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Abstract

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Abstract

This paper empirically examines how bank-firm relationships affect post-deregulation competition among underwriters in the U.S. corporate bond underwriting market. I find that there is a trade-off between relationships and price in the demand equation and that this trade-off is sharply higher for junk bond issuers and first-time issuers. This finding is consistent with the certification effect of commercial bank underwriting. Commercial bank entry has increased bank competition to the extent that their client-specific relationships have increased product differentiation in the market. Since issuers with low reputation value the relationships more, the deregulation has increased competition the most in these segments.

Do Bank-Firm Relationships Affect Bank Competition in the Corporate Bond Underwriting Market?

1 Introduction

Before the historic wave of deregulation swept the U.S. financial industry, a small number of investment banks dominated the underwriting markets for corporate securities. Since then, commercial banks have made substantial inroads in these markets, raising two important questions: What enabled these entrant commercial banks to enter this seemingly oligopolistic market? And, to the extent that they did, how has their entry changed the competitive structure of this market? These are the questions I investigate in this paper.

In analyzing the effect of commercial bank entry into these markets, the pioneering theoretical paper by (Puri 1999) finds that commercial banks and investment banks will coexist in equilibrium in these markets under one of two scenarios: (1) both types of underwriters fetch the same price for the security, i.e., there is no differentiation in certification ability; and (2) commercial banks fetch a higher price for the security, and investment houses discount their fees to the level where issuing firms are indifferent between either type of underwriter; i.e., there is a differentiation in certification ability.

Empirical analyses of the effects of commercial banks' underwriting in these markets to date have produced results conforming to both theoretical scenarios. For example, on the certification effect, several papers find that, ceteris paribus, commercial bank underwriting has had a positive (or non-negative) effect on the pricing of underwritten corporate bond issues. [1] In these papers, the typical econometric analysis involves regressing bond prices on various bond characteristics plus a variable indicating whether the underwriter is a commercial bank or an investment bank, and the coefficient for this variable has a negative sign. In contrast, (Gande, Puri, and Saunders 1999) finds that, while the general fee level went down in the corporate bond market as the market share of commercial banks went up, there also is no difference between underwriting fees charged by commercial banks and investment banks; that is, it finds no evidence that commercial bank entrants either undercut the incumbent investment banks or charge higher fees to extract rent from issuing firms. Their economet-

[1] See (Kroszner and Rajan 1994), (Puri 1994), (Puri 1996), (Gande, Puri, Saunders, and Walter 1997), and (Konishi 2002).

ric analysis involves regressing the micro-level transaction fee variable on various control variables (such as bond characteristics and a trend) plus a variable indicating whether the underwriter is a commercial bank or an investment bank, and the coefficient for this variable is not significantly different from zero.

These empirical results, then, present a conundrum. If commercial banks deliver better quality in the form of higher certification, why would firms ever choose investment banks that charge the same fees? And to the extent that firms are willing to pay higher underwriting fees for higher quality, why would profit-maximizing commercial banks fail to charge higher fees?

This paper seeks to reconcile these theoretical and empirical findings by using detailed bank-firm relationship data and a multinomial discrete choice model framework to estimate the model for the issuing firm's demand for underwriting services. This approach improves on the prior literature in several ways. First, the existing empirical works have yielded mixed results by examining two components of the theoretical predictions, i.e., certification ability banks possess and fees they charge, in separate regressions. In contrast, I jointly test both implications of the theory in a unified approach in order to help resolve the conundrum discussed above. This is done by examining certification ability (quality) and fees (price) as determinants of the firm's demand for underwriting services. If there is no trade-off between quality and price of underwriting services, that is consistent with the first scenario (no differentiation) suggested by (Puri 1999). If there is a trade-off, then that is consistent with the second scenario (differentiation).

Second, the binary model used in the existing works [2] cannot fully address the nature of differentiation among commercial banks. Theoretical work suggests that prior loan relationships give commercial banks private information about the firms. Although variables such as outstanding loan stakes are used as explanatory variables in the existing work, it is used only in a binary model. Therefore the model incorporates only the information about one commercial bank underwriter per observation that was actually chosen by the firm. So variation in relationships exists only across firms; no variation in relationships exists across banks for a given firm. Using a multinomial choice model improves on the existing works' binary model by incorporating information about other unchosen underwriters' existing loan relationships.

Third, this paper uses rich bank-firm relationship data that allow me to examine whether the valuation of relationships depends on (1) the borrower reputation of issuing

[2] (Puri 1996), (Gande, Puri, Saunders, and Walter 1997), and (Gande, Puri, and Saunders 1999).

firms, or (2) the significance of banks' roles in previous loan relationships. To the best of my knowledge, this is the first paper to address these questions directly.

Finally, using demand estimates to infer imperfect competition among sellers of differentiated products has become a standard analytical tool in the empirical industrial organizational literature in recent years. [3] Surprisingly, this method has not been applied in studies of the financial service industry. This paper conducts the first investigation on the nature of competition among banks in the financial services markets using the differentiated product, imperfect competition model framework.

In this demand analysis framework, a given issuing firm chooses one from multiple underwriters, both commercial banks and investment houses. This approach is useful in directly answering the following questions: (1) For a given fee level, does having a loan relationship increase the likelihood that a firm will choose a commercial bank? (Or, does presence of a commercial bank with a loan relationship decrease the likelihood that other commercial banks and investment houses will be chosen?) In other words, is there a trade-off between the fee and the loan relationship, a measure of certification? (2) Is the effect of a loan relationship on choice probability greater when the issuing firm has a lower borrower reputation in the market? In other words, is the fee-relationship trade-off greater for issuing firms with lower borrower reputation? The answers to these empirical questions provide an economic explanation for the effect of commercial bank entry in this deregulated market that is consistent with the existing theoretical understanding of the underwriting markets.

As will be discussed more in the later section, I conceptualize borrower reputation in the spirit of (Diamond 1991). [4] This is not to be confused with bank reputation of underwriters, which also has been studied in the literature [5] This paper mainly focuses on examining the effect of borrower reputation on the choice of underwriters. As a robustness check, however, I also include bank reputation as a control variable in later section.

In order to estimate this model, I constructed a unique data set consisting of 1,535 U.S. domestic corporate bond issues in the period 1993-1997. This data set combines individual issue-level and firm-level data with firm-specific and bank-specific data on previous loan arrangements.

I find that there is a significant trade-off between fees and loan relationships in the

[3](Bresnahan 1989) provides an authoritative survey of this literature.

[4]See Section 2.1.2.

[5]See (Chemmanur and Fulghieri 1994a), (Carter and Manaster 1990) and (Carter, Dark, and Singh 1998), for example.

demand model. Moreover, I find that this trade-off is sharply higher for junk-bond issuers and first-time issuers, i.e., firms with lower borrower reputation in the capital markets. These empirical findings are both consistent with the second equilibrium in (Puri 1999) where entrant commercial banks are differentiated by their certification ability which they possess for a subset of the issuing firms (because they have had previous loan relationships with them). The competitive effect of commercial bank entry is the greatest for segments of issuers with lower borrower reputation, where these relationships are more likely to be present and also where these relationships are valued more by the issuers. I also find that the valuation of relationships depends on the significance of the roles banks played in previous loan relationships.

The remainder of the paper is organized as follows. Section 2 reviews related branches of the corporate finance literature. Section 3 describes a model of the underwriting service market. Section 4 describes the data. Section 5 explains empirical specifications of the demand model and defines explanatory variables to be included in the estimation. Section 6 presents and discusses the estimation results. Section 7 concludes.

2 Literature Review

2.1 Related Literature in Corporate Finance

2.1.1 The Informational Roles of Commercial Banks

The literature on the theory of financial intermediation has stressed the unique informational function of commercial banks. Several papers argue that banks have scale economies and comparative cost advantages over other lenders (including individual bondholders) in producing information about the borrowers. [6] Other papers attribute the monitoring ability of banks to their incentive to build their reputation as lenders. For example, (Chemmanur and Fulghieri 1994b) model a firm's choice between bank loans and bonds, allowing for debt renegotiation in the event of financial distress. The main implication of the model is that banks' desire to acquire a reputation for making the "right" renegotiation versus liquidation decisions gives them an endogenous incentive to devote more resources towards evaluating a firm's value than bondholders. These papers suggest that commercial banks have closer, longer-term, and more exclusive relationships with their borrowers than do other types of

[6] For example, see (Leland and Pyle 1977), (Diamond 1984), (Black 1975), and (Fama 1985).

lenders. These views support the use of pre-existing relationship variables in my model as a measure of effectiveness in information production as underwriters. In a related empirical study, (Datta, Iskandar-Datta, and Patel 1999) find that the existence of bank debt (with any bank and not necessarily with the underwriting bank) lowers the at-issue yield for initial public bond offers.

2.1.2 The Firm's Debt Choice Model Based on Borrower Reputation

(Diamond 1991) uses the borrowing firm's reputation to explain its choice between bank loans and bonds. The main result of the paper is that borrower reputation and bank monitoring (of the firm's investment decisions) are substitutes. The intuition for this result is as follows: Young firms and old firms without high borrower reputations tend to rely more on bank loans, because they do not have reputations to lose and therefore bank monitoring is needed to enforce efficient investment decisions. Large established firms with high borrower reputations, on the other hand, do have a valuable reputation to lose and therefore have sufficient incentive to choose efficient investment decisions. Since bank monitoring is costly, this class of firms prefers to issue bonds.

The paper also implies that there is an intertemporal linkage between bank loans today and the firm's decision to issue bonds in the future: "A borrower's credit record acquired when monitored by a bank serves to predict future actions of the borrower when not monitored" (p. 690). This suggests that the monitoring of firms by commercial banks in the loan market can become an asset in another market, i.e., when such banks become underwriters in the bond market. These results of the paper support the hypothesis in my model that the issuing firm's valuation of bank relationships is inversely related to its borrower reputation.

2.2 Commercial Bank Underwriting Literature

Several papers [7] analyze the implications of commercial bank underwriting using game-theoretic models. They demonstrate that even if investors are assumed to rational, the potential social cost of conflicts of interest arising from combining investment banking and commercial banking cannot be ruled out. The existence and magnitude of the conflict of interest problem in these models depends on the cost of information production by the two

[7] (Kanatas and Qi 1998), (Rajan 1992b), (Puri 1999).

types of banks, the timing of their access to a firm's private information, investors' beliefs about the quality of the firms underwritten by commercial banks, etc. Since these variables are not directly measurable, empirical studies have instead measured the association between the pricing of the bond and the instance of commercial bank underwriting. [8] They conclude that generally there is no detectable conflict of interest in the data [9] and in some cases there is a net certification effect. (Gande, Puri, and Saunders 1999) measure the association between commercial bank entry and a change in underwriting fees and the ex ante yield of the bonds and conclude that deregulation has enhanced competition in the market in the short run. In contrast, I examine underwriter competition by estimating how issuers choose underwriters in the framework of the empirical methods developed in the industrial organization literature. This approach is aimed at providing the missing piece, i.e., an economic analysis of the issuer-side of this market.

