated from each other.

point out that giving underwriters power over allocation could improve pre-market price discovery. The pioneering theoretical work on this point includes Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), and Spatt and Srivastava (1991).

The Indian IPO market offers an interesting setting for studying underwriter power over allocations. In the Indian market, regulations induce natural variation in underwriter control over IPO allocations. Underwriters were first granted and then stripped of the ability to allocate shares in bookbuilt IPOs. Historically, firms could go public in India only via a fixed price offering mechanism that gave no discretion in allocation to underwriters. In 1999, bookbuilding was introduced into the Indian market. The initial version of bookbuilding differed from traditional fixed price offerings in two ways. One, underwriters enjoyed the ability to adjust prices in response to market demand as reflected in pre-market bidding. In contrast, underwriters of fixed price offerings could make no adjustment to the offer price in response to investor bids, so the filing price was the final offer price in these offerings. A second difference was that in bookbuilt IPOs, underwriters enjoyed complete control over allocations. In contrast, underwriters had no control over allocations in fixed price offerings, which were required to be proportionate by law. In November 2005, there was another shift in regulations governing the IPO process. In the new regime, bookbuilt IPOs retained the same ability to adjust offer prices in response to bids as before. However, allocations were required to be proportionate, so underwriters no longer controlled IPO allocations.

Thus, the Indian IPO market witnessed two versions of bookbuilding. Both versions of bookbuilding permitted similar flexibility in setting final offer prices in response to books. However, the two versions differed in the allocation power granted to underwriters. The earlier version of bookbuilding gave underwriters both pricing flexibility and allocation discretion, while the later version gave underwriters the same pricing flexibility but took away allocation discretion. We compare the effect of bookbuilding with and without allocation powers, in the spirit of a difference-in-difference approach. We also shed light on how underwriters use their allocation powers. Using a proprietary dataset of IPO books, we characterize the prevalence, economic signif-

icance, and cross-sectional drivers of discrimination in IPO allocations. Our results indicate that underwriters use allocation discretion extensively based on the hard and soft information they obtain during the pre-market process.

We briefly summarize the results. The first part of our analysis examines IPOs after the initial introduction of bookbuilding to the Indian market. In this time period, there are two types of offerings: fixed price offerings with no underwriter allocation power and bookbuilt IPOs in which underwriters have allocation power. In this regime, we find that bookbuilding is associated with lower underpricing, consistent with the view that there is greater pre-IPO information production when underwriters control allocation. We conduct a parallel analysis for the time period after November 2005 when underwriters were stripped of allocation powers. Much of the positive effect of bookbuilding quickly dissipates in the no-allocation power regime. This is probably not the result one might expect a priori given the high levels of underpricing in India (median = 22%, mean = 33% in our sample), which affords ample opportunities for cronyism and related quid pro quo. Yet, the evidence suggests that on average, discretion in allocation is used positively to benefit issuers.

The second part of our analysis examines books of bids and allocations for subsample of 25 IPOs. Our goal is to examine the extent of discrimination and empirically characterize its cross-sectional variation. This analysis brings to the table a new dataset on IPO bids and allocations, which has been relatively sparse in received work on IPOs. Absent legal requirements that underwriters should disclose data on their books, issue managers tend to guard the data rather zealously, leading Ritter and Welch (2002) to characterize share allocation issues as promising avenues for future research. We contribute towards filling in the gap. Our evidence in this analysis builds on work on European IPO books by Cornelli and Goldreich (2001, 2003) and Jenkinson and Jones (2005).

As background for the book analysis, we briefly discuss some institutional aspects of the Indian IPO market. An important aspect of the Indian market is the legal status of bids. In the U.S. (and other markets with bookbuilding), initial bids submitted by investors are only indicative. However, in the Indian IPO market, bids are

irrevocable and legally binding. Furthermore, all investors with the exception of tiny retail investors (bid amounts below about $2,000) must submit limit orders indicating both the quantity bid for and the price at which they bid. In the European markets analyzed by Cornelli and Goldreich (2001, 2003), institutions can submit either market or limit order bids. Third, underwriters are not allowed to discriminate between individual bids, all of which are awarded proportionate allocations. Finally, fixed buckets of shares are reserved for institutional and individual bidders. Thus, underwriter discrimination is *within* the institutional pool rather than between individuals and institutions.

The use of discrimination in our sample is pervasive. We can reject the hypothesis of no discrimination individually for every IPO in our sample. The odds of receiving favorable or unfavorable allocation depend on the bid size but the relation is not linear nor is it monotonic. Interestingly, bids are *not* a sufficient statistic for determining allocation. Other variables can partly explain IPO allocations. Controlling for bid size parametrically or non-parametrically, we find that underwriters tend to favor domestic mutual funds or foreign institutional investors at the expense of financial institutions such as banks and insurance companies. We find no evidence that frequent bidders are favored in allocations. However, bidders, conditional on being frequent, are less likely to be discriminated against when they are not equity market investors such as mutual funds. This finding is consistent with underwriters using uninformed nonequity investors for insurance against adverse demand conditions or for providing competition to informed equity market bidders. We find weaker evidence on the role of underwriter reputation or a U.S. affiliation in determining whether allocation discretion is used. Our results suggest that allocation decisions involve the use of both hard information in bids as well as soft information unrelated to the specific bid presented in the books. The ability to use non-bid and subjective information is associated with lower underpricing, and perhaps provides one explanation for the popularity of bookbuilding in IPOs compared to mechanisms that prescribe pricing and allocation policies blind to non-bid information.

The rest of the paper is organized as follows. Section 2 overviews the related

IPO literature. Section 3 provides a brief description of the institutional setting of the Indian IPO market. Section 4 describes the data for the analysis of underpricing in Indian IPOs. Section 5 compares bookbuilt IPOs with fixed price IPOs using various specifications. Section 6 presents evidence from the bids and allocations from a proprietary sample of IPO books. Section 7 concludes.

2 Literature

The IPO literature is quite extensive. Ritter and Welch (2002) and Ljungqvist (2005) provide relatively recent and comprehensive surveys of literature. Ritter and Welch discuss IPO activity, pricing and allocations, while Ljungqvist focuses on IPO underpricing.

The literature on IPO offering mechanisms dates back to at least Rock (1986). Rock models the lemons problem in the IPO market with asymmetric information among potential IPO investors, and argues that underpricing is a natural consequence of this lemons problem. Benveniste and Spindt (1989) model the information gathering process in a mechanism design setting close to the U.S. bookbuilding process. In their model, underwriters commit to underpricing in order to extract favorable information held by outside investors in the pre-IPO period. A related point is made by Spatt and Srivastava (1991), who contend that pre-play communication and limited participation constraints similar to discriminatory allocations results in a superior selling procedure (see also Sherman (2005)). In these models, discrimination is the critical ingredient in the bookbuilding process, as it allows underwriters to extract favorable information in exchange for more favorable IPO allocations. A testable implication of bookbuilding theories that has drawn much attention is the "partial adjustment" phenomenon, which predicts that IPOs with more favorable price adjustments in the filing period should experience more underpricing. Hanley (1993) provides early evidence on this phenomenon. Recent work on the partial adjustment process includes Lowry and Schwert (2004). Dasgupta and Hansen (2007) provide an excellent and recent survey of the literature (see, especially, their Section 4.8).

Empirical evidence on the impact of bookbuilding is limited. A key empirical constraint, as pointed out by Sherman (2002, 2005) and Jagannathan and Sherman (2005, 2006), is that bookbuilding dominates most markets into which it is introduced. Within the U.S., the most studied IPO market, bookbuilding has been the offering mechanism of choice, so there is little time series or cross-sectional variation in IPO offering mechanisms.[2] Given this constraint, one approach is to study bookbuilding cross-sectionally across markets. Ljungqvist, Jenkinson, and Wilhelm (2003) conduct such an analysis. They report that underpricing is lower for bookbuilt IPOs when the issues are marketed in the U.S. and when issuers use U.S. lead managers. Our analysis is centered within one marketplace, but more importantly, the setting provides an interesting experiment in which we can disentangle the two distinct building blocks that comprise bookbuilding: allocation flexibility and pricing flexibility. Bookbuilding is usually observed with both elements bundled together while in our study, there is natural separate variation in the individual components. In particular, the variation sets up an interesting laboratory to isolate and examine the role of IPO allocation flexibility, the dimension of bookbuilding that has attracted much controversy. Our evidence suggests that allocation flexibility is critical for effective bookbuilding.

The second part of our paper analyzes IPO books. Empirical work in this area is sparse, largely due to lack of micro-level allocation data, leading Ritter and Welch (2002) to remark that share allocation issues represent a promising area of research in IPOs. We bring to the table a new dataset on IPO allocations. Other research in this area includes Cornelli and Goldreich (2001, 2003) and Jenkinson and Jones (2005), who present evidence on books of European share offerings. The two studies report mixed findings. Cornelli and Goldreich (2001) analyze bids and allocations of 23 bookbuilt European IPOs (and 16 SEOs) from one investment bank. They find that bidders who place limit-price orders receive greater allocations compared to market price based bids. Cornelli and Goldreich (2003) find that limit prices exert strong influence on the final offer price. Jenkinson and Jones (2005) do not find increased allocations to limit-price bids in their sample of European IPOs. Ljungqvist (2005)

[2]There is the occasional exception, for instance, the IPO of google.com.

attributes the differences in results to differences in the nature of the investment banks who provide the data to Cornelli and Goldreich and Jenkinson and Jones.

Like Cornelli and Goldreich (2001, 2003) and Jenkinson and Jones (2005), we also examine bids and allocations in IPOs. However, our study is set in a different marketplace with differences in both the institutional setting and the underpricing environment. For instance, in our sample, *all* institutional bidders must submit limit order bids, shares reserved for institutional and individual allocations are not fungible, and bids are legally binding contracts. We also sample data across multiple underwriters. Besides these institutional differences, there is a first order difference in IPO underpricing environment in our studies. The underpricing level in our setting is rather high (median 22%, mean 33%) compared to the 7.57% (mean) and 4.29% (median) underpricing in the Cornelli and Goldreich sample. Interestingly, despite these differences, we also find evidence consistent with the predictions of bookbuilding theories.

Our work is also related to a growing literature on aggregate institutional allocation in IPOs. Ljungqvist and Wilhelm (2002) estimate a structural model using samples drawn from France, Germany, and U.K. They report that increasing institutional allocations results in greater pre-IPO price revisions and that constraining allocation discretion results in lower price updates. Hanley and Wilhelm (1995) and Aggarwal, Prabhala and Puri (2002) find that aggregate institutional allocation is greater in more underpriced issues. All three papers discussed above focus on how underwriters distribute shares *between* institutions and individuals, and relate underpricing to the aggregate allocations to each group. Our study focuses on discrimination in allocation *within* the institutional bucket. We show that within-institutional investor discrimination exists, that it is economically significant, and characterize its cross-sectional variation. Our evidence suggests that this type of allocation discretion is an important foundation for effective bookbuilding.

3 Institutional Setting

The Indian capital market is one of the oldest in the world. The first Indian stock exchange, the Bombay Stock Exchange (BSE), opened in 1875, and lists 4,763 companies as of December 2005 (Table 113, SEBI 2006). A number of regional stock exchanges also exist, but these account for a small fraction (less than 1%) of overall trading. The primary competitor to the BSE is the electronic National Stock Exchange (NSE), which lists more than 1,500 companies as of August 2007.