3 The Market for Underwriting Services

When a firm decides to issue a bond, it hires an underwriting bank to market, price, and distribute the security. [10] For a relatively small offering and/or if the firm is a frequent issuer, the issuer typically contacts several underwriting banks to get their individual quotations. For a large issue and/or if the firm issues infrequently, the issuer is more likely to hold a "beauty contest", that is, the issuing firm invites nderwriting banks to make detailed proposals in formal presentations, after which the firm chooses a bank to underwrite its bond.

To examine how banks compete in this market, we first must understand the nature of the product that is bought and sold. Security underwriting is a financial service. By hiring an underwriting bank, the issuing firm pays for two kinds of services: (1) it effectively buys insurance for unsold securities, and (2) it buys the bank's ability to document, market, price, and sell the security.

[8]See (Ang and Richardson 1994), (Kroszner and Rajan 1994), and (Puri 1994) for default rate studies using pre-Glass-Steagall historical data. See (Puri 1996), (Gande, Puri, Saunders, and Walter 1997), and (Hamao and Hoshi 1999) for studies on the ex ante yield. (Konishi 2002) studies both default rates and the ex ante yield using pre-war data in Japan.

[9]One exception is (Hamao and Hoshi 1999), which examines the post-derefulation Japanese market and concludes there might be a conflict of interest.

[10]I abstract from the syndicate structure here for expositional clarity and discuss it in Section 4.

How do banks price this mix of services? Do fees vary across transactions and across banks in a given transaction? The fee variation across transactions is easily observed, and is is strikingly high, especially compared to the oft-discussed "7 % fix" in the equity IPO market [11] (see Figure 1). What accounts for these variations in fees?

For the underwriting bank providing services to a given firm, it is predicted that the costs of providing these two kinds of services are negatively correlated with the borrower reputation of the issuing firm. For example, if the issuer is a "hot," well-regarded name in the market, not only is the probability of unsold securities low, but so is the cost of marketing and selling the security. In contrast, it is more expensive both to insure (against unsold securities) and to market and distribute a less well-known issuer's bond. Investors need to be educated and persuaded harder to purchase the bond (even after controlling for its higher yield), which also requires educating the bank's sales force. Thus, the first implication of the analysis is that the borrower reputation characteristics of the issuing firms and bonds are factored into the price of underwriting services. Credit ratings and previous issue experience of the firms are examples of such characteristics.

Similarly, ths cost of underwriting is likely to be associated with some features of the bonds, such as the maturities and the shelf registration status. Long-maturity bonds are less liquid and their prices are more volatile over course of theif maturity; therefore, the fees are expected to be higher the longer the maturity of the bond. Shelf registration (e.g., Medium-Term Notes Programs), on the other hand, simplifies the issuance procedures and allows for flexible timing of issuance and is therefore expected to lower the fee.

The second implication is these two kinds of services share a common cost component, that is, the cost of assessing the issuer's creditworthiness *and* certifying the findings to the investors. I refer to this assessment and certification aspect of the underwriting service as information production. When certain banks are perceived by investors as more effective in information production, they can build up demand for the securities they sell faster and thus will face a lower risk of unsold securities and a lower marginal cost of marketing and sales. Therefore, if banks differ in their effectiveness at producing information, they face different profit functions *even after controlling for the issuer and bond characteristics*, which leads to a prediction that fees vary across banks for a given firm as well.

Issuing firms may prefer banks that are better at producing information for two reasons. First, dealing with such banks is less likely to lead to unsold securities or otherwise failed transactions, which could hurt their borrower reputation in the capital markets for

[11] See (Chen and Ritter 2000) and (Hansen 2001).

future transactions. Second, such banks' ability to build up demand for the security may indicate that they can negotiate a lower yield for the bond than other underwriting banks can. So the product in this market is expected to be differentiated mainly along two dimensions—fees and information production effectiveness.

One way that banks come to be more effective at information production is through past relationships with the firms. Established networks and communication channels with an issuer increase a bank's effectiveness in producing information about that particular issuer. As discussed in Section 2, the financial intermediation literature explains why commercial banks may play a unique informational role with the firms to which they lend. [12] The effect of this relationship on underwriter demand may be positive or negative or zero, depending on the issuing firms' valuations of the relationships. As with fees, these relationships vary both across issuers and across banks. Because these entrant banks have pre-existing relationships with some of the issuers through their loan business *prior to* deregulation, I treat these relationships as predetermined and exogenous to the competition in the underwriting market and use the variation in fees and relationships to estimate a model of underwriting demand.

The price competition literature has used estimates of the demand function to quantify the ability of sellers (banks in this paper) to set prices in industries with differentiated products. The first-order condition of a bank's profit maximization problem gives the basis for using own-price elasticities to estimate the mark-ups that sellers charge. A high trade-off between relationships and fees in the demand equation implies low price elasticities for firms with relationships and thus high market power.

Lastly, the analysis of fee determination and demand behavior yields another prediction, viz., that this trade-off between fees and relationships varies with the firm's borrower reputation. Firms with low borrower reputation stand to gain the most from choosing an underwriting bank whose effective information production capability can certify them. For firms with high borrower reputation, on the other hand, the information production effectiveness of banks is largely redundant, since their security can sell easily in the market regardless of who the underwriter is. In other words, it is predicted that there is a higher trade-off between relationships and fees for firms with lower borrower reputation to the extent that pre-existing relationships make commercial banks more effective information producers. If true, this indicates that not only are the pre-existing relationships a source of market power for the entrant commercial banks, but their economic significance is inversely related to the borrower reputation of issuing firms.

[12] (Leland and Pyle 1977), (Diamond 1984), (James 1987), (Rajan 1992a).

To summarize, I investigate the following questions:
(1) Do issuing firms value banks' superior effectiveness at producing information about the issuers for investors?
(2) If the answer to question 1 is yes, then what is the magnitude of the trade-off issuers are willing to make between fees and the value of the relationship?
(3) Does this trade-off vary across the borrower reputation characteristics of the issuers?
(4) How do the abilities of banks to set fees vary across the borrower reputation characteristics of the issuers?

4 The Data

4.1 Data Sources

I construct the dataset using two data sources. One is U.S. Domestic New Issues Database by Thomson Financial Securities Data, which compiles new issues information from company filings, press releases, and news sources. The other is Loanware Database compiled by Capital Data (a division of Dealogic), a joint venture between Computasoft Ltd. and Euromoney Institutional Investor Plc; this database contains detailed historical information on global syndicated loans and related instruments, and I use the U.S. national market segment of it. The Appendix provides a full list of variables used in the estimation.

DealScan, which is compiled by Loan Pricing Corporation, is another commercial database that collects similar loan transaction information on the U.S. market. Both Loanware and Dealscan are sold mainly to large investment banks and institutional investors. Dealscan offers a relatively affordable academic discount, while Loanware offers none, so Dealscan has been used more frequently in academic research. [13] The Appendix provides a comparison of the two databases on the data collection methodology, the U.S. market coverage, and some relevant software features. The two databases appear to offer equivalent coverage of the U.S. market, while Loanware offers superior coverage of the international loan market.

[13] See (Kleimeier and Megginson 2000) and (Esty and Megginson March 2003) for examples of Loanware usage in the literature.

4.2 Data Selection

The sample period is from January 1, 1993 to August 31, 1997—roughly 4- 2/3 years. I chose this period based on the following criteria. First, the sample should begin after January 1989, when the first commercial bank underwriting of a public corporate bond took place. Second, the economic and regulatory environment surrounding the underwriters and issuers should remain relatively stable. The decision to omit data after August 1997 is primarily due to the merger in September 1997 of Salomon Brothers and Smith Barney, as a result of the acquisition of Salomon by Travelers, Smith Barney's parent company. Both Salomon and Smith Barney were leading investment banks in the U.S. corporate bond underwriting market at the time of the merger. It is of course quite infeasible to omit *all* mergers and acquisitions activities involving underwriters from any reasonably long sample period. In the wake of financial globalization, there has been a flurry of cross-border and cross-industry mergers between major players. A few examples are Paine Webber Group's purchase of Kidder, Peabody & Co. in October 1994, and Swiss Bank Corp.'s double acquisitions of the investment-banking unit of S.G. Warburg in May 1995 and of Dillon, Read & Co. in May 1997. However, none of these earlier M&A events involved two firms ranked in the top ten of the corporate bond underwriting market. Rather, they are characterized as acquisitions of veteran Wall Street players by commercial banks just entering the underwriting market, so one can argue that ownership changes of these firms had no substantial impact on the competitive environment in the underwriting market. In contrast, the Salomon-Smith Barney merger represented the first merger of two existing major investment banks, thus affecting the overall market structure.

I exclude financial firms (one-digit SIC code 6) and regulated industries (one-digit SIC code 4) from my study. I also concentrate on the top 16 underwriters[14] of fixed-rate, non-convertible corporate debt. Fixed-rate debt comprises about 90% of all non-convertible issues. Moreover, I find that both the composition and the sum of market shares of top underwriters are virtually uniform between fixed-rate and other coupon-type bonds. For my sample, five of the 16 underwriters are Section 20 subsidiaries [15] of bank holding companies, namely J.P. Morgan, Chase Manhattan Bank, Bankers Trust, Citicorp, and Nations Bank.

[14]The rankings were based on the dollar value of underwritings and gave full credit to the book-runner(s).

[15]The name is derived from Section 20 of the Glass-Steagall Act, which prohibits member banks in the Federal Reserve System from being affiliated with firms that are engaged "principally" in the securities business. These subsidiaries were permitted to enter the investment banking business after meeting various requirements, such as a ceiling on their security-related revenues.

Using the above criteria results in a sample of 1,535 non-convertible, fixed-rate corporate bond issues.