The Indian economy has historically been heavily regulated. Economic deregulation set in around 1991 in response to a balance-of-payments crisis. Capital market deregulation followed. Prior to 1992, multiple regulations and regulatory authorities governed and had jurisdiction over the securities market. With respect to new issues, the primary governing law was the Capital Issues (Control) Act of 1947, under which any firm wishing to issue securities had to obtain approval from the Central (i.e., Federal) Government. This law was quite different in content and scope from the comparable 1933 and 1934 Securities Acts that govern the U.S. securities market. While the U.S. laws focus on "truth-in-disclosure," the pre-1992 regulations in India mandated a strong role for the government, allowing it to intervene in all aspects of the IPO process, including the amount, type and price of the issue through an institution called the Controller of Capital Issues.

In 1992, there was a significant shift in the regulatory environment in India to a market-oriented framework closer to the U.S. system. The 1947 Capital Issues (Control) Act was repealed and the government allowed a larger role for market forces. A new regulatory authority, the Securities and Exchange Board of India (SEBI), roughly analogous to the U.S. Securities and Exchange Commission, was formed. SEBI moved to modernize the Indian securities market through paperless record keeping, electronic trading through the NSE, and electronic depository services. Capital market growth followed. The total amount of equity capital increased from INR 130 billion (INR = Indian rupees), or about $ 3 billion, in 1993-94 to INR 271 ($ 7 billion) in 2005-06. During this period, the amount raised in IPOs increased from INR

79 billion to INR 109 billion (Table 12, SEBI, 2006). Trading became concentrated in the two major exchanges, the BSE and the NSE, while the regional exchanges essentially faded out and are now practically defunct (Table 19, SEBI 2006).

The specific regulations for raising capital also underwent change after 1992. Around June 1992, the SEBI issued its Disclosure and Investor Protection (DIP) Guidelines in Section 11 of the Securities and Exchange Board of India Act. The DIP guidelines, as periodically amended, constitute the basis for the regulation of primary issuances in the Indian capital market. Perhaps the most prominent of these guidelines was the abolition of control on pricing of capital. While new firms (those with less than 12 months of commercial activity) continued to be required to price equity at par, i.e., book value, older companies were allowed free pricing of new issues.

A second major change in IPO markets came around 1999. Prior to 1999, IPOs were required to be offered via a fixed price mechanism. Under this mechanism, the firm and its lead manager set the offer price. Investors then bid for the number of shares they are interested in. Allocations are made on a pro-rata basis. In September 1999, bookbuilding was introduced to the Indian market. As in the U.S., investment bankers gather information in bookbuilt IPOs by sampling demands of potential investors in IPOs. This information is used to set a preliminary filing range, which is called a "price band" in the Indian market. The price band is constrained to be no wider than 20% of the low end of the filing range. Investors are then allowed to bid for an IPO. The lead manager sets the final price according to her assessment of the information in the bids, subject to a minimum time of three days before closing IPO books. The final offer price is constrained to lie within the price band. The price band can itself be reset during the bidding phase, in which case bidding is extended for three days subject to total bidding period not exceeding ten working days and investors can amend or delete their prior bids. After setting the offer price, there is the allocation phase, which is described more fully below.

With respect to bidding for IPOs, the type of bid allowed depended on investor category. Investors are categorized as small (or retail) and non-retail. Retail investors were initially defined as those who bid for up to 1,000 shares. This definition was

revised in 2003 when retail investors were defined as investors who bid for shares worth up to INR 50,000, which is about $1,000. This threshold was increased to INR 100,000 (about $ 2,000) in 2005. Retail investors could place market orders by bidding for a number of shares up to the maximum monetary value that defines retail investors. Alternatively, retail investors could place limit bids. All other investors are required to place limit bids only. In all cases, the bids are legally binding contracts. Investors allocated shares at their bids are obliged to take up their share of allocations.

With respect to allocations, there are separate pools of shares for each investor category. The quantity of shares available for allocation in each category is known ahead of time. In fixed price IPOs, at least 50% of the shares must be made available to individuals. In typical bookbuilt IPOs, the proportions available to investor categories is 35%, 15%, and 50% to retail investors, other non-institutional investors, and qualified institutional buyers (QIBs), respectively. In offers made in terms of Rule 19 (2) (b), these proportions were 30%, 10%, and 60%, respectively.[3] Adjustments are permitted between categories only if a category is undersubscribed. The number of shares allocated to each investor depends on the type of investor. All individual investors – small "retail" investors or high net worth individuals making big bids – have to be treated on a non-discriminatory basis in all regimes. Institutional investors are a different matter. Lead managers had complete discretion in making allocations to QIBs prior to November 2005; after this period, QIBs face proportionate allocations, just like their retail counterparts. Besides the two methods for public issue of equity, SEBI also allows for a hybrid route. Here, bookbuilding could be used for a percentage, say 75% of the issue with participation from institutions and large retail investors bidding more than the cutoff amounts for small investors, while the remaining 25% could be issued to small retail investors at the price determined in the bookbuilding process.[4]

[3]After November 2005, a small 5% of the total issue size attributable to QIBs is available for allocation only to domestic mutual funds.

[4]The exact number of shares available for each category and the rules applicable to a given issue are known ahead of time. The hybrid method was used as the only non fixed price mechanism when bookbuilding was first introduced in India in 1999. All 16 bookbuilt offerings between 1999 and 2001 used the hybrid method. We make no distinction between these offerings and offerings classified by

To summarize, starting in 1999, there were two mechanisms available in the Indian IPO market: a fixed price mechanism and a bookbuilding mechanism. Prior to November 2005, fixed price offerings had no pricing or allocation flexibility while bookbuilt offerings gave both. Thus, in this regime, the difference between fixed price and bookbuilt offerings reflects the value of both pricing and allocation flexibility. After November 2005, bookbuilt IPOs and fixed price offerings shared the same allocation restrictions (proportionate) but bookbuilt IPOs had pricing flexibility while fixed price offerings did not.[5] Thus, in the post-November 2005 period, the difference between fixed price and bookbuilt offerings reflects the value of pricing flexibility without allocation flexibility. The (across-regime) difference in difference (between fixed price and bookbuilt IPOs) sheds light on the value of allocation flexibility in IPOs.

4 Data

Prime database (henceforth, "Prime"), a major data provider for Indian capital markets, is our primary source of data for Indian IPOs. We obtain data on the bidding behavior and allocations for each IPO by reading the "Key Response Data Summary" sheet in Prime. It provides information on the extent of total oversubscription in each offering. The total oversubscription of an issue is defined as the ratio of total number of shares applied for to the total number of shares available for offer.

We use "Advanced Data Search" in Prime to obtain data on the following basic issue and issuer characteristics after filtering for IPOs. The offer date is the date on which the offer opens for bidding. Offer "proceeds" equal the product of the number of shares and the issue price. The search in Prime also allows filtering for whether an offering uses fixed price or bookbuilt method and identifies the lead managers for an

regulators as being "pure bookbuilding". In both types of offerings, lead managers have complete discretion over allocation over a significant fraction, usually 50%, of shares issued.

[5]Though the regulatory change altering bookbuilding from the discretionary to proportionate allocation regime was announced in September 2005, it did not affect firms that filed a draft document for an IPO prior to this date. AIA Engineering Ltd., which opened on November 17, 2005, was the first IPO under the new regime.

issue and the industry that the offering firm is a part of. We use the lead manager data to establish a reputation variable. For every offering, we assign the proceeds raised per lead manager on a prorata basis to all managers who are identified as "lead managers" in Prime. For each year, we calculate every lead manager's market share of total proceeds in that year and rank them on the basis of their market shares. We define "Reputed Lead Managers" as a dummy variable that takes the value of one if the offering has a lead manager ranked in the top five in the offering year, and zero otherwise.

Financial data for each issuer are available from "Public Issues Pricing Parameters" in Prime though many fields are not populated for large fractions of the sample. Prime separately provided us data on firm "size", which is the book value of equity of the issuer. We search Prime for information on whether an offering was refunded or devolved, the date of these events and the amounts refunded or devolved. These issues are deleted from our final database. Our specifications control for the age of the firm. We construct this variable by searching for the year of incorporation from Prowess, a large database of Indian companies maintained by the Center for Monitoring the Indian Economy (CMIE). Age is defined as the year of an IPO minus the year of incorporation of the firm. If we cannot construct the age variable from Prowess, we obtain the data from offer documents on the SEBI website, which provides information on IPOs offered after 2002.

We collect information on the listing date, opening and closing prices as of the first day of trading for each IPO. Firms going public in India can list themselves on multiple exchanges simultaneously. Virtually all firms in India list on either the Bombay Stock Exchange (BSE) or the National Stock Exchange (NSE), which are the major stock exchanges in India today, roughly analogous to NYSE/AMEX and NASDAQ in the U.S., respectively. In our sample, firms were listed on a number of regional exchanges such as Bangalore, Chennai and Hyderabad. We made efforts to obtain the price data from the regional exchanges by calling them and obtaining the information from their print record archives. However, the price data prove to be unreliable. In many cases, we do not have data on the stated start trading day for

the IPO and the prices we obtained are of unknown and unverifiable quality. Thus, while our search did uncover data on some of the regional IPOs, we do not use these IPOs in our final analysis.[6] Another feature of IPOs in India is that firms list on an exchange after varying periods of time from the opening date of the issue. For reliability of our analysis, we also exclude those offerings that were listed with a lag of over 2 months from the offering date.[7] We also uncovered examples of firms that do not eventually list for trading although other records indicate that an offer has been completed.[8] We exclude these offerings from our sample.

For the remaining IPOs from Prime that we could identify on the NSE and/or the BSE, Prime provides the listing date and some stock price information. In recent times, most offerings are listed on at least one of these two exchanges. For offerings listed on both exchanges, if the listing date on the two exchanges is different, we choose the earlier listing date and the corresponding stock prices. If, on the other hand, the listing dates are the same, we use the data from the BSE. Based on the stock prices, we define underpricing as the difference between the price at the first day of trading and the issue price, as a percentage of the issue price. Given the lag between the offer date and list date, we market-adjust IPO underpricing by the return on the BSE SENSEX index. We exclude as outliers three IPOs whose market-adjusted underpricing was over 1000 percent.

Figure 1 shows that capital raising activity in India varied significantly over the years. After the surge in IPO activity until 2000 largely due to the worldwide information techonology boom, the subsequent meltdown adversely affected the number of IPOs in India. However, IPO activity has picked up after 2003, with the number of IPOs more than doubling in 2004. The trend has continued in 2005 and 2006. To

[6]The share of all regional stock exchanges in the total share volume traded in the country fell from about 8.8% in 2001-02 to 0.2% by 2005-06 when 14 of them had no stock trading (Table 19, SEBI 2006).

[7]In our sample, 75 percent of the IPOs were listed within 2 months of the offer date. In recent times, the lag is less than a month for most offerings with a trend towards instant listing of IPOs in the most recent time periods.

[8]These offerings include: Baid Mercantiles Ltd., Swal Computers Ltd., Weal Infotech Ltd., Array.com India, Oceana Software Solutions, Geekay Imaging, Ador Powertron, Globsyn Technologies, Blupast Industries, Vigneshwara Export and Shirdi Industries.

identify these periods of cold and hot IPOs, we create a variable "HOT" as a dummy variable which takes the value of one for offerings whose opening date of bidding was in years other than 2001 to 2003, and zero otherwise. Bookbuilding started gaining ground over fixed price mechanism by 2003. It now dominates the Indian IPO market, as seen in Figure 1.[9]

We study two subsamples for our underpricing analysis. One comprises IPOs made between January 2000 and November 2005, the regime that permitted allocation discretion in bookbuilt offerings, and another regime between November 2005 and November 2006, where bookbuilt offerings had no allocation discretion.

5 Bookbuilding and IPO Underpricing

5.1 Regime With Discretion in Allocation

Table 1 presents descriptive statistics for our final sample of IPOs and a correlation matrix for the variables used in our analyses. For the overall period, the median underpricing in our sample of Indian IPOs, adjusted for market return, is 22% percent, while the mean underpricing is 33%. As in Cornelli and Goldreich (2001, 2003), underpricing is positively correlated with oversubscription,. The median (mean) oversubscription is 9 (18), indicating a market with active interest in IPOs. Underpricing is negatively correlated with bookbuilding for the full period. As we discuss later, this correlation is time varying, and averages a significant negative correlation in the old regime and an insignificant correlation in the second regime. We analyze these correlations more fully in the regression specifications that we turn to next.

Table 2 presents regression results. The sample comprises of 112 IPOs offered between 2000 and November 2005 in the regime when underwriters could control IPO allocations. The dependent variable in the Table 2 specifications is IPO underpricing,

[9]Though bookbuilding mechanism was formally available starting in 1999, it started only in September 1999 and virtually no firms used bookbuilding in the startup period. While there were 33 fixed price offerings, there were only 2 bookbuilt offerings in the last two months of calendar 1999. Thus, we ignore 1999 and start our analysis with the offerings made in 2000.

which is the IPO return from the close of bidding to the first day of trading adjusted for market-wide movements in prices. The main right-hand side explanatory variable of interest is the mechanism used for IPO offering, which is either bookbuilding (BBUILT = 1) or a fixed price offering (BBUILT = 0). The regression controls for the degree of oversubscription, manager reputation, issue size or proceeds, the age of the firm going public, and a dummy for whether the IPO is made during a hot IPO period. Oversubscription and proceeds are the natural logarithms of the relevant variables. The results are similar when we use oversubscription adjusted for market-wide oversubscription by subtracting the average oversubscription for all IPOs in the year of the IPO. The table reports t-statistics based on robust standard errors.

As expected from the univariate correlations in Table 2, oversubscription has a positive coefficient and is statistically significant at 1% in all specifications. Thus, aggressive bidding in IPOs is associated with a greater initial "pop" in IPO prices. Underwriter reputation does not matter. Log proceeds is negative and significant with a p-value of better than 5%. Thus, larger issues are associated with lower underpricing, in keeping with the standard results in the IPO literature (Ljungqvist 2005). While we control for issue proceeds in our specification in keeping with the IPO literature, we obtain similar results when we control for firm (rather than issue) size, which is the logarithm of the book value of equity. Firm age is not significant in the final specification, although it tends to matter in specifications that exclude log proceeds, where it has a negative coefficient. We include a dummy for whether an IPO is in a hot year or not, but this variable is not significant. The key variable of interest in this specification is BBUILT, the variable that indicates whether an IPO was offered through bookbuilding or a fixed price mechanism. BBUILT has a negative coefficient and is significant with a t-statistic of 1.93, about a p-value of 5%. Thus, bookbuilt IPOs experience lower underpricing, after controlling for other factors, in the regime where underwriters have allocation powers. This result supports the argument that discretion in bookbuilt IPOs enables the underwriter to extract pre-IPO information, which in turn facilitates more accurate pricing and hence lower underpricing.

In Table 3, we investigate whether bookbuilding is also associated with more certain pricing, or lower variance of underpricing. We test this proposition by regressing the log of the variance of underpricing on bookbuilding and other explanatory variables. We precede the formal regression in Table 3 by testing whether the regression residuals from the underpricing regression in Table 2 are heteroskedastic. The Bresuch-Pagan test for heteroskedasticity rejects the null of homoskedastic standard errors at the 1% level. Table 3 tests the form of heteroskedasticity, focusing in particular on whether bookbuilding has a negative effect on underpricing variance. We measure the underpricing variance as the squared residual from a regression of IPO underpricing on the explanatory variables in each column in Table 3. We regress the natural logarithm of the variance on BBUILT and other control variables. Table 3 reports the results.

In Table 3, BBUILT has a negative and significant coefficient, indicating that bookbuilding is associated with lower variance of underpricing. Among the control variables, oversubscription is positively related to underpricing variance. Log proceeds has a negative coefficient, suggesting that large issues are more accurately priced, perhaps because underwriters engage in more extensive information gathering for such issues. Firm age has a significant negative coefficient, consistent with the view that older firms with longer operating histories can be priced more accurately compared to younger firms. Underwriter reputation has a *positive* coefficient, indicating that more reputed managers are associated with less accurately priced issues. This result is an empirical puzzle, as reputed underwriters can be expected to price issues more accurately. The key result, however, is the negative coefficient for bookbuilding, which indicates that bookbuilt IPOs tend to be priced more accurately, consistent with greater ex-ante information production for bookbuilt IPOs, juxtaposed with the value of being able to adjust offer prices in response to market bids in the bookbuilding mechanism.

We next consider parallel specifications in which the Discretionary Allocation Regime is defined as a narrow time period from November 2004 to November 2005. One motivation for this analysis is that bookbuilding entered the Indian IPO market

in 1999. Given the lack of experience of underwriters and investors with bookbuilding in this initial period, it is plausible that the full impact of the new mechanism is perhaps not immediately realized. A second issue is related to IPO cycles. As in the U.S., the Indian IPO market also underwent a cycle, when there was a drop in issuance volume analogous to the U.S. market. Drawing IPO samples from narrower time periods mitigates the cyclicality regime effects. Most importantly, looking ahead to the next section, our objective is to test for the impact of bookbuilding before and after the regime shifts in allocation power in November 2005. Shorter time periods before and after the regime change provide for sharper tests of the effect of the regime change. Accordingly, we reconsider results from a subperiod from November 2004 to November 2005 for a potentially more powerful test of bookbuilding in the regime where underwriters control allocations.

Tables 4 and 5 report the regression results for the underpricing level and variance specifications, respectively, for the narrowly defined Discretionary Allocation Regime. Briefly, bookbuilding continues to be associated with lower underpricing (Table 4) and lower underpricing variance (Table 5) even in this narrower window of time. As before, oversubscription is significant and has a positive coefficient. Log proceeds is not significant in Table 4, but firm age has a negative coefficient significant at p-level of 10%. The main coefficient of interest, BBUILT, continues to be negative and significant, suggesting that bookbuilding is associated with lower underpricing even in the narrow time period of one year prior to November 2005. The variance specification reported in Table 5 has few surprises compared to Table 3. Bookbuilding has a reliably negative and significant coefficient in this narrow window specification.

5.2 Regime With No Discretion in Allocation

As discussed earlier, in November 2005, underwriters of bookbuilt IPOs lost the power to allocate shares. The other elements of the bookbuilding process remained intact around the regime change. As before, underwriters sample the demand curves of potential investors, set a pricing band, open the issue for bidding, and set the final

price in response to the bids. However, underwriters do not control IPO allocations, and thus cannot commit to allocate shares to investors providing more informative pricing information. If discretion in allocation is critical to the effectiveness of bookbuilding, we should find that the positive effects of bookbuilding in the pre-November 2005 period largely vanish in the post-November 2005 regime. On the other hand, if the effectiveness of bookbuilding does not hinge on the ability to discriminate in allocations, bookbuilding should have similar effects in the later period. We estimate specifications analogous to those in Tables 2-5 for IPOs drawn from the new regime prevalent after November 2005. Tables 6 and 7 report the results. Table 6 presents the results for underpricing levels, while Table 7 presents results for the variance of underpricing.[10]

As in Tables 2 and 4, we find in Table 6 that oversubscription is positively associated with underpricing. However, in contrast to the results in Table 2, the coefficient for BBUILT is not significant. Thus, in the regime where underwriters do not control IPO allocations, bookbuilding has no effect on IPO pricing. This suggests that allocation flexibility is a critical ingredient for the effectiveness of bookbuilding. With regard to the control variables, log proceeds is no longer significant, similar to the corresponding result in Table 4 where we sample IPOs from a similar length time window before the regime change. Firm age is now significant at p-levels of better than 5%. Again, this result is remarkably similar to that in Table 4. Interestingly, manager reputation is significant at the 5% level, so reputed managers are associated with lower levels of underpricing. We conjecture that the result perhaps reflects the fact that with no incentives to gather information in bookbuilt IPOs, investors rely on the better analytics or research capabilities of larger underwriters.

Table 7 presents the results for the variance specification. Interestingly, bookbuilding has a negative and significant coefficient, indicating that bookbuilt IPOs have lower underpricing variance. None of the other variables are significant in the variance specification. The fact that the variance is lower for bookbuilt IPOs is not

[10]Unlike the regressions in the old regime, we do not use the HOT dummy since all IPOs in the new regime were in a hot IPO period.

entirely unexpected given that underwriters of bookbuilt IPOs have some flexibility to adjust offer prices ex-post in response to investor bids in the bidding phase. In unreported results, we re-estimate all specifications controlling for firm size using the log of the book value of equity. The results are similar: bookbuilding is not significantly related to IPO underpricing in the post-November 2005 regime. We also experimented with two-stage estimates in which bookbuilding is modeled using a logit specification in stage 1 and underpricing is regressed on instrumented bookbuilding (and other controls) in the second stage, and find similar results.[11] Collectively, the findings highlight the sharp effect of the regime shift that eliminates allocation power from underwriters. Bookbuilding is negatively related to underpricing when underwriters control allocation, but this relation vanishes shortly after underwriters lose allocation power. Thus, the ability to discriminate in allocation seems to be central to effective bookbuilding.

6 Bids and Allocations: Evidence From Books

Section 5 analyzes the pricing effects associated with bookbuilding when underwriters control IPO allocations. In this section, we examine the actual use of allocation powers by underwriters. We examine the extent to which underwriters discriminate in their allocation and analyze its cross-sectional variation across IPOs.

6.1 Dataset

Of the two regimes in our sample period, our allocation analysis focuses on the pre-November 2005 time period when underwriters control allocations. We have a sample from the post-November 2005 period, but this has little interest from the viewpoint

[11] These specifications rely on the non-linearity for identification. Candidate instruments such as reputation or a U.S. affiliated underwriter satisfy the standard instrument conditions (related to bookbuilding but not underpricing) but not the condition that outcome should vary over either leg of the binary support, not an uncommon issue in selection models with binary instruments (Heckman and Navorro-Lozano (2004)). In the specifications identified through non-linearity, bookbuilding continues to have a negative and significant coefficient.

of allocations, because in this period, allocations were required to be proportionate by law. We obtain a proprietary sample of books for 25 IPOs drawn from the pre-November 2005 period. Confidentiality restrictions prevent us from revealing the identity of the sample companies in the dataset, but the broad sample characteristics are similar to the universe of all bookbuilt IPOs. Our objective is to analyze the extent and determinants of discrimination in allocation in bookbuilt IPOs.