4.3 Variables in the Demand Equation

4.3.1 The Fee Variable

The fee variable (FEE) used in the estimation is a gross spread expressed as a percentage of the size of the bond. The gross spread is the fee that underwriters receive, or the difference between the price at which securities are sold to investors and the price paid by the underwriters to the issuing firm. A typical public bond offering consists of multiple underwriters forming a selling syndicate, where one underwriter serves as the book-runner. I identified the book-runner (or the lead-manager) as the underwriter of a given issue.[16] Given the syndicate structure, this seems to be a reasonable assumption. This rule is also consistent with the perception of practitioners who advertise their bank's market position in terms of "book-runner ranking."

4.3.2 The Loan Variable

I construct variables LOAN1-LOAN16 (for 16 underwriting banks in the sample) using transactions data from the Loanware database. A loan agreement frequently (but not always) consists of participation by a number of banks in a way that is analogous to the structure of a selling syndicate in a public bond offering. I use several definitions of relationships based on the significance of roles played by banks in their syndicates. [17] The relationship defined in the baseline model is whether or not a given bank has acted as an arranger for a given firm in a loan transaction; in other words, the dummy variable for bank j is 1 if it has served as an arranger, and 0 if not. In constructing these variables, I paid careful attention to past mergers and acquisitions by lending banks and borrowing firms. Using CUSIPS where available and name matches, I tracked down those transactions where firms' names have changed between the time of the loan transaction and the time of the bond issuance. Banks' transactions were similarly tracked down.

[16] In a small number of cases where there were two co-book-runners, each was counted as if it underwrote separate issues.

[17] I also estimate the model with alternative loan variable specifications using Japanese data in (Yasuda 2001) and find that the results are robust to various variable specifications.

These variables capture the presence loan relationships between a given firm and individual commercial banks that existed before the banks entered into the underwriting market (see Appendix A for the exact variable definitions). I treat these relationships as predetermined and exogenous to the competition in the underwriting market.

4.4 Variables in the Fee Equation

As discussed in Section 3, underwriting fees are determined in part by various costs, including distribution costs, the expected cost of taking market and underwriter reputation risks, and information production costs. The variables that I use in the fee equations include credit-rating dummy variables, maturity variables, and the size of the issue. Being in the junk-bond category means issuers have less financial strength and in general have lower borrower reputation than those in the non-junk bond category. This increases the risk-related cost for the underwriter. It might also mean that it is more costly to distribute these bonds because the company is less well-known and investors need to be marketed more intensively (which also feeds back to creating potentially greater market risk). For similar reasons, investors require substantially higher yields for junk bonds.

In general, underwriters also demand higher underwriting fees for longer maturity bonds. This makes sense to the extent that a normal yield curve is also upward sloping; in addition, the secondary market for 30-year corporate bonds is much less liquid than for 30-year treasury bonds.

Similarly, a larger issue is more liquid than a smaller issue, ceteris paribus, and thus underwriters may charge lower fees (as a percent of total proceeds) for it. Alternatively, the personnel costs of investment bankers and fixed income professionals is high and fixed in the short run, and adjusting the cost through hiring and firing is both costly and time-consuming. So we can assume that in the short-run the scale of operation for a given bank is fixed. For large, so-called "bulge-bracket" [18] banks, with higher overhead costs, underwriting larger issues is more cost-effective, so they may strategically give a size discount.

I also include a variable that represents the previous issue experience of firms in the bond market. From the underwriter's point of view, the bonds of frequent issuers are easier to market than those of first-time or infrequent issuers, and they are less likely to

[18] "Bulge-bracket" is Wall Street jargon for the most elite investment banks. It literally refers to the banks in an underwriting syndicate who were responsible for placing the largest amounts of the issue with investors and whose names appear first in the tombstone.

lead to failed transactions because the frequent issuers' track records enhance their borrower reputations. Thus the fee is expected to be decreasing in this variable. Another indicator of issue frequency is whether the bond was issued under shelf registration or the Medium-Term Notes (MTN) program. Registering for this program simplifies the filing process and reduces the legal and accounting costs of incremental issues. I used the sample of observed (and thus chosen) fees to check whether these variables affect the fee in the predicted direction, and in fact they do. [19]

4.5 Descriptive Statistics of the Sample

Table I reports various summary sample statistics. Several observations can be made. First, issues underwritten by commercial banks are smaller than issues underwritten by investment banks; their maturity also tends to be slightly shorter, but no better or worse in terms of credit ratings. There are a few plausible reasons for this. For example, if a smaller, younger firm is more likely to choose the commercial bank with which it had built close ties, the issue size might proxy for characteristics of that firm. Or if commercial banks have a smaller distribution capability relative to investment banks, the issue size might reflect the supply-side constraint.

In Panels D and E of Table I, the sample is tabulated by previous issue experience and by the issuer's SIC code. Commercial bank issues are relatively more frequent among first-time issuers. This observation is consistent with the proxy explanation just discussed. In contrast, there is little difference between commercial bank and investment bank subsamples in terms of the distribution of issuers across different industries.

5 Underwriter Choice Model

5.1 Discrete Choice Model

The central component of my analysis is a multinomial discrete choice model of a firm's underwriter demand. The approach is transaction-based rather than capital stock-based.

[19] I used these OLS estimates as starting values for the fee equation parameters in the estimation. Coefficients have the predicted signs and are significant.

This is similar to the pecking-order financing model [20] and is consistent with the premises of other debt choice models as well.

Firms are assumed to maximize an indirect value function of the form

$$V_{ij} = \bar{V}_{ij} + \epsilon_{ij} \tag{1}$$

where the banks are numbered $1..J$, indexed by j and the firms are numbered $1..N$, indexed by i.[21] $\bar{V}_{ij}$, the predetermined component of the value function, is assumed to depend on product characteristics and fees.[22] Thus

$$\begin{aligned} V_{i,(m,j)} = {} & \alpha \mathrm{FEE}_{i,j} + \beta \mathrm{LOAN}_{i,j} + \\ & \delta_m^{INVG} \mathrm{INVGRADE}_i + \delta_m^{LAMT} \ln(\mathrm{AMOUNT})_i + \\ & \delta_m^{LOMAT} \mathrm{LOMAT}_i + \delta_m^{HIMAT} \mathrm{HIMAT}_i + \\ & \delta_m^{FSTTIME} \mathrm{FIRSTTIME}_i + \delta_m^{SIC} \mathrm{SIC}_i + \epsilon_{i,(m,j)} \end{aligned} \tag{2}$$

where

$\mathrm{FEE}_{i,j}$ is the underwriting fee (in %) charged by bank j

$\mathrm{LOAN}_{i,j}$ is 1 if a prior loan relationship exists between firm i and bank j, otherwise 0

$\mathrm{INVGRADE}_i$ is 1 if the firm is an investment grade issuer, otherwise 0

$\ln(\mathrm{AMOUNT})_i$ is the natural log of the issue size in \$ millions

[20] In this well-known partial equilibrium model of the firm's financing behavior, the firm optimizes with respect to each financial transaction, taking its need for external finance as given. See (MacKie-Mason 1990) and (Helwege and Liang 1996) for the use of similar discrete-choice models.

[21] There is no outside good in the model, chiefly because it is not obvious what the market M —appropriate pool of firms—is. It is not readily observed and needs to be estimated. (Berry 1994) points out that this is a common problem in industry studies, with no clear-cut solutions. Since my results suggest that commercial bank entry potentially induced a shift away from loan markets to bond markets by junk-bond issuers and new issuers, explicitly modeling an outside good would be a valuable extension that I leave for future researchers.

[22] The fact that these variables are indexed by i as well as by j is a unique feature of this market. This is because the underwriting service, the good in this market, has an underlying product, the bond, which varies with both the choices (e.g., maturity) and the attributes (e.g., credit rating) of the issuers. See the data section for more discussion on this point.

LOMAT_i	is 1 if the bond maturity is shorter than 5 years, otherwise 0
HIMAT_i	is 1 if the bond maturity is longer than 15 years, otherwise 0
FIRSTTIME_i	is 1 if the firm is a first-time bond issuer, otherwise 0
SIC_i	are SIC code dummies
$\epsilon_{i,(m,j)}$	is the idiosyncratic error term

5.2 Interaction of Relationships with Borrower Reputation

As discussed in Section 3, I am interested in examining how valuation of relationships vary with borrower reputation. Therefore, I interact the borrower reputation characteristics of issuers with the relationship variable and fees. [23] The indirect value function is now given by:

$$\begin{aligned} V_{i,(m,j)} &= \sum_r Y_{i,r}\left[\,\alpha_r \text{FEE}_{i,j} + \beta_r \text{LOAN}_{i,j}\,\right] + \\ &\quad w_i^T \delta_m + \epsilon_{i,(m,j)} \end{aligned} \tag{3}$$

where

$Y_{i,r}$ is 1 if the borrower reputation type of the issuer is r, else 0, for $r = 1, ..., R$

w_i are the six bond and firm characteristics variables described above

δ_m are similarly the coefficients for those variables

5.3 Logit Model

Assume that the error term ϵ follows the Generalized Extreme-Value (GEV) distribution and the nest structure is given by Figure 2. (McFadden 1978) [24] showed that the assumption of the GEV distribution implies

- The lower-nest choice probability:

$$\Pr(j|m,\, Y_{i,r}) = \frac{e^{\alpha_r \text{FEE}_{i,j} + \beta_r \text{LOAN}_{i,j}}}{\sum_{k=1}^{K} e^{\alpha_r \text{FEE}_{i,k} + \beta_r \text{LOAN}_{i,k}}} \tag{4}$$

[23] This further relaxes the restrictive nature of traditional discrete choice models by allowing differences between individual choosers (firms) to have a systematic effect on their tastes.

[24] Also see (McFadden 1981).

- The upper-nest choice probability:

$$\Pr(m) = \frac{e^{w_i^T \delta_m + \lambda I_{i,m}}}{\sum_t e^{w_i^T \delta_t + \lambda I_{i,t}}} \tag{5}$$

$$\text{where } I_{i,t} = log(\sum_{l \in L_t} e^{\alpha \text{FEE}_{i,l} + \beta \text{LOAN}_{i,l}}) \tag{6}$$

The inclusive value $I_{i,t}$ measures the expected aggregate value of subset t, and the coefficient λ reflects the dissimilarity of alternatives within a specific subset. A simple multinomial logit model is consistent with a nested-logit model with the restriction that $\lambda = 1$. I estimate both a straightforward logit model and a nested-logit model where λ is allowed to differ from 1. [25]

5.4 Data Issues

In calculating transaction fees for each bond issue, I use multi-variate imputations by various bond and issuer characteristics (e.g., maturity, Medium-Term Notes(MTN) status, etc.), by which the underwriting fees are known to vary (see Sections 4.3 and 4.4). The fee is assumed to be exogenous in the model because, essentially, a single firm (consumer in this market) is assumed to be too insignificant to affect the average fee. [26] This follows the practice of

[25] While logit error specification is a computationally convenient choice for estimating multinomial discrete choice models, the literature has pointed out the unattractive substitution property of logit models. A nested-logit model improves upon it by relaxing this feature. The relaxation of the Independence of Irrelevant Alternatives (IIA) property translates into more reasonable substitution patterns for nested-logit models compared to simple logit models; see (Maddala 1983). Note that the nest structure does not impose sequential decision-making on the underlying economic agent's problem.