The bookbuilding literature largely focuses on bids received by underwriters as determinants of allocation. Underwriters promise greater rewards in the form of higher allocation for more aggressive bids, which should provide bidders the incentive to reveal rather than suppress any favorable information they hold about the IPO. More broadly, the message of the bookbuilding literature, as underlined by Cornelli and Goldreich (2001, 2003), is that allocations should be a function of an underwriter's assessment of the usefulness of the information in a bid. If so, the bid itself need not be a sufficient statistic for determining IPO allocations. For instance, it is probably the case that information flows between underwriters and potential bidders occur both within and outside the formal IPO process. Soft information probably flows ex-ante when underwriters set a filing range while underwriters witness the hard information in bids presented during the IPO process. Thus, while we control for the actual bid in an IPO, we investigate the role of other variables as candidates to explain allocations.

6.2 IPO Bids

Table 8 describes the characteristics of the pool of institutional investors. Our sample has a total of 4,236 bids by participating institutions. The median (mean) number of bids in our sample equals 91 (169), suggesting that institutions are quite active in bidding for IPOs.

Our dataset identifies the name of the institutional bidder, the number of shares that the institution bid for, the number of shares allocated for the bidder, and a brief identification of the type of institution. Institutions are classified as domestic funds, foreign institutional investors, banks/financial institutions, and other institu-

tions such as insurance companies. In our sample, domestic local currency mutual fund operations of foreign financial institutions (e.g., Deutsche Investment Opportunity Fund) are identified as domestic funds and are marked separately from the foreign parents they belong to. We treat these funds no differently from MFs with domestic parents. The financial institutions are largely domestic banks with government ownership, large players in the domestic local currency lending market with significant influence with the government and regulators.

Domestic mutual funds (MFs) account for 1,884 bids and foreign institutional investors (FIIs) account for 1,732 bids in our sample, or about 45% and 40% of all bids. The remaining bids primarily come from financial institutions (FIs). We view bidders as being "equity" bidders if they are either domestic mutual funds or foreign institutional investors. The median and mean number of bids per issue by equity investors is 77 (145). FIIs place about 27 bids in the median issue while MFs place about 46 bids in the median issue. FIs contribute a median of 14 bids per issue.

The individual bidder names in our sample are not coded consistently so the same fund could have different acronyms across IPOs. Most acronyms are not precise enough to establish the identity of the bidding fund clearly. Thus, we cannot reliably identify the particular fund that bids for an IPO. However, the acronyms are informative enough that we can assign a fund to the parent family it belongs to. Our sample comprises 325 fund families, domestic and foreign.

We classify fund families according to the frequency with which they participate in IPOs. Frequent bidders are those that belong to families that bid in at least 7 issues (the 75th percentile of the number of IPOs bid per family), rare bidders come from families that participate in only 1 issue (the 25th percentile) while moderate bidders comprise the rest of the bidders. Table 8 shows that frequent bidders account for over 75% of all bids, while moderate frequency bidders account for most of the rest. The previous frequent family measure counts the number of IPOs that a family participates in but ignores the number of bids made by funds from one family. For example, a fund family in which 100 funds made bids in an IPO would be considered in the same way as a family of funds in which only one fund bid for an IPO. Thus,

we present a second measure in the lowest panel in Table 8 that classifies frequent and infrequent bidders according to the number of bids made by funds in a family in all IPOs. The patterns are similar even according to this second measure. Frequent bidding families dominate the institutional investor landscape in Indian IPOs.

The number of shares bid by each category of investor is displayed in the right Panel of Table 8. To aggregate quantities bid across all IPOs, we normalize the number of shares bid by the number of shares offered in an IPO and average this ratio across IPOs for each investor type. Equity bidders, i.e., domestic and foreign mutual funds, account for 15 times the number of shares offered in the median issue, of which FIIs account for 10.98 times oversubscription and MFs account for 3.29 times the oversubscription. This pattern for MFs and FIIs reverses that of the number of bids in the left panel, where MFs are more dominant compared to FIIs. In other words, FIIs dominate in terms of number of shares bid but not in terms of the number of institutions bidding, suggesting that each FII puts far greater capital in IPO bidding than a comparable domestic fund. Not surprisingly, we get similar findings when we analyze bids at the level of the individual investor rather than bids of entire categories. FIIs also account for correspondingly large pieces of IPO allocation, as revealed in the right most column in Table 8. Interestingly, FIs account for 9% of the quantities bid but are allocated only about half that proportion of total shares offered (4.7%). This evidence suggests that the large government-backed banks tend to be rationed out in IPO allocations at the expense of other investors more active in equity investing.

6.3 Discrimination in Allocation

6.3.1 Aggregate Discrimination

We begin by testing whether there is discrimination in the aggregate. For each IPO, if the allocation is strictly proportionate, the distribution of allocation should be uniform. In fact, it should be equal to the inverse of the total oversubscription for an issue adjusted for rounding to nearest trading lot. In unreported results, we find that the Kolmogorov-Smirnov test rejects the null hypothesis of no discrimination at

a p-level of 0.00 individually for every IPO in our sample.

How many shares are reallocated by underwriters as a result of discrimination in allocation? For each IPO, we compute the number of shares that an investor would receive had the allocation been proportional. We round up the number of shares to the nearest trading lot. The excess allocation received by an investor is the difference between the actual share allocation minus the hypothetical allocation if there were proportionate allocation. We scale the excess allocation by the number of shares offered in the IPO. Because the average excess allocation sums to zero (by definition), we could report either the positive or the negative orthant of the excess allocation across IPOs. Table 9 displays the averages across the positive side but we obtain similar results when we consider negative excess allocations. In the aggregate, underwriters reallocate on average about 35% of the number of shares offered in an IPO relative to the allocation patterns if a strictly proportionate system were followed. These figures are greater for domestic MFs and FIIs while FIs are likely to receive roughly proportionate allocations.

6.3.2 Discrimination Across Individual Bids

To evaluate the discrimination at the level of the individual bids, we need to identify bids that are rewarded with high or low allotments. For this purpose, we compute the "allocation function" associated with each bid. This function is the ratio of the shares allocated to the shares bid. Thus, if an institution bids for 50 shares and gets 20 shares, the percentage allocated equals 40%. To compare this figure across IPOs, we aggregate the allocation function across IPOs. The major complication is the mechanical effect introduced by oversubscription. For instance, an issue that is oversubscribed 100 times is likely to have allocation functions close to 1%, while issues oversubscribed five times will have 20% of shares allocated in the aggregate. Thus, simply comparing allocation functions across IPOs would be confounded by varying oversubscription levels across IPOs.

Our procedure for accounting for oversubscription is nonparametric. For each IPO,

we compute the allocation function (i.e., proportion of bid rewarded with allocations) for every bidder in the sample. We create a dummy variable called FAVORED if the allocation function is in the top quartile of the allocation functions for the issue. Likewise, the variable UNFAVORED equals 1 if the allocation function is in the bottom 25% of the allocation function for an issue. The remaining investors fall in the middle range within each IPO. Thus, hypothetically, if there are 100 available shares in an IPO, four bidders bid 100 shares each, and the allocations are 40-30-20-10, the investor receiving 10 shares would have UNFAVORED=1 while the one receiving 40 shares would be FAVORED=1 and the rest would have both FAVORED and UNFAVORED equal to zero. The last category of bidders forms the baseline category with respect to which the odds are computed in the multinomial logit estimation to follow. Since bids are ranked within IPOs in this procedure, the data are comparable across IPOs.

The actual allocation function for each investor is a subjective call made by an underwriter given the tangible and intangible information the underwriter possesses about the bidder. It is quite plausible that much of the decision is driven by private assessments of the underwriter based on interactions with bidders, some of which could be outside the formal process for the particular IPO in question. We do not have access to this vector of information, but focus on a vector of publicly observable characteristics and examine whether they are related to allocation beyond the specifics of the bid itself. The distinction between bid and bidder is important, because it reflects the essential difference between bookbuilding and other offering mechanisms. In the latter, pre-specified rules map bids to allocations. In contrast, in bookbuilding, underwriters are not bound by such rules and can make different allocations to different bidders presenting the same bid. We examine this difference and its variation, to assess the use of discrimination in IPO allocations.

To view the underwriter allocation functions in a simple way, we construct a two-way classification of the allocation function. One dimension is the bid size and the other, given the information in Table 9, is the investor type. To incorporate bid size, we could use a parametric approach in which we include the bid size normalized by

shares offered as an explanatory variable in the logit model. Such a specification would presume linearity across the entire range of quantities bid, which is neither realistic nor empirically justified given the heterogeneity in bidding across IPOs. We adopt a within-IPO ranking nonparametric approach. We identify a bid for an IPO as being large or small based on where it ranks among all the bids for the IPO. Specifically, we divide investor bids *within* each IPO into quartiles. We rank each investor's bid according to the quartile within the IPO that the bid belongs to. Once again, comparisons of bids across IPOs pose no problems.

Table 10 summarizes the allocation function information on the basis of the two-way classification. Each of the two panels comprises of four columns (one for each bid quartile). The four columns in the LHS panel report the fraction of a given type of bidder who is likely to be UNFAVORED, or get the lowest quartile of allocations from among all allocations awarded to an IPO. The four columns in the RHS panel show the fraction of a given type of bidder who is more likely to be FAVORED, or be in the highest quartile of all allocations.

Table 10 reveals that there does not exist a monotonic relationship between bid size and allocation for most bidder types (i.e., when reading across columns). However, interesting patterns of discrimination are evident across bidder types for a given bid size (i.e., when reading down a column). For example, reading across columns in the left panel for MFs in Table 10, we find that larger bids are monotonically *less* likely to be UNFAVORED. It decreases from 24.84% probability of being UNFAVORED for the smallest quartile bids to 16.90% for the largest quartile bids. These patterns are consistent with the view that strong MF bids are less likely to be penalized with low allocations. The pattern for FIIs is quite the opposite, where larger bids are *more* likely to be UNFAVORED. On the other hand, a non-monotonic pattern emerges for FIs. In the case of FIs, the probability of being UNFAVORED decreases with increasing bid sizes except in case of bid sizes in the third quartile.

The right panel of Table 10 examines investors who are FAVORED. Once again, we find that large bids by FIIs are less likely to be FAVORED with the highest quartile allocation. We do not find a linear pattern for other types of investors. Here,

allocations are somewhat "U-shaped," with the highest and lowest bids more likely to be FAVORED than the middle quantity bids. Non-linearities in allocation are also evident in the lower panel of Table 10 which reports data on allocations classified by the size of bids and the frequency with which the bidder's family participates in an IPO. For frequent and moderate bidders, higher quartile bids are less likely to be rewarded by FAVORED allocations. On the other hand, rare bidders (who take part in only one IPO in our sample) display a nonlinear pattern where the highest and lowest quartile bids are less likely to be rewarded with FAVORED allocations. Conversely, these types of bids are more likely to receive UNFAVORED treatment, i.e., be placed in the lowest quartile allocations. A similar elevation in probability of being UNFAVORED – or receiving lowest quartile allocations – is evident for frequent and moderate bidders.

In Table 10, we find clear evidence of discrimination when we classify allocations by investor type, given quantity. For almost any given bid size (i.e., any column), the probability of being in the lowest quartile allocation (i.e., being UNFAVORED) is higher for FIs than for MFs and FIIs (except for the highest bid size where FIIs are more likely to be UNFAVORED than FIs). For instance, in column 1, which comprises investors making the lowest bid size, the probability that a low bid size will be UNFAVORED is 16.79% for FIIs, 24.84% for MFs, but it is 43.17% for FIs. Thus, FIs are likely to be at the short end of the stick when it comes to receiving allocations. The opposite picture emerges when we look at the RHS panel, which represent investors who are FAVORED. For instance, among all bids made by FIIs, the likelihood of being FAVORED is 27.72%, i.e., 27.72% of FII bids are among the bids that receive the highest allocations. This figure is 27.38% for MFs, and it falls to 6.82% for FIs. Thus, given a fixed bid size, FIs are less likely to receive a favorable allocation compared to MFs or FIIs.

The evidence in Table 10 suggests that the pattern of allocations is not straightforward. It is neither proportionate nor a function of bid strength alone. The more complex pattern is certainly consistent with underwriters' gaining and using soft information in the IPO process to make allocations strategically. The findings in Section

5 illustrate that being allowed to generate and use such information is associated with lower underpricing in bookbuilt IPOs. The next section characterizes allocations more fully using a multinomial logit model that incorporates other variables in addition to bid size and investor type.

6.4 Multinomial logit model of discrimination

We estimate multinomial logit models to test which types of investors are the recipients of favorable or unfavorable allocations. In the logit model, the dependent variable is -1, 0, or +1 corresponding to UNFAVORED=1, FAVORED=0 and UNFAVORED=0, and FAVORED=1, respectively. The first category comprises investors who receive the lowest quartile of all allocations in an IPO, while the last comprises investors who receive the highest quartile of all allocations in an IPO. The rest of the investors belong to the middle category where both FAVORED and UNFAVORED equal zero. This category forms the baseline for the logit results discussed below.

Table 11 reports estimates of several specifications that vary according to the independent variables included in the specification. In all cases, the top Panel A corresponds to FAVORED allocations, while the lower Panel B corresponds to UNFAVORED allocations. The baseline specification controls for bid size alone through the four bid quartiles. Collinearity necessitates omitting one of the four bid quartiles. We omit the lowest bid quartile, which forms the baseline relative to which the other quartile coefficients are estimated. In the overall sample, we find that larger bids are less likely to be rewarded with higher allocations. While the coefficients for BIDQTILE2 and BIDQTILE3 are not significantly different from each other, the coefficient for BIDQTILE4 is significantly lower than that for BIDQTILE2, suggesting that especially large bids are unlikely to be rewarded with large allocations. The relation is not monotonic with respect to UNFAVORED, where BIDQTILE2 has a marginally significant coefficient (p=0.11), BIDQTILE3 has a more negative and significant coefficient, but the coefficient for BIDQTILE4 is not significant. This pattern is consistent with the aggregate descriptive statistics reported in Table 10.

The second specification introduces the nature of the bidder as an explanatory variable. As before, we consider two variables, one indicating whether a bidder is a MF or not, and the other indicating whether a bidder is a FII or not. The remaining investors, who represent the omitted class, are largely FIs. The results, reported in column 2 of Table 11, suggest that both MFs and FIIs are more likely to receive favorable allocation treatment, i.e., be in the uppermost quartile of the overall allocation function. We can include the omitted category, FIs, as an explanatory variable if we force the specification to have no intercept. In this model, the coefficient for FIs is, unsurprisingly, negative. The lower panel indicates that discrimination by investor identity only takes place with respect to highest quartile allocation. Investor identity is not a determinant of UNFAVORED, or discrimination *against*. Underwriters appear to be more even handed in cutting back on allocations across all categories of investors. The coefficients for MFs and FIs are of similar orders of magnitude.

Specification 3 includes several other variables. One variable is FREQUENT, or the frequency with which a bidder's fund family participates in our IPO sample. Frequent participants might be favored because they could be one source of soft information flows. Alternatively, frequent participants may provide more fertile ground for quid pro quo in trading allocations for commissions. Finally, it is also possible that frequent bidders provide insurance against the lack of sufficient interest in an IPO. Of course, in our case, given the high levels of oversubscription for most IPOs, the insurance is not as much against IPO failure as against potential reputational losses suffered by underwriters who attract lower oversubscriptions than usual. Interestingly, FREQUENT is *not* significant in the FAVORED equation and has a positive sign in the UNFAVORED model. The data suggest that underwriters attach little incremental value to frequent participation in IPOs. This result could also manifest a lack of power, since the number of non-frequent bidding families are relatively few in our sample.

An interesting test comes from the interaction of the frequent bidder variable with the investor type. Opportunities for quid pro quo, such as swapping allocations for trading commissions, are greater when the frequent bidder is an equity market par-

ticipant. Likewise, soft information flow relating to bookbuilding may be greater if frequent bidders are equity market participants. On the other hand, frequent bidders who are not equity investors may matter in allocations if they provide insurance against inadequate bidding in IPOs or offer uninformed competition to equity investors involved in bookbuilding information flows. To test these hypotheses, we interact FREQUENT bidders with whether the bidder is a non-equity bidder. The coefficient is significant in the UNFAVORED equation, suggesting that frequent bidders are less likely to be discriminated against if they are not equity market investor, consistent with an insurance role of these uninformed investors.

We next consider a proxy for the quality of the investor presenting a bid. We consider all families that bid for at least 10 IPOs in our sample. For each qualifying fund family, we construct a sample of all the IPOs that the family invested in. For each IPO, we compute the total number of shares bid by all funds belonging to the family and normalize this quantity by the shares offered in the IPO. We run a cross-sectional regression of IPO underpricing on the size of the family's bid. We identify a family as a high quality bidder if its regression R^2 falls into the top quartile of the regression R^2 of all qualifying families. We set the variable QUALITY equal to 1 for high quality bidding families and set it to zero for all other families.

Intuitively, our quality measure classifies families as having high quality if two conditions are met. One condition for a high quality family is that its bidding behavior more closely explains IPO underpricing. The other condition is that the family should participate in a sufficient number of IPOs in our sample. Both the tracking of IPO underpricing and the frequency of participation are based on our sample of IPOs rather than the universe of all IPOs, so our measure is potentially noisy, which creates a bias towards not finding a significant result. We expect that quality bidders should be rewarded with high allocations and less likely to belong to the lowest quartile allocations. Table 11 shows that one of these predictions is supported. The coefficient for QUALITY is positive and significant in Panel A, showing that bidders ranked highly on the quality measure are more likely to be FAVORED in IPO allocations.

We include several issue-specific variables in the logit model. The total level of

oversubscription in an IPO could affect allocation. Mechanically, greater levels of oversubscription make more shares available to the underwriter for reallocation, so discrimination should be more likely both on the negative and the positive side in more oversubscribed issues. Such a prediction also comes from bookbuilding theories which suggest that when underwriters learn more positive information in the pre-market (through greater oversubscription), they are more likely to use discrimination. On the other side, if there is little overbidding for an IPO, there is less opportunity to shift around allocations. We find that more oversubscribed issues are more likely to have UNFAVORED allocations. Following the IPO underpricing literature, we include log proceeds as a second control. If greater proceeds are associated with less pricing uncertainty, then there is less to learn in larger issues, so discrimination should be lower for large IPOs. We also consider two proxies for underwriter quality. We include REPUTED to test whether reputed underwriters engage in more discrimination but find it not to be significant in either panel. The second proxy for underwriter quality is whether the managing syndicate includes an underwriter with a U.S. affiliation. This allows us to test whether a U.S. affiliation results in greater discrimination given the parents' greater experience in bookbuilding. We find that the U.S. affiliation variable matters in the FAVORED equation at 5%.

We also reestimate all logit models with IPO fixed effects, to test whether IPO level heterogeneity explains the significance of some of the explanatory variables. We continue to include issue-level variables in the logit equation in this specification. The last column of Table 11 gives the results. None of the variables lose significance as a result of the IPO fixed effects. The underwriter reputation and U.S. affiliation variables are now significant in the UNFAVORED equation at 10% level. The pseudo-R^2 in the regression does not change appreciably, suggesting that IPO level heterogeneity is not the driver of the cross-sectional relationships established above. Due to the non-linearity of the logit model and for economic comparisons of binary and continuous variables, we also report the marginal effects of the logit model in Table 12. The statistically significant explanatory variables also tend to have economically significant marginal effects.

To gain additional insights into the allocation decisions, we examine the turnover in bookbuilt and fixed price IPOs in the after-market in the first week after IPO trading opens. When underwriters control allocations, bookbuilt IPOs have lower turnover (median (mean) = 3.49 (4.77) times shares offered) compared to fixed price offerings (median (mean) = 7.10 (11.69)) and the difference is significant at 5%. In contrast, when underwriters do not control allocations, the difference in turnover is no longer significant. In fact, turnover in bookbuilt offerings is *higher* in the proportionate allocation regime. The mean (median) turnover is 5.42 (4.20) for bookbuilt IPOs compared to 4.46 (2.65) in the fixed price regime, with a p-value for difference = 0.12. These results suggest that underwriters use their allocation powers to shift shares away from investors likely to flip in the short-term after-market once IPO trading begins.

Overall, the results show that underwriters discriminate in allocation significantly. Underwriters use information other than the information embedded in an investor's bid to determine allocations. The odds of receiving favorable allocation depends on hard information embedded in bids and other hard and soft information relating to bidders and the issue being offered. The underpricing results in Section 5 suggest that the ability to discriminate is associated with beneficial pricing effects.

7 Conclusion

Bookbuilding is the dominant method of offering IPOs in the U.S. and has come to dominate many markets into which it is introduced. Bookbuilding is controversial, mainly because of the power it gives underwriters over the IPO process. Unlike other mechanisms, which prescribe fairly tight rules according to which issues are priced and shares allocated, bookbuilding prescribes no preset rules as to how bids should be mapped to offer prices or how shares should be allocated to bidders. These decisions are left to the subjective judgment of underwriters, who thus enjoy considerable power over IPO pricing and more controversially, over IPO allocations.

Our paper develops empirical evidence on the use of underwriter allocation power

and its effect on IPO pricing, exploiting natural variation in allocation power in the Indian IPO market. We find that bookbuilding is associated with lower underpricing when underwriters control allocations, but much of this positive effect is quickly dissipated when allocation power is taken away from underwriters. Thus, giving underwriters control over IPO allocations positively impacts IPO pricing even in a high underpricing market. We examine the type of allocation policies associated with these positive pricing effects, based on a proprietary dataset of bids and allocations in IPOs. Discrimination is pervasive and economically significant in our sample. Allocation is a function not only of the particular bid presented but also depends on the identity of the bidder presenting a bid, issue characteristics, and other soft information possessed by the issue manager during the IPO process.

Our results have other implications. The literature on IPO allocations focuses on the aggregate allocations to institutional investors, specifically the ability of underwriters to reward institutions in the aggregate at the expense of retail investors. In the institutional environment of our study, institutional and individual share quotas are essentially fixed. Yet, allocation discretion matters. Thus, our results suggest that the ability to discriminate in IPO allocations *within* the institutional investor category is also important for effective bookbuilding. More generally, the ability of underwriters to use non-bid and subjective information rather than bids alone is perhaps one explanation for the popularity of bookbuilding in IPOs compared to other mechanisms that constrain pricing and allocation policies blind to non-bid information.