[26] I control for the correlation of fees with quality variables that are not included in the demand equations by using the same product categories for fees of alternative banks in each observation. In other words, if a given observation is a short-maturity, investment grade, first-time issue without MTN registration, I use the imputed fees for that product category for all banks. Again, a unique feature of this market is that consumer characteristics (e.g., the issuer's credit rating) make up the product characteristics. In other

micro-data studies of other industries. [27]

In particular, I impute the fees as follows:

$$\begin{aligned}\text{FEE}_{i,j} \;=\; & \text{CONS}_j + \ln(\text{MATURITY})_i\,\gamma_j^{LMAT} + \ln(\text{NO.ISSUES}+1)_i\,\gamma_j^{ISSUE} + \\ & \text{MTN}_i\,\gamma_j^{MTN} + \ln(\text{AMOUNT})_i\,\gamma_j^{LAMT} + \text{CREDIT RATINGS}_i\,\gamma_j^{CREDIT} + \\ & \text{YEARS}_i\,\gamma_j^{YEAR} + \text{SIC}_i\,\gamma_j^{SIC} + \text{LOAN}_{i,j}\,\gamma_j^{LOAN} + u_{i,j} \qquad (7)\end{aligned}$$

where

CONS_j is the constant term	
$\ln(\text{MATURITY})_i$ is natural log of the bond maturity	
$\ln(\text{NO.ISSUES}+1)_i$	is natural log of the number of previous bond issues plus 1
MTN_i	is 1 if the bond is issued under an MTN programme, otherwise 0
$\ln(\text{AMOUNT})_i$	is the natural log of the issue size, in $ millions
CREDIT RATINGS_i	are credit rating dummies corresponding to the issue's Moody's rating (AA dummy = 1 if the issue's rating is AA, etc.)
YEARS_i	are year dummies (YEAR94 = 1 if the issue date is in 1994, etc.)
SIC_i	are SIC dummies (SIC2 = 1 if the issuer's primary SIC code is in the 2000's, etc.)
$\text{LOAN}_{i,j}$	is 1 if a prior loan relationship exists
$u_{i,j}$	$\sim N(0,\sigma^2)$ iid

A data issue arises in studying this market because fees vary across both issuers and banks, but only one fee per issue, that is, the fee offered by the bank that is hired to underwrite the bond, is observed. Though the fee is assumed to be exogenous in the model, the observations I have to compute the average fees are not a random subset, but are the fees charged when they are chosen. To illustrate how not treating this feature of the data will lead to biased estimates of fees, let c_i represent the index of the bank chosen by firm i. Since

words, in studying this market, we cannot make the usual operating assumption that a given seller's (bank's) product mix is fixed in the short run. This is true of many service markets, in contrast with, say automobile manufacturing markets.

[27] See (Goldberg 1995).

fee enters the value function of the issuing firm negatively, the fact that a given bank was chosen over other banks in the choice set implies that these observed fees, $(p_{i,j}; j = c_i)$, are on average lower than the unconditional distribution of $p_{i,j}$. As a result, if I impute unobserved fees by obtaining estimates of γ from Equation 7 using observed fees as dependent variables, the model will systematically underestimate unobserved fees and bias the fee coefficient α toward zero, or even a positive number.

To correct for the bias using this information (on their choice), it was advantageous to compute them iteratively and jointly with the demand model. I use the Expectation-Maximization Algorithm, [28] which provides an appealing framework for this task. The main idea is to estimate fee equation estimates γ, σ and demand equation estimates α, β, μ jointly in an iterative algorithm where fee imputation is conditional on the information in $c_i, i = 1..N$. Variables used to impute fees in this step are as described above in this section. The main appeal of using this framework for my data problem is that it provides an iterative procedure where, if not for the systematic absence of some data, the Maximum Likelihood estimation is straightforward. The demand estimates obtained from this estimation method are then used to estimate the upper level of the nested-logit model. Details are in Appendix B.

5.5 Research Hypotheses Revisited

The empirical demand model corresponds to my research questions as follows:

(1) Do issuing firms value banks' superior effectiveness at producing information about the issuers for investors? This is captured by coefficient β in Equation 4.

(2) What is the magnitude of the trade-off issuers are willing to make between fees and the value of the relationship? This is measured by the ratio of the coefficient $\frac{\beta}{\alpha}$.

(3) Does this trade-off vary across the borrower reputation characteristics of the issuers? This hypothesis is tested by interacting the demand function with the borrower reputation characteristics of the issuers, thus allowing the valuations of relationships and fee to vary across these characteristics.

(4) How do the abilities of banks to set fees vary across the borrower reputation characteristics of the issuers? This is measured by calculating own-price elasticities of individual banks from the demand estimates.

[28] See (Dempster, Laird, and Rubin 1977) and (McLachlan and Krishnan 1997).

6 Estimation Results

6.1 Baseline Model

Table II reports the estimation results of the baseline model presented in Section 5 (Equation 2, 4, 5, and 7) and Appendix B. The fee coefficient α is negative and significant, whereas the relationship coefficient β is positive and significant. Thus both fee and prior loan relationships are significant determinants of demand in the underwriting market. Besides the inclusive value variables, I also include issuer and bond characteristics in the upper nest. Since these are chooser-specific variables, parameters are estimated separately for each choice. The coefficients for one choice (in this case investment banks) are normalized to zero, so the reported coefficients are for the choice of commercial banks.

Coefficients on ln(AMOUNT) and HIMAT are negative and significant, whereas the coefficient on FIRSTTIME is positive and significant. This is consistent with the prediction that firms issuing large bonds and long-maturity bonds are less likely to choose commercial banks (due to their limited operational scale) and that first-time issuers are more likely to choose them, potentially due to their prior relationships. The coefficient on INVGRADE is not significantly different from zero, which confirms the inference made from Table I. The dissimilarity coefficient of the nested-logit model (λ) is 1.4413, which is not significantly different from one at the 5% significance level by the Wald test. Consistent with this result, estimates of a multinomial logit model are quantitatively very similar to those of the nested-logit model. (See Table VII, Panel A).

The estimates of equations determining fees, γ, are reported for each bank in Panel B. Bank1-Bank5 are commercial banks and Bank6-Bank16 are investment banks. Within each category, banks are listed in the order of their market shares in the sample. Bank1 is therefore the top-ranking commercial bank underwriter, whereas Bank6 is the top-ranking investment bank underwriter and is the top-ranking bank overall. Coefficients for the maturity and credit rating variables are mostly positive and significant, whereas those for the past issue experience and shelf-registration (MTN) variables are mostly negative and significant. Coefficients for issue size, on the other hand, are negative and significant for top-ranking investment banks and either positive and significant or not significantly different from 0 for commercial banks and low-ranking investment banks. This result suggests that it is indeed cost effective for top bulge-bracket investment banks to underwrite large size issues, while it is not so for smaller investment banks and for entrant commercial banks. Overall, these findings are consistent with the analysis of fee determination in Section 3 and with the discussions of variables entering pricing equations in Section 4.

6.2 Junk vs. Non-Junk Model

Table III reports the estimation results where fee and relationship coefficients are allowed to vary across the issuer's borrower reputation characteristics, i.e., credit rating and specifically, whether the issuer's credit rating is in the junk-bond category at the time of the issuance. Being in the junk-bond category means issuers have less financial strength and in general lower borrower reputation than those in the non-junk bond category. The fee coefficient α_1 for non-junk (i.e. "high quality") issuers is negative and significant at -1.5823, whereas the fee coefficient for junk-bond issuers ("low quality") is also negative and significant but smaller at -0.4113. The loan coefficients β_r are positive and significant (either at 1% or 5%) for all four subgroups. The coefficients for commercial banks are larger than those for investment banks, and within each group, the coefficient for junk issuers is larger than that for non-junk issuers.

The upper-nest coefficients are qualitatively similar to those in the baseline model. Firms with smaller issues, short to middle maturity, and no prior issue experience are more likely to choose commercial bank underwriters. The inclusive value coefficient λ is 0.8018. Estimates from the two logit models are quite similar.

Fee equation estimates are also qualitatively (and quantitatively) similar to the baseline model results. Most banks raise fees for larger maturity issues and lower them for seasoned issuers, MTN-program users, and higher credit rating issues. The top-ranking investment banks lower fees for large issues, while smaller investment banks and commercial banks either do not give a size discount or charge a size premium.

6.3 First-Time vs. Seasoned Model

Table IV reports the estimation results where the trade-off between fee and relationship in the demand equation is allowed to vary along the newness of the issuers in the corporate bond market. Investors are less likely to be familiar with or even to recognize the name of first-time issuers in the market, so these firms are worse off than seasoned issuers in terms of their borrower reputation. Seasoned issuers, on the other hand, have a track record of issuing public debt, which contributes positively to their borrower reputation. The fee coefficient α_1

for non-first-time (i.e. "high borrower reputation") issuers is negative at -1.2012, whereas the fee coefficient α_2 for first-time issuers ("low borrower reputation") is negative at -0.4139. The loan coefficients β_r are positive for all four subgroups. The coefficients for first-time issuers are larger than those for seasoned issuers. Interestingly, while the LOAN coefficients are significant at the 1% level for commercial banks, for investment banks they are statistically significant only for first-time issuers.

Upper-nest coefficients of the demand equation, INVGRADE, ln(AMOUNT), LOMAT, HIMAT, and FIRSTTIME are similar to those reported in the baseline model. λ is 0.8227. Fee equation coefficients are again similar to the baseline results.

6.4 The Implied Value of Bank-Firm Relationships

In the demand estimates presented in Table II-IV, the trade-off between relationships and fees implies that issuers are willing to pay a higher fee for underwriting services from banks with pre-existing relationships. The trade-off is quantified by the ratio of the two coefficients, $\frac{\beta}{\alpha}$. Ratios computed from these tables are reported in Table V.

In the baseline model reported in Table II, this ratio is -0.874. Since fee is expressed as a percentage and the relationship is an indicator variable, this ratio has a unit of 0.874%. In terms of the underlying demand model, a bank with a relationship can charge a premium of up to 0.874% before an issuer prefers a bank without a relationship (ceteris paribus). Evaluated at the sample mean issue size of about $180 million, this translates to about $1.57 million. Since the level of the underwriting fee paid by the issuers in the sample ranges anywhere from $200,000 to several million dollars, the value of a relationship implied by the results is quite substantial, and at the same time reasonable.

In Table III where this trade-off is allowed to differ between non-junk bond and junk bond issuers and also between commercial banks and investment banks, an interesting pattern emerges. For commercial banks, the ratios $\frac{\beta}{\alpha}$ are -0.635 and -4.039 for high- and low-reputation issuers, respectively. Evaluated again at the mean issue size of $180 million, the valuation of pre-existing relationships for the two classes of issuers are approximately $1.14 million and $7.27 million, respectively. For investment banks, the results are similar, but the magnitudes are smaller: the ratios are -0.499 and -2.773, and the implied values are $0.90 million and $4.99 million, respectively. The large difference in the values of $\frac{\beta_r}{\alpha_r}$ confirms the prediction of an inverse relationship between the borrower reputation of issuing firms and their valuation of the ability of underwriting banks to certify them for investors.

Similar implications are obtained from the results reported in Table IV. For commercial banks, the ratios $\frac{\beta}{\alpha}$ are -0.759 and -2.642 for high- and low-reputation borrowers, respectively. In dollar terms, these are approximately \$1.37 million and \$4.75 million. For investment banks, the LOAN coefficient is not statistically different from zero for seasoned issuers. For first-time issuers, however, it is significant at 1% and the implied value is \$7.33 million. Again, these large differences in the values of $\frac{\beta_r}{\alpha_r}$ suggest that there is an inverse relationship between the borrower reputation of issuing firms and their valuation of the ability of underwriting banks to certify them for issuers.

6.5 Own-Price Elasticities as Measures of Markups

The price competition literature has used estimates of the demand function to quantify the ability of sellers (banks in this paper) to set prices in industries with differentiated products. The higher trade-offs for firms with low borrower reputation suggest that banks derive greater market power from these pre-existing relationships when providing services to these low-reputation firms. To quantify this economic implication, I calculated the own-price elasticities of individual banks from the demand estimates. Table VI reports the results of calculations based on the estimates reported in Tables III and IV. In the first column I report the mean own-price elasticities of sixteen individual banks, where all observations were used for the calculations. In the second and third columns, I report the own-price elasticities for high- and low-reputation firms. In the first case, the price elasticities that banks face when supplying underwriting services to junk bond issuers are significantly lower. Similarly, the elasticities for first-time issuers are significantly lower in magnitude, roughly half those for seasoned bond issuers.

Price elasticities have a theoretical relationship to price mark-ups (over the marginal cost) in a profit-maximization framework. So low elasticities of firms with low borrower reputation imply higher mark-ups and thus a position of greater market power and less competitive threat from others. This finding is consistent with the main finding of the paper: what matters is not so much a generic organizational form (i.e., whether it is a commercial bank or an investment bank), but the client-specific relationship that makes them locally more effective in producing information, and the valuation of such relationships by issuers, which in turn depends on the borrower reputation of the issuers in the capital market.

6.6 Robustness Results

In addition to the nested-logit model, I ran a logit model of the baseline model. The results are presented in Table VII, Panel A. Consistent with the point estimate of λ in the baseline result, these estimates are quite similar to those in the nested-logit model, and all the qualitative results hold.

6.6.1 Bank Reputation

As discussed earlier, this paper mainly focuses on examining the effect of borrower reputation on the choice of underwriters. As a robustness check, however, I also examined whether the results were sensitive to the inclusion of underwriting bank reputation variables. For this purpose, I used two specifications. In one, I included market shares as a proxy for bank reputation, as argued by (De Long 1991). This proxy measure was used in an empirical study by (Megginson and Weiss 1991) and was found to be highly correlated with the Carter-Manaster (1990) bank reputation measure [29] Table VII, Panel B reports the results. First, the main results are robust to controlling for bank reputation variables. Both fee and loan coefficients in the demand equation are significant and of the same sign as the baseline model. Similarly, I find that the other demand estimates and fee equation estimates are qualitatively similar. The coefficient on market share is positive and significant at 3.2558, suggesting that there is a reputation premium on fees. This result is consistent with established theoretical predictions in the literature such as (Chemmanur and Fulghieri 1994a) and (Booth and Smith 1986).

In addition, I used the specification where banks were classified as either high-reputation or low-reputation according to their market share and included these two dummy variables in the fee equation. This specification was also used in (Gande, Puri, Saunders, and Walter 1997). [30] I find that the results are unchanged with this second specification, which is reassuring. In other words, the coefficients were both positive and significant, with a larger coefficient for the high-reputation bank.

[29] (Carter, Dark, and Singh 1998).

[30] Conversations with market participants suggest that bank reputation is perceived more as a binary concept (e.g. "bulge-bracket" vs. "small-guys") than a continuous spectrum. Thus this specification seems to be both a reasonable and a parsimonious one.

6.6.2 Aggregate Effect of Relationships on Fees

The fee variable interacts with the LOAN variable insofar as banks may systematically raise or lower the fees they charge to firms with which they have relationships. For example, banks may lower fees for firms with which they have relationships because their marginal information costs are lower; as a result, ceteris paribus, those firms would be more likely to choose that bank, over and above the non-fee benefit of the relationship. In that case, the coefficient on the LOAN variable in the demand equation partly absorbs that fee effect. To account for this, I have included loans in the fee equation to evaluate the benefit of relationships net of the effect of loan on fees in the baseline model.

I also estimated a variant of the baseline model where loans were aggregated across commercial banks and investment banks separately for junk issuers and non-junk issuers in the fee equation, and where the loan and fee coefficients in the demand equation were separately estimated for junk issuers and non-junk issuers. The results suggest something interesting. First, for both junk and non-junk issuers, there is a substantial fee discount when there are relationships between firms and commercial banks. The loan coefficient in the demand equation is still positive and significant. These findings suggests that while there are fee discounts (in the aggregate) for firms that have had relationships with commercial banks, there is still a net benefit from relationships over and above the fee discount. Note that this result does not imply that commercial banks charge lower fees than investment banks, but rather that they charge lower fees (in the aggregate) to those firms with which they have had relationships. For investment banks, the effect of relationships on fees is small and significantly positive for junk issuers, and not significantly different from zero for non-junk issuers.

6.7 Extension: Does the Valuation of Relationships Depend on the Significance of Roles Banks Play?

As discussed in Section 4.3.2, I used arrangership of loan agreements as an indicator of a prior banking relationship. In Table VIII, I report the results of broadening this relationship definition to other roles.

I used both (1) dummy variables as a measure of the presence or absence of relationships, and (2) count variables, i.e., how many transactions have occurred in the past, as a measure of both the existence and intensity of relationships. Furthermore, I can observe what roles a bank played in a given transaction. Thus I was able to construct "the most exclusive" measures using only the top-position role, i.e., arrangers, "the most inclusive" measures, using the union of all six roles reported (i.e., arranger, lead-manager, co-lead, co-manager, co-agent, and participant), and measures in between these two.

When the definition is "arranger", the results are robust to how I measure them (dummy or count). When I broadened the definition of relationships to include other bank roles reported for loans, such as lead-manager, co-lead, co-manager, co-agent, and participant, an interesting finding emerges: Participant is not a meaningful measure of relationships. When I include the other four roles in the definition of relationships, the results are qualitatively the same. The LOAN coefficient is positive and significant but smaller than is obtained when using the "only arranger" definition. This finding is consistent with the prediction that the closer to the top of the syndicate the bank is, the more significant its relationship is and therefore the more significant informational advantage such a bank gains.

When I include participant (the lowest position in the syndicate) in the definition, though, I find that the LOAN coefficient in the demand equation is not significantly different from zero. I think this is because when banks serve as participants, they are merely invited to participate in the deal by the arranger or lead-manager bank, but they typically do not have any direct interaction with the borrower firms, and thus they do not have any superior information about the firm than do others as underwriters. Instead, banks gain superior information (or certification ability) only when they serve as one of the leading lenders to the firms. [31]

7 Conclusion

In this paper, I reconcile the conundrum which thus far has existed between theoretical and empirical findings in the literature on commercial bank underwriting by examining both quality (certification ability) and price (fees) implications of the theory in a unified approach. I show that there is a significant trade-off between fees and loan relationships

[31] Furthermore, this result that not all relationships are equal is also confirmed in a study I conducted using Japanese data (Yasuda 2001). I created a measure of "top-lender," "second-top lender," etc., using balance sheet data and found that (1) the higher the ranking, the more likely a bank will be chosen as the underwriter, and (2) when the bank ranks lower than a top third position, past loan relationships do not affect its likelihood of being chosen as underwriter.

(a measure of certification ability) in the firm's demand model for underwriting services. Moreover, I find that this trade-off is sharply higher for junk-bond issuers and first-time issuers, i.e., firms with lower borrower reputation in the capital markets. I also find that the valuation of relationships depends on the significance of the roles banks played in previous loan relationships. These empirical findings are consistent with the second equilibrium in (Puri 1999) where entrant commercial banks are differentiated by their certification ability which they possess for a subset of the issuing firms (because they have had previous loan relationships with them) and are able to earn rent on it. The competitive effect of commercial bank entry is the greatest for segments of issuers with lower borrower reputation, where these loan relationships are more likely to be present and also where these relationships are valued more by the issuers. These findings explain both the successful entry by commercial banks into low-reputation borrower segments of the market and the continuing dominance of bulge-bracket investment banks in blue-chip, seasoned-issuer segments of the market.

Appendix

A List of Variables

A.1 Demand Equation

(A) Dependent Variables

.BOOK1-BOOK16: .BOOK j is 1 if the jth bank is chosen by the issuing firm in the given observation; 0 otherwise.

.BANK_DUM: .Takes a value of 1 if the chosen bank in the given issue is a commercial bank; 0 otherwise.

(B) Bank-specific Explanatory Variables:

.LOAN1-LOAN16: .LOAN j Takes a value of 1 if bank j ever acted as an arranger in a loan agreement for the firm in the given issue in the period prior to the sample period (1980-1992); 0 otherwise.

.FEE1-FEE16: .UNDERWRITING FEE j is the gross spread (expressed as a percentage of the issue amount) charged by bank j for the given issue.