Our results also have implications for regulatory policy. Granting allocation powers unconditionally to underwriters can certainly result in its abuse. It is probably naive to think that there are no such instances of abuse, or to believe that incentives for kickbacks would never be abused by underwriters (Nimalendran, Ritter, and Zhang (2006)). The point underlined by our evidence is that there is a detectable positive side to allocation powers as well. The benefits probably come from the flexibility that bookbuilding gives IPO managers to use not just the bid but also other hard and soft non-bid information in the IPO process. This discretion to use non-bid information, unique to bookbuilding, is used positively in the Indian IPO market.

As a closing note, it is also apt to point out that non-discretionary allocation schemes such as the proportionate scheme used in India are not without their own hazards. In fact, the recent allegations of abuses in the Indian market clearly illustrate bid rigging in IPO shares that are subject to proportionate allocations.[12] In balance, our evidence supports the view that the IPO process could become more effective by allowing underwriters to use non-bid information to allocate shares together with more transparency to mitigate the incentives for kickbacks and quid pro quo.

[12]The incentive problems caused by proportionate allocations are discussed in the local financial press, see, e.g., http://www.thehindubusinessline.com/2005/12/18/stories/2005121802380100.htm on the Yes Bank IPO.

Figure 1
IPO Activity in India: 2000 - 2006

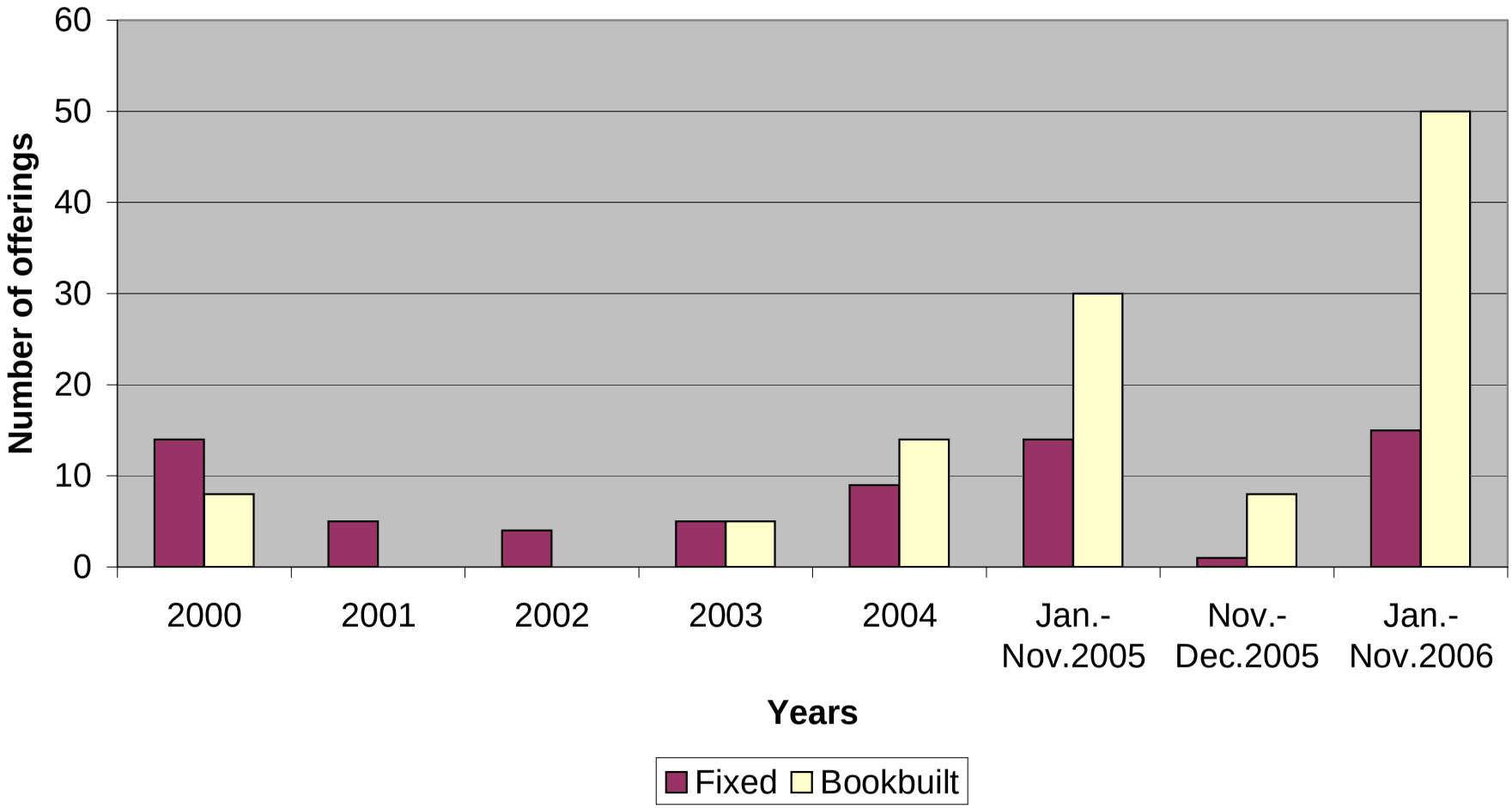

Table 1

Descriptive statistics: Correlation Matrix and Averages , ALL IPOs

VARIABLE	UPRICING	OVERSUBS	BBUILT	SIZE	PROCEEDS	AGE	HOT	MEAN (MEDIAN)
UPRICING	1							33% (22%)
OVERSUBS	0.55[a]	1						18.15 (9.01)
BBUILT	-0.15[b]	0.14[c]	1					0.64
SIZE (INR billion)	-0.03	0.01	0.09	1				1.29 (0.13)
PROCEEDS (INR billion)	-0.04	0.06	0.22[a]	0.70[a]	1			2.17 (0.60)
AGE	-0.04	-0.03	-0.16[b]	0.10	0.03	1		15.52 (11)
HOT	0.06	0.17[b]	0.19[a]	-0.04	0.03	-0.31[a]	1	87.63%
REPUTED	-0.12	0.09	0.42[a]	0.20% [a]	0.31[a]	0.18[b]	-0.16[b]	44.09%

Table 1 reports the correlation matrix and sample mean (median) of several characteristics. The data comprises IPOs completed in India between January 2000 and November 2006 listed on the Bombay Stock Exchange or National Stock Exchange. UPRICING denotes the percentage difference between the issue offer price and the price at the close of the first trading day minus the return of the SENSEX index over the same period. Oversubscription is the ratio of the number of shares that investors bid for to the number of shares offered in the IPO. BBUILT=1 if an IPO was bookbuilt and BBUILT=0 otherwise. SIZE denotes the book value of equity expressed in local currency units (billion rupees). PROCEEDS is the number of shares offered (in billions) times the offer price in local currency. AGE is the IPO year minus the year in which the firm going public is incorporated, which is obtained from the Center for Monitoring the Indian Economy database. HOT equals 0 if the IPO occurs between 2001 and 2003 and is 1 otherwise. REPUTED is 1 if the issue manager is top 5 ranked and is zero otherwise. Superscripts [a], [b], and [c] denote significance at 1%, 5%, and 10%, respectively.

Table 2

Underpricing and Bookbuilding: Regime With Allocation Discretion

Dependent variable:	*UPRICING*
OVRSUB	0.27 (4.30)[a]
BBUILT	-0.36 (-1.93)[c]
REPUTED	0.11 (0.56)
PROCEEDS	-0.09 (-2.10)[b]
AGE	-0.00 (-1.24)
HOT	-0.05 (-0.43)
Constant	1.83 (2.42)[b]
# Obs	112
Adj. R^2	31.56%

Table 2 reports estimates of a linear regression. The sample comprises 112 IPOs completed in India between 2000 and 2006 that list on the Bombay Stock Exchange or the National Stock Exchange. The dependent variable UPRICING denotes the percentage difference between the issue offer price and the price at the close of the first trading day minus the return of the SENSEX index over the same period. OVRSUB is the natural logarithm of the number of shares that investors bid for to the number of shares offered in the IPO. BBUILT is 1 if an IPO was bookbuilt and is zero otherwise. REPUTED is 1 if the issue manager top 5 ranked and is zero otherwise. PROCEEDS is the natural logarithm of the number of shares offered times the offer price in local currency terms. AGE is the IPO year minus the year in which the firm going public is incorporated, which is obtained from the Center for Monitoring the Indian Economy database. HOT is zero if the IPO occurs between 2001 and 2003 and is zero otherwise. Robust t-statistics are reported in parentheses. Superscripts [a], [b], and [c] denote significance at 1%, 5%, and 10%, respectively.

Table 3

Underpricing Variance and Bookbuilding: Regime With Allocation Discretion

Dependent variable:	*Log variance of residual UPRICING*
OVRSUB	0.51 (3.74)[a]
BBUILT	-1.88 (-4.00)[a]
REPUTED	1.12 (2.56)[b]
PROCEEDS	-0.34 (-1.98)[b]
AGE	-0.02 (-2.03)[b]
HOT	0.49 (1.00)
Constant	3.20 (0.99)
# Obs	112
Adj. R^2	22.23%

Table 3 reports estimates of a linear regression. The sample comprises 112 IPOs completed in India between 2000 and 2006 that list on the Bombay Stock Exchange or the National Stock Exchange. The dependent variable is the natural logarithm of the squared residual in the underpricing regression estimated in Table 3. OVRSUB is the natural logarithm of the number of shares that investors bid for to the number of shares offered in the IPO. BBUILT is 1 if an IPO was bookbuilt and is zero otherwise. REPUTED is 1 if the issue manager is top 5 ranked and is zero otherwise. PROCEEDS is the natural logarithm of the number of shares offered times the offer price in local currency terms. AGE is the IPO year minus the year in which the firm going public is incorporated, which is obtained from the Center for Monitoring the Indian Economy database. HOT is zero if the IPO occurs between 2001 and 2003 and is zero otherwise. Robust t-statistics are reported in parentheses. Superscripts [a], [b], and [c] denote significance at 1%, 5%, and 10%, respectively.

Table 4

Underpricing and Bookbuilding: Regime With Allocation Discretion

Sample from November 2004 to November 2005

Dependent variable:	*UPRICING*
OVRSUB	0.44 (6.39)[a]
BBUILT	-0.61 (-3.67)[a]
REPUTED	0.01 (0.13)
PROCEEDS	-0.06 (-1.02)
AGE	-0.01 (-1.81)[c]
Constant	0.93 (0.85)
# Obs	50
Adj. R^2	62.70%

Table 4 reports estimates of a linear regression. The sample comprises 50 IPOs completed in India between November 2004 and November 2005 that list on the Bombay Stock Exchange or the National Stock Exchange. The dependent variable UPRICING denotes the percentage difference between the issue offer price and the price at the close of the first trading day minus the return of the SENSEX index over the same period. OVRSUB is the natural logarithm of the number of shares that investors bid for to the number of shares offered in the IPO. BBUILT is 1 if an IPO was bookbuilt and is zero otherwise. REPUTED is 1 if the issue manager is top 5 ranked and is zero otherwise. PROCEEDS is the natural logarithm of the number of shares offered times the offer price in local currency terms. AGE is the IPO year minus the year in which the firm going public is incorporated, which is obtained from the Center for Monitoring the Indian Economy database. Robust t-statistics are reported in parentheses. Superscripts [a], [b], and [c] denote significance at 1%, 5%, and 10%, respectively.