(C) Binary (Commercial Banks vs. Investment Banks) Explanatory Variables:

.Inclusive Value0-1:	.Inclusive Value1 is the inclusive value for Commercial Banks at the C-Bank/I-Bank node of the nest. Inclusive Value 0 is the inclusive value for Investment Bank at the C-Bank/I-Bank node.
.INVGRADE:	.is 1 is the issue is rated by Moody's as investment grade, else 0.
.ln(AMOUNT):	.is the natural log of size of the issue in millions of U.S. dollars.
.LOMAT:	.is 1 if the bond maturity is shorter than 5 years, else 0.
.HIMAT:	.is 1 if the bond maturity is longer than 15 years, else 0.
.FIRSTTIME:	.is 1 if the firm had no previous issues of non-convertible bonds; 0 otherwise.
.SIC:	.Dummy variables for SIC codes of issuing firms. SIC2 is 1 if the issuer's primary SIC code is in the 2000's, etc.

A.2 Fee Equations

(A) Dependent Variables

.FEES:	.Gross spread, or equivalently underwriting fees charged by the underwriting bank to the issuing firm for its service (as % of issue proceeds).

(B) Explanatory Variables

.ln(MATURITY):	.natural log of the bond maturity in years).
.ln(NO.ISSUES+1):	.natural log of the number of previous bond issues plus 1 (to avoid getting ln(0).

.MTN:	.is 1 if the issue is under the Medium-Term Notes (MTN) programme, or else 0.
.ln(AMOUNT):	.is the natural log of size of the issue in millions of U.S. dollars.
.CREDIT RATINGS:	.are credit rating dummies corresponding to the issue's Moody's ratings. AA = 1 if the issue's rating is AA, etc.
.YEARS:	.are year dummies (YEAR94 = 1 if the issue date if in 1994, etc.)
.SIC:	.Dummy variables for SIC codes of issuing firms. SIC2 is 1 if the issuer's primary SIC code is in the 2000's, etc.
.LOAN:	.LOAN j Takes a value of 1 if bank j ever acted as an arranger in a loan agreement for the firm in the given issue in the period prior to the sample period (1980-1992); 0 otherwise.

B Estimation Method

In the Expectation-Maximization Algorithm framework, the observed data are viewed as being "incomplete" and are augmented by unobserved data to make up the "complete data." Each EM iteration involves an E-step, where the conditional expectation of the complete-data log likelihood given the observed data is computed using the previous estimates $\theta_{(0)}$, and an M-step, where the conditional expectation is maximized over θ. This procedure is repeated iteratively until convergence is achieved.

Let c_i represent the index of the bank chosen by firm i.

Let $\theta = \{\alpha, \beta, \mu, \gamma, \sigma\}$.

We observe c_i and p_{i,c_i}, as well as $x_{i,j}$, z_i. The task is to estimate θ according to the maximum likelihood principle. I do this using an EM-type algorithm, assuming p_{-c_i} to be the "hidden" data and hence $\{c_i, p_{c_i}, p_{-c_i}\}$ to be the complete data. Thus I need to establish $\Pr(c_i, p_{c_i}, p_{-c_i}|\theta)$.

$$\Pr(c, p_c, p_{-c}|\theta) = \Pr(c|p_c, p_{-c}, \theta) \Pr(p_c, p_{-c}|\theta)$$

by Bayes's rule. According to the logistic choice model

$$\Pr(c|p_c, p_{-c}, \theta) = \frac{e^{d_c^T \mu + \alpha p_c + \beta x_c}}{\sum_{k=1}^{K} e^{d_k^T \mu + \alpha p_k + \beta x_k}} . \tag{8}$$

According to the iid normal distribution of δ_k, we know that each $p_k \sim N(z^T \gamma_k, \sigma^2)$ independently. Hence

$$\Pr(p_c, p_{-c}|\theta) = \prod_{k=1}^{K} \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2\sigma^2}(p_k - z^T \gamma_k)^2} . \tag{9}$$

Hence, we have the log likelihood of the complete data (of a single firm) as

$$\begin{aligned} \ln \Pr(c, p_c, p_{-c}|\theta) \quad = \quad & -\frac{1}{2\sigma^2} \sum_{k=1}^{K} (p_k - z^T \gamma_k)^2 - \frac{K}{2} \ln 2\pi\sigma^2 + \\ & \ln \frac{e^{d_c^T \mu + \alpha p_c + \beta x_c}}{\sum_{k=1}^{K} e^{d_k^T \mu + \alpha p_k + \beta x_k}} . \end{aligned} \tag{10}$$

In order to implement the E-step, I compute

$$\begin{aligned} & E_{\theta^{(0)}} (\ln \Pr(c, p_c, p_{-c}|\theta) \mid c, p_c) \\ = \quad & \int \ln(\Pr(c, p_c, p_{-c}|\theta)) \Pr(p_{-c}|c, p_c, \theta^{(0)}) \, dp_{-c} \\ = \quad & \left(\int \frac{\prod_{k \neq c} e^{-\frac{1}{2\sigma^{2,(0)}}(p_k - z^T \gamma_k^{(0)})^2}}{e^{\alpha^{(0)} p_c + \beta^{(0)} x_c} + \sum_{k \neq c} e^{\alpha^{(0)} p_k + \beta^{(0)} x_k}} dp_{-c} \right)^{-1} \\ & \int \ln(\Pr(c, p_c, p_{-c}|\theta)) \left(\frac{\prod_{k \neq c} e^{-\frac{1}{2\sigma^{2,(0)}}(p_k - z^T \gamma_k^{(0)})^2}}{e^{\alpha^{(0)} p_c + \beta^{(0)} x_c} + \sum_{k \neq c} e^{\alpha^{(0)} p_k + \beta^{(0)} x_k}} \right) dp_{-c} . \end{aligned} \tag{11}$$

Note that the first integral term is irrelevant in the M-step because it is a function only of the old parameters $\theta^{(0)}$ and therefore is invariant with respect to new θ. So for the rest of this section I drop this term from the analysis. What remains inside the second integral term is the product of a log of complete-data likelihood (evaluated at the new θ) and the remaining part of the conditional probability $\Pr(p_{-c}|c, p_c, \theta^{(0)})$, to be evaluated at the old θ.

These are high-dimensional ($K = 15$) integrals over hybrid distributions consisting of normal and logit components and are computationally non-trivial. Neither numerical integration nor Monte-Carlo EM (where the E-step is replaced by a Monte-Carlo process) is trivial nor immediately promising given the high dimensionality. Instead I use what is commonly referred to as an "EM-type algorithm," whereby the single most likely value p_{-c} that maximizes the conditional density above (i.e., only $\Pr(c, p_c, p_{-c}|\theta^{(0)})$) is computed and a probability of 1 is placed on these data. In terms of the underlying economic problem, this part can be described as adjusted fee imputation, where instead of using unconditionally imputed fees for unobserved fees, I replace them with fees that are adjusted to maximize the joint likelihood $\Pr(c_i, p_c, p_{-c})$, using estimates of θ from the previous iteration.

To monitor convergence, we need to evaluate the observed-data likelihood function $L(\theta^{(k)})$ in each (kth) iteration. In my model the incomplete-data likelihood function is expressed as

$$\begin{aligned}\Pr(c, p_c|\theta) &= \int \Pr(c, p_c, p_{-c}|\theta)\, dp_{-c} \\ &= \int \prod_{k=1}^{K} \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2\sigma^2}(p_k - z^T\gamma_k)^2} \left(\frac{e^{\alpha p_c + \beta x_c}}{\sum_{k=1}^{K} e^{\alpha p_k + \beta x_k}} \right) dp_{-c}\ . \end{aligned} \qquad (12)$$

As discussed above, these integrals are computationally challenging. Laplace's method provides a useful way of approximating integrals that take the form

$$I(\lambda) = \int_D e^{-\lambda g(x)} f(x)\, dx\ , \qquad (13)$$

where λ is a large parameter[32]. I apply this approximation method to evaluate the observed-data likelihood function.

C Loanware and Dealscan

To verify how the two databases compare, I contacted sales representatives of both database companies. According to them, both firms compile their databases from the same sources: data submissions by banks themselves and SEC filings by borrower companies. (Banks have

[32]See (Judd 1996) pp.545-547.

incentives to self-report on their transactions so that their deals are included in the league table calculations.) So their data collection methodology is equivalent.

To compare their coverage of the US domestic market, I obtained top 10 lead arrangers US market league tables for the latest available period from their websites. Comparing the two tables reveals that for 5 banks out of 10, Loanware covered more deals than Dealscan and that for 4 out of 10, Dealscan covered more deals than Loanware. For 1 bank in the top 10, the two databases contained the same number of deals. The overall volumes covered were $689 billion and $639 billion for Loanware and Dealscan, respectively. While neither database is perfect (since each apparently misses some transactions that the other collects), there seems to be no systematic difference between the two databases in terms of their U.S. market coverage.

From this, I infer that using Dealscan to reproduce the estimation yields qualitatively the same result, provided that one follows similarly careful procedures to account for bank mergers, firm mergers/reorganization, and the information about roles played by banks. Loanware has a fearture that allows one to easily track down deals done by subsidiaries of a financial conglomerate prior to their acquisitions. DealScan does not have this feature, i.e., deals are associated with the historical names of lenders at the time of transactions, and not with the names of future acquirers of such lenders. DealScan, however, has a feature that allows one to select deals based on the roles banks played.

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Figure 1. Underwriting Fees and Issue Amount

This figure reports the scatterplot of underwriting fees against issue amount (in $ million). The data consist of 1,535 corporate bond issues, from January, 1993 to August, 1997. The plot follows the industry practice of expressing underwriting fees as a percent of the principal amount.

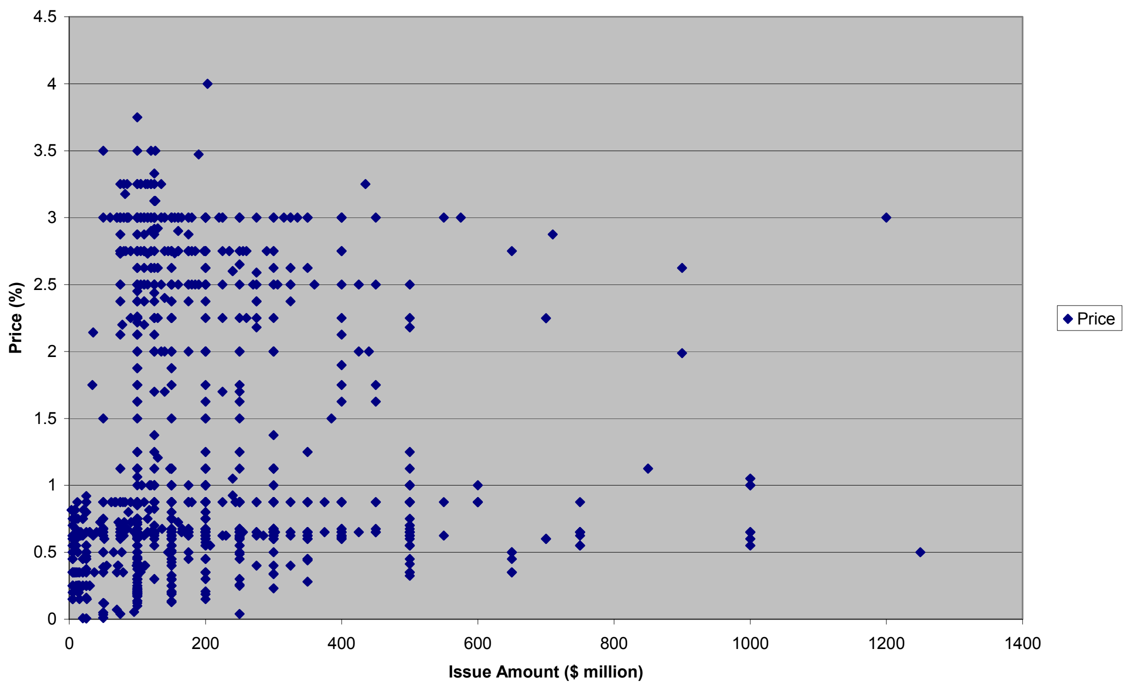

Figure 2. Firm's Choice Set

This figure specifies the nest structure used in demand model.

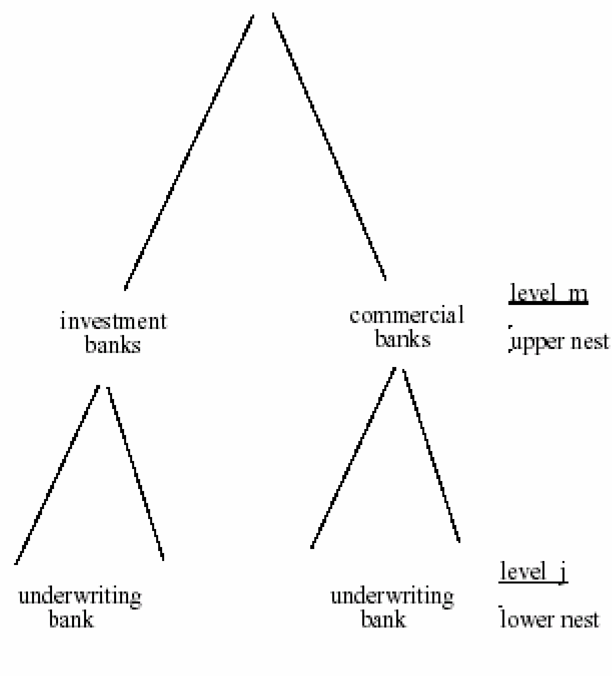

Table I. Sample Summary Statistics

This table presents some summary statistics for the 1,535 bond issues underwritten in the 1/1993-8/1997 period. "Issue Size" is the amount of principal reported in the SDC New Issues Database. Lead underwriter is given full credit for the deal. "Market shares" are computed by dividing the subcategory's total number of issues by the category total. "Credit Rating" refers to the issue's Moody's rating. "Commercial Bank Issues" are issues lead-underwritten by Section 20 subsidiaries of commercial banks.

Panel A: Issue Size ($millions)	<= 75	75 < <= 150	< 150	Total
All Issues				
No. of Issues	216	687	632	1535
Market Shares (by No. of Issues)	0.14	0.45	0.41	1.00
Transaction Volume ($millions)	$7,209.5	$82,769.8	$189,541.8	$279,521.1
Commercial Bank Issues				
No. of Issues	54	115	54	223
Market Shares (by No. of Issues)	0.24	0.52	0.24	1.00
Transaction Volume ($millions)	$1,242.0	$13,804.0	$14,146.0	$29,192.0
Investment Bank Issues				
No. of Issues	162	572	578	1312
Market Shares (by No. of Issues)	0.12	0.44	0.44	1.00
Transaction Volume ($millions)	$5,967.5	$68,965.8	$175,395.8	$250,329.1

Panel B: Maturity (years)	<= 5	5< <= 15	15<	Total
All Issues				
No. of Issues	240	962	333	1535
Market Shares (by No. of Issues)	0.16	0.63	0.22	1.00
Transaction Volume ($millions)	$32,885.7	$177,556.3	$69,079.1	$279,521.1
Commercial Bank Issues				
No. of Issues	44	154	25	223
Market Shares (by No. of Issues)	0.20	0.69	0.11	1.00
Transaction Volume ($millions)	$3,490.0	$22,094.5	$3,607.5	$29,192.0
Investment Bank Issues				
No. of Issues	196	808	308	1312
Market Shares (by No. of Issues)	0.15	0.62	0.23	1.00
Transaction Volume ($millions)	$29,395.7	$155,461.8	$65,471.6	$250,329.1

Panel C: Credit Rating	Caa-Ba3	Baa1-Aaa	Total
All Issues			
No. of Issues	469	1066	1535
Market Shares (by No. of Issues)	0.31	0.69	1.00
Transaction Volume ($millions)	$87,796.6	$191,724.5	$279,521.1
Commercial Bank Issues			
No. of Issues	73	150	223
Market Shares (by No. of Issues)	0.33	0.67	1.00
Transaction Volume ($millions)	$11,810.0	$17,382.0	$29,192.0
Investment Bank Issues			
No. of Issues	396	916	1312
Market Shares (by No. of Issues)	0.30	0.70	1.00
Transaction Volume ($millions)	$75,986.6	$174,342.5	$250,329.1

Table I. Sample Summary Statistics (cont'd)

This table presents some summary statistics for the 1,535 bond issues underwritten in the 1/1993-8/1997 period. Lead underwriter is given full credit for the deal. "Market shares" are computed by dividing the subcategory's total number of issues by the category total. "Commercial Bank Issues" are issues lead-underwritten by Section 20 subsidiaries of commercial banks. "First-Time" issues refer to the firms with no previous issues of non-convertible bonds. "SIC Code" is the issuer's primary SIC Code reported in the SDC New Issues Database.

Panel D: Previous Issue Experience	First-Time	Seasoned	Total
All Issues			
No. of Issues	678	857	1535
Market Shares (by No. of Issues)	0.44	0.56	1.00
Transaction Volume ($millions)	$123,955.9	$155,565.2	$279,521.1
Commercial Bank Issues			
No. of Issues	117	106	223
Market Shares (by No. of Issues)	0.52	0.48	1.00
Transaction Volume ($millions)	$16,447.0	$12,745.0	$29,192.0
Investment Bank Issues			
No. of Issues	561	751	1312
Market Shares (by No. of Issues)	0.43	0.57	1.00
Transaction Volume ($millions)	$107,508.9	$142,820.2	$250,329.1

Panel E: SIC Codes	000's	1000's	2000's	3000's
All Issues				
No. of Issues	9	193	468	334
Market Shares (by No. of Issues)	0.01	0.13	0.30	0.22
Transaction Volume ($millions)	$1,635.0	$31,970.6	$88,846.6	$69,470.8
Commercial Bank Issues				
No. of Issues	1	30	61	59
Market Shares (by No. of Issues)	0.00	0.13	0.27	0.26
Transaction Volume ($millions)	$300.0	$4,015.0	$8,270.0	$7,006.0
Investment Bank Issues				
No. of Issues	8	163	407	275
Market Shares (by No. of Issues)	0.01	0.12	0.31	0.21
Transaction Volume ($millions)	$1,335.0	$27,955.6	$80,576.6	$62,464.8

Panel E: SIC Codes (cont'd)	5000's	7000's	8000's	Total
All Issues				
No. of Issues	233	233	65	1535
Market Shares (by No. of Issues)	0.15	0.15	0.04	1.00
Transaction Volume ($millions)	$39,548.5	$35,849.6	$12,200.0	$279,521.1
Commercial Bank Issues				
No. of Issues	34	31	7	223
Market Shares (by No. of Issues)	0.15	0.14	0.03	1.00
Transaction Volume ($millions)	$5,375.0	$3,421.0	$805.0	$29,192.0
Investment Bank Issues				
No. of Issues	199	202	58	1312
Market Shares (by No. of Issues)	0.15	0.15	0.04	1.00
Transaction Volume ($millions)	$34,173.5	$32,428.6	$11,395.0	$250,329.1

Table II. EM Algorithm Estimation of Firm's Underwriter Choice Model

This table reports the EM algorithm estimation result of the baseline model as described in the text. Panel A presents estimates of the demand model; Panel B presents estimates of the fee equations. The dependent variable in Panel A is a discrete variable corresponding to the choice of underwriting bank. Thus it is a multinomial variable equaling j if the issuing firm chooses $bank_j$ in the given observation (j = 1-16) for lower-nest choice in Figure 2, and a binary variable equaling 1 if the chosen bank is a commercial bank, and 0 otherwise for upper-nest choice. Underwriting fee_j is the gross spread (measured as a percentage of principal) charged by $bank_j$ in the given issue. $Loan_j$ is 1 if $bank_j$ ever acted as an arranger in a loan agreement for the firm in the given issue during the 1980-1992 period, and 0 otherwise. Inclusive Value is the inclusive value as discussed in the text. INVGRADE is 1 if the issue is rated by Moody's as investment grade, and 0 otherwise. Ln(Amount) is the natural log of size of the issue in $millions. LOWMAT is 1 if the bond maturity is shorter than 5 years, and 0 otherwise. HIMAT is 1 if the bond maturity is longer than 15 years, and 0 otherwise. FIRST TIME is 1 if the firm had no previous issues of non-convertible bonds. SIC dummies refer to dummy variables for primary SIC codes of issuing firms. SIC2 is 1 if the issuer's primary SIC code is in the 2000's, etc. Point estimates and standard errors for these industry dummies are not reported though they are included in the demand estimation. The dependent variables in Panel B are the underwriting fees, or the gross spread (measured as a percentage of principal) charged by banks in the given issue. Bank1-bank5 are commercial banks; bank6-bank16 are investment banks. Ln(MATURITY) is the natural log of the bond maturity in years. Ln(# OF ISSUE +1) is the natural log of the number of previous bond issues plus 1. MTN dummy is 1 if the issue is under the Medium-Term Notes (MTN) program, and 0 otherwise. ln(AMOUNT) is the natural log of size of the issue in $ millions. AA dummy – CCC (or below) dummy are credit rating dummies corresponding to the issue's Moody's ratings. AA = 1 if the issue's rating is AA, etc. $LOAN_j$ is 1 if $bank_j$ ever acted as an arranger in a loan agreement for the firm in the given issue in the period prior to the sample period (1980-1992), and 0 otherwise. No LOAN coefficients are estimated for Bank14 and Bank15 because there are no observations where $LOAN_j$ = 1 for these banks. Year dummies are dummies corresponding to the issue date. YEAR94 = 1 if the issue date is in 1994, etc. Point estimates and standard errors for constant term, year dummies and SIC dummies are not reported though they are included in the fee equations. ***, **, * denotes that the coefficient is statistically significantly different from zero at the 1, 5, and 10 percent levels, respectively.