Table 5

Underpricing Variance and Bookbuilding: Regime With Allocation Discretion

Sample from November 2004 to November 2005

Dependent variable:	*Log variance of residual UPRICING*
OVRSUB	0.14 (0.72)
BBUILT	-2.38 (-3.58)^a
REPUTED	1.10 (2.39)^b
PROCEEDS	0.05 (0.19)
AGE	0.02 (1.43)
Constant	-3.79 (-0.78)
# Obs	50
Adj. R^2	26.30%

Table 5 reports estimates of a linear regression. The sample comprises 50 IPOs completed in India between November 2004 and November 2005 that list on the Bombay Stock Exchange or the National Stock Exchange. The dependent variable is the natural logarithm of the squared residual in the underpricing regression estimated in Table 4. OVRSUB is the natural logarithm of the number of shares that investors bid for to the number of shares offered in the IPO. BBUILT is 1 if an IPO was bookbuilt and is zero otherwise. REPUTED is 1 if the issue manager is top 5 ranked and is zero otherwise. PROCEEDS is the natural logarithm of the number of shares offered times the offer price in local currency terms. AGE is the IPO year minus the year in which the firm going public is incorporated, which is obtained from the Center for Monitoring the Indian Economy database. Robust t-statistics are reported in parentheses. Superscripts ^{a}, ^{b}, and ^{c} denote significance at 1%, 5%, and 10%, respectively.

Table 6

Underpricing and Bookbuilding: Regime With No Allocation Discretion

Dependent variable:	*UPRICING*
OVRSUB	0.22 (7.93)^a
BBUILT	-0.06 (-0.69)
REPUTED	-0.12 (-2.04)^b
PROCEEDS	0.00 (0.20)
AGE	-0.01 (-2.35)^b
Constant	0.10 (0.01)
# Obs	74
Adj. R^2	50.19%

Table 6 reports estimates of a linear regression. The sample comprises 74 IPOs completed in India between November 2005 and November 2006 that list on the Bombay Stock Exchange or the National Stock Exchange. The dependent variable UPRICING denotes the percentage difference between the issue offer price and the price at the close of the first trading day minus the return of the SENSEX index over the same period. OVRSUB is the natural logarithm of the number of shares that investors bid for to the number of shares offered in the IPO. BBUILT is 1 if an IPO was bookbuilt and is zero otherwise. REPUTED is 1 if the issue manager is top 5 ranked and is zero otherwise. PROCEEDS is the natural logarithm of the number of shares offered times the offer price in local currency terms. AGE is the IPO year minus the year in which the firm going public is incorporated, which is obtained from the Center for Monitoring the Indian Economy database. Robust t-statistics are reported in parentheses. Superscripts ^{a}, ^{b}, and ^{c} denote significance at 1%, 5%, and 10%, respectively.

Table 7

Underpricing Variance and Bookbuilding: Regime With No Allocation Discretion

Dependent variable:	*Log variance of residual UPRICING*
OVRSUB	0.42 (1.40)
BBUILT	-1.60 (-2.25)^b
MANAGER REPUTATION	0.78 (1.34)
PROCEEDS	-0.11 (-0.54)
AGE	0.03 (1.12)
INTCPT	-2.74 (-0.77)
# Obs	74
Adj. R^2	5.00%

Table 7 reports estimates of a linear regression. The sample comprises 74 IPOs completed in India between November 2005 and November 2006 that list on the Bombay Stock Exchange or the National Stock Exchange. The dependent variable is the natural logarithm of the squared residual in the underpricing regression estimated in Table 6. OVRSUB is the natural logarithm of the number of shares that investors bid for to the number of shares offered in the IPO. BBUILT is 1 if an IPO was bookbuilt and is zero otherwise. REPUTED is 1 if the issue manager is top 5 ranked and is zero otherwise. PROCEEDS is the natural logarithm of the number of shares offered times the offer price in local currency terms. AGE is the IPO year minus the year in which the firm going public is incorporated, which is obtained from the Center for Monitoring the Indian Economy database. Robust t-statistics are reported in parentheses. Superscripts ^{a}, ^{b}, and ^{c} denote significance at 1%, 5%, and 10%, respectively.

Table 8

Bidders, Bids and Allocation: Descriptive Statistics

	# Bids			**Quantities** - *Median (Mean)*		
Investors	Total	Median # (Mean #)	Median % (Mean %)	Oversubscription	% of Total Bidding	% of Allocation
			By category			
EQUITY	3,616	77 (144.6)	84.3% (83.9%)	15.05 (19.42)	87.73% (86.01%)	90.69% (88.31%)
FII	1,732	27 (69.3)	35.2% (32.2%)	10.98 (14.75)	64.04% (59.88%)	63.97% (54.76%)
MF	1,884	46 (75.4)	49.2% (51.6%)	3.29 (4.67)	24.07% (26.13%)	28.79% (33.55%)
NONEQUITY	620	17 (24.8)	15.7% (16.1%)	2.24 (2.83)	12.27% (13.99%)	9.31% (11.69%)
FI	489	14 (19.6)	13.9% (13.3%)	1.56 (2.19)	9.16% (10.07%)	4.67% (8.39%)
All	4236	91 (169.4)	-	17.47 (22.25)	-	
			By family: frequency of IPO participation			
Frequent	3,092	75 (123.7)	88.89% (84.72%)	15.31 (19.18)	91.48% (88.96%)	93.6% (88.11%)
Moderate	1,001	8 (40.0)	9.05% (13.15%)	1 (2.83)	6.36% (9.97%)	5.11% (10.70%)
Rare	143	0 (5.7)	0.0% (2.13%)	0 (0.24)	0 (1.07%)	0.00% (1.20%)
			By family: frequency of applications in IPOs			
Frequent	3339	84 (133.56)	87.14% (83.51%)	15.58 (19.08)	90.83% (88.37%)	90.8% (88.23%)
Moderate	767	10 (30.68)	12.86% (14.26%)	1.04 (2.83)	8.94% (10.18%)	7.30% (10.60%)
Rare	130	1 (5.2)	1.10% (2.23%)	0.06 (0.34)	0.31% (1.45%)	0.05% (1.16%)

Table 8 provides descriptive statistics on bids and allocations for institutional investors in a proprietary sample of 25 bookbuilt Indian IPOs for which IPO books were made available to us. Column 1 in the table identifies the type of bidder. Bidders are classified as equity investors if they are domestic mutual funds (MFs) or foreign institutional investors (FIIs). Other investors are NONEQUITY investors, of which financial institutions (FIs) form the largest category. Funds are assigned to the families they belong to and are identified by the frequency of participation of the family in our sample. Frequent bidders belong to a family that participates in the top quartile of participation frequency, rare bidders belong to fund families that lie in the bottom quartile of participation frequency, while the remaining bidders are classified as moderate frequency bidders. Columns 2-4 provide statistics for the number of bids by investor category while columns 5-7 provide statistics for the number of shares normalized by the total number of shares offered in the issue.

Table 9

Aggregate Discrimination in IPO Allocations

Variable	Min	Q25	Median	Mean	Q75	Max
Aggregate	21.03	26.57	35.52	35.24	45.68	50.73
FII	0.17	13.32	19.59	20.80	30.06	39.50
MF	2.77	6.16	12.00	12.94	17.04	35.71
FI	0	0	0.24	2.68	3.93	25.46
Others	0	0	0.11	1.30	1.23	7.74

Table 9 reports statistics on reallocation of shares in IPOs. The excess allocation is the actual allocation received by an investor minus the hypothetical allocation had the manager followed a proportionate allocation rule. Table 9 reports data on the distribution of the excess allocation classified by investor type. FII denotes a foreign institutional investor, MF denotes a domestic mutual fund, while Fo stands for a domestic financial institution. The data consist of a proprietary sample of 25 Indian bookbuilt IPOs for which IPO books were made available to us.

Table 10

Odds of Receiving Favorable or Unfavorable Allocations in IPOs

	Size of bid is in				All	*Size of bid is in*				All
Investors	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Bids	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Bids
	Fraction of bids receiving lowest quartile allocation					Fraction of bids receiving highest quartile allocation				
					By category					
Equity	22.41%	22.22%	19.38%	28.22%	21.93%	34.88%	29.33%	25.77%	20.39%	27.54%
FII	16.79%	19.89%	20.29%	31.57%	24.46%	48.18%	32.10%	28.85%	17.11%	27.72%
MF	24.84%	23.72%	18.64%	16.90%	22.01%	29.11%	27.55%	23.25%	31.46%	27.38%
Non-equity	45.06%	33.78%	34.94%	23.66%	34.67%	13.58%	2.70%	9.64%	7.63%	8.36%
FI	43.17%	33.87%	39.47%	23.47%	35.61%	12.95%	0.81%	7.89%	5.10%	6.82%
					By family: frequency of IPO participation					
Frequent	22.89%	23.98%	22.22%	28.54%	34.78%	32.61%	24.12%	23.48%	20.28%	25.07%
Moderate	30.80%	23.66%	21.57%	24.48%	23.18%	30.80%	28.67%	21.96%	14.11%	23.97%
Rare	45.16%	22.58%	11.11%	30.43%	31.47%	22.58%	32.26%	29.63%	17.39%	25.17%

Table 10 reports the probability of receiving favorable or unfavorable allocations in IPOs for different types of institutional bidders and different sizes of bids. Column 1 lists the type of institutional bidder. Bidders are equity investors if they are domestic mutual funds (MFs) or foreign institutional investors (FIIs). Other investors are NONEQUITY investors, of which financial institutions (FIs) form the largest category. Funds are assigned to the families they belong to and are identified by the frequency of participation of the family in our sample. Frequent bidders belong to a family that participates in the top quartile of participation frequency, rare bidders belong to fund families that lie in the bottom quartile of participation frequency, while the remaining bidders are classified as moderate frequency bidders. Bids are classified as being in quartile 1, 2, 3, or 4, based on their ranking within the distribution of all bids for a given IPO. The left panel (columns 2-6) reports the fraction of bidder types and bid sizes that are in the lowest quartile of IPO share allocations while the right panel (columns 7-11) reports the fraction of bidder types and bid sizes that are in the highest quartile of allocations. The data consist of a proprietary sample of 25 Indian bookbuilt IPOs for which IPO books were made available to us.

Table 11

Multinomial logit

Panel A: *Outcome = Top quartile allocation*				
BIDQTILE2	-0.39 (-4.16)^a	-0.43 (-4.54)^a	-0.46 (-4.48)^a	-0.46 (-4.41)^a
BIDQTILE3	-0.56 (-4.08)^a	-0.61 (-3.72)^a	-0.66 (-4.01)^a	-0.66 (-3.97)^a
BIDQTILE4	-0.77 (-4.28)^a	-0.94 (-4.13)^a	-1.05 (-4.56)^a	-1.07 (-4.57)^a
MF		1.23 (4.10)^a	1.42 (4.13)^a	1.42 (4.13)^a
FII		1.52 (4.94)^a	1.96 (4.63) ^{a}	2.00 (4.65)^a
FREQUENT			0.13 (0.73)	0.13 (0.70)
NONEQ*FREQ			0.23 (0.55)	0.23 (0.56)
QUALITY			0.92 (2.28)^b	0.92 (2.24)^b
OVERSUB			0.01 (0.27)	-0.08 (-3.35)^a
PROCEEDS			-0.03(-0.86)	0.01 (0.29)
USMGR			0.07 (1.73)^c	0.02 (2.29)^b
REPUTED			0.02 (0.36)	0.04 (0.81)
Constant	-0.30 (-3.82)^a	-1.47 (-5.46)^a	-1.29 (-1.26)	-1.96 (-2.78)^a
Panel B: *Outcome = Bottom quartile allocation*				
BIDQTILE2	-0.25 (-1.57)	-0.26 (-1.61)^c	-0.22 (-1.33)	-0.22 (-1.34)
BIDQTILE3	-0.43 (-2.49)^b	-0.45 (-2.57)^a	-0.41 (-2.45)^a	-0.41 (-2.46)^b
BIDQTILE4	-0.15 (-0.58)	-0.21 (-0.77)	-0.22 (-0.78)	-0.23 (-0.79)
MF		-0.37 (-1.03)	-1.51 (-3.40)^a	-1.54 (-3.40)^a
FII		-0.18 (-0.51)	-1.11 (-2.27)^b	-1.12 (2.23)^b
FREQUENT			0.42 (3.48)^a	0.43 (3.53)^a
NONEQ*FREQ			-1.56 (-5.32)^a	-1.57 (-5.31)^a
QUALITY			0.26 (0.85)	0.26 (0.84)
OVERSUB			0.05 (2.07)^b	0.03 (1.12)
PROCEEDS			0.00 (0.12)	-0.00 (-0.28)
USMGR			-0.03 (-0.88)	-0.00 (-0.14)
REPUTED			0.02 (0.46)	0.19 (2.03)^b
Constant	-0.50 (-3.51)		0.23 (0.50)	0.23 (0.51)
Pseudo-R^2	0.77%	2.47%	3.82%	4.04%

Table 11 reports coefficients of four multinomial logit models. Specifications 1 to 3 vary according to the independent variables included while specification 4 adds IPO fixed effects. In each specification, the dependent variable is -1 if a bidder's allocation was in the lowest quartile of all allocations made in an IPO, +1 if the allocation is in the top quartile, and zero otherwise. BIDQTILE2 (3,4) equal 1 if a bid is in the quartile 2 (3,4) of the distribution of bids for the IPO and zero otherwise. MF =1 (0) if a bidder is (is not) a domestic mutual fund. FII is 1 (0) if an investor is (is not) a foreign institutional investor. Frequent bidders belong to a family that participates in the top quartile of participation frequency. NONEQ*FREQ interacts FREQUENT with NONEQ where NONEQ is 1 if MF=0 and FII=0 and is zero otherwise. QUALITY is 1 (0) if the R-squared in a regression of underpricing on quantities bid by a family is (is not) in the top quartile. USMGR is 1 (0) if the lead manager is (is not) U.S. affiliated. REPUTED is 1 (0) if the IPO manager is (is not) ranked among the top 5. OVERSUB is the log of the oversubscription for the IPO. PROCEEDS is the natural logarithm of issue proceeds in local currency. The data consist of a proprietary sample of 25 Indian bookbuilt IPOs for which IPO books were made available to us.

Table 12

Multinomial Logit: Marginal Effects

Panel A: *Outcome = Top quartile allocation*				
BIDQTILE2	-0.05 (-3.13)^a	-0.06 (-3.68)^a	-0.07 (-4.00)^a	-0.06 (-3.90)^a
BIDQTILE3	-0.08 (-2.99)^a	-0.08 (-2.87)^a	-0.09 (-3.24)^a	-0.08 (-3.20)^a
BIDQTILE4	-0.12 (-4.21)^a	-0.14 (-3.98)^a	-0.15 (-4.78)^a	-0.13 (-4.69)^a
MF		0.24 (4.87)^a	0.34 (5.69)^a	0.31 (5.68)^a
FII		0.30 (5.57)^a	0.43 (5.80)^a	0.40 (5.63)^a
FREQUENT			0.00 (0.02)	-0.00 (-0.02)
NONEQ*FREQ			0.11 (1.26)	0.10 (1.25)
QUALITY			0.17 (2.43)^b	0.16 (2.32)^b
OVERSUB			-0.00 (-0.06)	-0.02 (-4.04)^b
PROCEEDS			-0.01 (-0.94)	0.00 (0.39)
USMGR			0.01 (1.63)^c	0.01 (2.59)^b
REPUTED			0.00 (0.27)	-0.00 (-0.65)
Panel B: *Outcome = Bottom quartile allocation*				
BIDQTILE2	-0.02 (-0.85)	-0.03 (-0.87)	-0.02 (-0.55)	-0.02 (-0.67)
BIDQTILE3	-0.05 (-1.46)	-0.05 (-1.54)	-0.04 (-1.31)	-0.05 (1.47)
BIDQTILE4	0.01 (0.27)	0.01 (0.14)^a	0.01 (0.17)	0.00 (0.04)
MF		-0.14 (-2.44)^b	-0.34 (-5.09)^a	-0.35 (-4.99)^a
FII		-0.13 (-2.54)^b	-0.29 (-4.27)^a	-0.30 (-4.06)^a
FREQUENT			0.07 (3.55)^a	0.07 (3.72)^a
NONEQ*FREQ			-0.21 (-9.15)^a	-0.22 (-9.23)^a
QUALITY			-0.02 (-0.50)	-0.01 (-0.28)
OVERSUB			0.01 (1.90)^c	0.01 (1.93)^c
PROCEEDS			0.00 (0.72)	-0.00 (-0.48)
USMGR			-0.01 (-1.20)	-0.00 (-0.97)
REPUTED			0.00 (0.23)	0.04 (2.22)^b

Table 12 reports marginal effects of four multinomial logit models. Specifications 1 to 3 vary according to the independent variables included while specification 4 adds IPO fixed effects. In each specification, the dependent variable is -1 if a bidder's allocation was in the lowest quartile of all allocations made in an IPO, +1 if the allocation is in the top quartile, and zero otherwise. BIDQTILE2 (3,4) equal 1 if a bid is in the quartile 2 (3,4) of the distribution of bids for the IPO and zero otherwise. MF =1 (0) if a bidder is (is not) a domestic mutual fund. FII is 1 (0) if an investor is (is not) a foreign institutional investor. Frequent bidders belong to a family that participates in the top quartile of participation frequency. NONEQ*FREQ interacts FREQUENT with NONEQ where NONEQ is 1 if MF=0 and FII=0 and is zero otherwise. QUALITY is 1 (0) if the R-squared in a regression of underpricing on quantities bid by a family is (is not) in the top quartile. USMGR is 1 (0) if the lead manager is (is not) U.S. affiliated. REPUTED is 1 (0) if the IPO manager is (is not) ranked among the top 5. OVERSUB is the log of the oversubscription for the IPO. PROCEEDS is the natural logarithm of issue proceeds in local currency. The data consist of a proprietary sample of 25 Indian bookbuilt IPOs for which IPO books were made available to us.

References

[1] Aggarwal, R., N. R. Prabhala, and M. Puri, 2002, Institutional allocation in initial public offerings: Empirical evidence, Journal of Finance 57, 1421-1442.

[2] Benveniste, L. and P. Spindt, 1989, How investment bankers determine the offer price and allocation of new issues, Journal of Financial Economics 24, 343-361.

[3] Benveniste, L., and William Wilhelm, 1990, A comparative analysis of IPO proceeds under alternative regulatory environments, Journal of Financial Economics 28, 173-207.

[4] Cornelli, Francesca and David Goldreich, 2001, Bookbuilding and strategic allocation, Journal of Finance 56, 2337-2369.

[5] Cornelli, Francesca and David Goldreich, 2003, Bookbuilding: How informative is the order book?, Journal of Finance 58, 1415-1443.

[6] Dasgputa, Sudipto, and Hansen, Robert G., 2007, Auctions in Corporate Finance, Chapter 3 in Handbook of Empirical Corporate Finance, B. Espen Eckbo (Ed.), North Holland.

[7] Gasparino, C., M. Schroeder and K. Kranhold, 2000, SEC targets IPO process with probes, Wall Street Journal, December 17, C1.

[8] Hanley, Kathleen, 1993, The underpricing of initial public offerings and the partial adjustment phenomenon, Journal of Financial Economics 34, 231-250.

[9] Hanley, K. and W. Wilhelm, 1995, Evidence on the strategic allocation of initial public offerings, Journal of Financial Economics 37, 239-257.

[10] Heckman, J. and S. Navarro-Lozano, 2004, Using matching, instrumental variables and control functions to estimate economic choice models, Review of Economics and Statistics 86, 30-57.

[11] Jagannathan, Ravi, and Ann Sherman, 2005, Reforming the bookbuilding process for IPOs, Available at SSRN, http://ssrn.com/abstract=648322

[12] Jagannathan, Ravi, and Ann Sherman, 2006, Why do IPO Auctions Fail?, NBER Working Paper.

[13] Jenkinson, Tim and Howard Jones, 2005, Bids and allocations in European IPO bookbuilding, Journal of Finance, forthcoming.

[14] Ljungqvist, Alexander, 2005, IPO underpricing, Chapter 7 in Handbook of Corporate Finance: Empirical Corporate Finance, B. Espen Eckbo (Ed.), North Holland.

[15] Ljungqvist, A., T.J. Jenkinson and W.J.Wilhelm, 2003, Global integration in primary equity markets: The role of U.S. banks and U.S. investors, Review of Financial Studies 16, 63-99.

[16] Ljungqvist, A. and W.J.Wilhelm, 2002, IPO allocations: discriminatory or discretionary?, Journal of Financial Economics 65, 167-201.

[17] Lowry, Michelle, and G. William Schwert, 2004, Is the IPO pricing process efficient? Journal of Financial Economics 71, 3-26.

[18] Nimalendran, M., Jay Ritter, and Donghang Zhang, 2006, Do today's trades affect tomorrow's IPO allocations?, Journal of Financial Economics (forthcoming).

[19] Ritter, Jay and Ivo Welch, 2002, A review of IPO activity, pricing, and allocations, Journal of Finance 57, 1795-1828.

[20] Rock, K., 1986, Why new issues are underpriced, Journal of Financial Economics 15, 187-212.

[21] Securities and Exchange Board of India (SEBI), 2006, Handbook of Statistics on the Indian Securities Market, December.

[22] Sherman, Ann, 2002, Global trends in IPO methods: bookbuilding vs. Auctions, mimeo, University of Notre Dame.

[23] Sherman, Ann, 2005, Global trends in IPO methods: bookbuilding versus auctions with endogenous entry, Journal of Financial Economics 78, 615-649.

[24] Smith, R. and S. Pulliam, 2000, U.S. probes inflated commissions for hot IPOs, Wall Street Journal, December 7, C1.

[25] Spatt, C. and S. Srivastava, 1991, Preplay communication, participation restrictions, and efficiency in initial public offerings, Review of Financial Studies 4, 709-726.

[26] Subramanyam, Pratap, 2005, Investment Banking: An odyssey in high finance, Tata-McGraw Hill Publishing Company Limited, New Delhi.