Number of Observations: 1535

Panel A: Demand estimates Dependent variable: Choice of underwriting bank			
Explanatory variables	Estimate		std.err.
UNDERWRITING FEE (α)	-0.6180	***	(0.0923)
LOAN (β)	0.5401	***	(0.1480)
Inclusive Value	1.4413	**	(0.5998)
INVGRADE	0.1651		(0.1827)
Ln(AMOUNT)	-0.4184	***	(0.0753)
LOWMAT	-0.0641		(0.2258)
HIMAT	-0.6487	***	(0.2427)
FIRST TIME	0.5091	***	(0.1602)
SIC dummies	yes		

Table II. EM Algorithm Estimation of Firm's Underwriter Choice Model (continued)

Panel B: Fee Estimates

Dependent variable: Underwriting fees

Explanatory Variables	Bank1 Estimate		std.err.	Bank2 Estimate		std.err.	Bank3 Estimate		std.err.	Bank4 Estimate		std.err.
ln(MATURITY)	0.2069	***	(0.0024)	0.0752	***	(0.0017)	0.3708	***	(0.0024)	0.3411	***	(0.0016)
ln(# OF ISSUES +1)	-0.0385	***	(0.0015)	0.1211	***	(0.0011)	-0.0013		(0.0015)	-0.1756	***	(0.0010)
MTN dummy	0.0045		(0.0069)	-0.0544	***	(0.0050)	-0.1082	***	(0.0070)	-0.0189	***	(0.0046)
ln(AMOUNT)	0.0285	***	(0.0022)	0.0181	***	(0.0016)	0.0129	***	(0.0023)	0.0199	***	(0.0015)
AA dummy	0.1005	***	(0.0173)	-0.0518	***	(0.0126)	0.1886	***	(0.0174)	0.1231	***	(0.0116)
A dummy	0.1150	***	(0.0163)	0.0461	***	(0.0118)	0.1534	***	(0.0164)	0.3572	***	(0.0109)
BBB dummy	0.0629	***	(0.0162)	-0.0532	***	(0.0118)	0.1657	***	(0.0163)	0.2085	***	(0.0109)
BB dummy	0.7858	***	(0.0166)	1.0759	***	(0.0121)	1.2899	***	(0.0168)	1.1495	***	(0.0112)
B dummy	1.7820	***	(0.0164)	2.2760	***	(0.0119)	2.1673	***	(0.0165)	1.9900	***	(0.0110)
CCC dummy	2.5874	***	(0.0309)	2.8687	***	(0.0224)	2.8505	***	(0.0312)	2.3003	***	(0.0207)
LOAN	-0.1312	***	(0.0065)	-0.2210	***	(0.0054)	0.1468	***	(0.0055)	-0.2123	***	(0.0038)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Explanatory Variables	Bank5 Estimate		std.err.	Bank6 Estimate		std.err.	Bank7 Estimate		std.err.	Bank8 Estimate		std.err.
Constant	-0.3344	***	(0.0217)	0.3480	***	(0.0535)	0.6038	***	(0.0339)	1.2720	***	(0.0661)
ln(MATURITY)	0.1964	***	(0.0018)	0.1704	***	(0.0044)	0.1965	***	(0.0028)	0.1549	***	(0.0054)
ln(# OF ISSUES +1)	-0.0215	***	(0.0011)	-0.0307	***	(0.0028)	-0.0077	***	(0.0018)	-0.0433	***	(0.0035)
MTN dummy	-0.0049		(0.0052)	-0.1554	***	(0.0128)	-0.1021	***	(0.0082)	-0.3847	***	(0.0159)
ln(AMOUNT)	0.1393	***	(0.0017)	-0.0251	***	(0.0042)	-0.0943	***	(0.0027)	-0.0880	***	(0.0052)
AA dummy	-0.0479	***	(0.0130)	0.1293	***	(0.0320)	0.0608	***	(0.0204)	-0.1537	***	(0.0397)
A dummy	-0.0306	**	(0.0123)	0.1185	***	(0.0301)	0.0328	*	(0.0192)	-0.2107	***	(0.0374)
BBB dummy	0.0714	***	(0.0122)	0.1415	***	(0.0300)	0.0429	**	(0.0191)	-0.2279	***	(0.0372)
BB dummy	1.3454	***	(0.0125)	1.0019	***	(0.0308)	0.7073	***	(0.0196)	0.7672	***	(0.0382)
B dummy	1.8748	***	(0.0124)	2.0572	***	(0.0303)	2.1298	***	(0.0194)	1.6603	***	(0.0377)
CCC dummy	2.3982	***	(0.0233)	2.5342	***	(0.0572)	2.4710	***	(0.0365)	2.0033	***	(0.0710)
LOAN	0.7017	***	(0.0083)	-0.0489	**	(0.0248)	0.0470	**	(0.0196)	-0.1275	***	(0.0396)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Table II. EM Algorithm Estimation of Firm's Underwriter Choice Model (continued)

Panel B: Fee Estimates (continued)

Dependent variable: Underwriting fees

Explanatory Variables	Bank9 Estimate		std.err.	Bank10 Estimate		std.err.	Bank11 Estimate		std.err.	Bank12 Estimate		std.err.
ln(MATURITY)	0.1933	***	(0.0029)	0.1787	***	(0.0039)	-0.2250	***	(0.0042)	0.2020	***	(0.0016)
ln(# OF ISSUES +1)	-0.0086	***	(0.0019)	-0.0050	**	(0.0025)	-0.1279	***	(0.0027)	-0.0354	***	(0.0010)
MTN dummy	-0.1008	***	(0.0085)	-0.2995	***	(0.0113)	-0.2105	***	(0.0122)	0.0294	***	(0.0046)
ln(AMOUNT)	-0.0051	*	(0.0028)	-0.1075	***	(0.0037)	0.0529	***	(0.0040)	0.0015		(0.0015)
AA dummy	-0.0073		(0.0213)	0.4070	***	(0.0282)	0.0090		(0.0304)	0.1605	***	(0.0114)
A dummy	0.0410	**	(0.0200)	0.4142	***	(0.0266)	-0.3140	***	(0.0287)	0.0164		(0.0107)
BBB dummy	0.0901	***	(0.0200)	0.4953	***	(0.0264)	-0.4803	***	(0.0285)	0.0423	***	(0.0107)
BB dummy	1.2709	***	(0.0205)	1.5547	***	(0.0271)	0.8254	***	(0.0293)	0.3914	***	(0.0109)
B dummy	1.9884	***	(0.0202)	2.4759	***	(0.0267)	1.4107	***	(0.0289)	2.1644	***	(0.0108)
CCC dummy	2.5980	***	(0.0380)	2.8719	***	(0.0504)	1.8971	***	(0.0544)	2.3714	***	(0.0203)
LOAN	0.4389	***	(0.0106)	0.0485	**	(0.0208)	-0.1695	***	(0.0425)	-0.2563	***	(0.0276)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Explanatory Variables	Bank13 Estimate		std.err.	Bank14 Estimate		std.err.	Bank15 Estimate		std.err.	Bank16 Estimate		std.err.
ln(MATURITY)	0.2083	***	(0.0014)	0.2669	***	(0.0011)	0.1794	***	(0.0009)	0.2427	***	(0.0008)
ln(# OF ISSUES +1)	-0.1125	***	(0.0009)	-0.0655	***	(0.0007)	0.0258	***	(0.0006)	-0.0624	***	(0.0005)
MTN dummy	-0.4681	***	(0.0042)	0.0397	***	(0.0033)	0.1618	***	(0.0027)	0.1963	***	(0.0023)
ln(AMOUNT)	-0.2966	***	(0.0014)	-0.0198	***	(0.0011)	0.0204	***	(0.0009)	0.0659	***	(0.0008)
AA dummy	0.3923	***	(0.0106)	-0.2356	***	(0.0083)	-0.2855	***	(0.0067)	0.1444	***	(0.0058)
A dummy	0.1895	***	(0.0099)	0.0664	***	(0.0078)	-0.0898	***	(0.0063)	0.0781	***	(0.0054)
BBB dummy	0.1342	***	(0.0099)	-0.1167	***	(0.0078)	0.0190	***	(0.0062)	-0.0159	***	(0.0054)
BB dummy	1.5306	***	(0.0101)	1.4041	***	(0.0080)	1.2957	***	(0.0064)	1.7584	***	(0.0056)
B dummy	2.0117	***	(0.0100)	2.0251	***	(0.0079)	2.1211	***	(0.0063)	1.9502	***	(0.0055)
CCC dummy	2.6227	***	(0.0189)	2.3467	***	(0.0149)	2.4153	***	(0.0119)	2.6905	***	(0.0103)
LOAN	0.3855	***	(0.0149)							0.2155	***	(0.0115)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Table III. Estimation Results of Junk vs. Non-Junk Model

This table reports the EM algorithm estimation result of the Junk vs. Non-Junk model as described in the text. Panel A presents estimates of the demand model; Panel B presents estimates of the fee equations. The dependent variable in Panel A is a discrete variable corresponding to the choice of underwriting bank. Thus it is a multinomial variable equaling j if the issuing firm chooses $bank_j$ in the given observation (j = 1-16) for lower-nest choice in Figure 2, and a binary variable equaling 1 if the chosen bank is a commercial bank, and 0 otherwise for upper-nest choice. Underwriting fee_{ji} (non-junk issuers) is the gross spread (measured as a percentage of principal) charged by $bank_j$ in the given issue if $firm_i$'s issue is investment grade, and zero otherwise. Underwriting fee_{ji} (junk issuers) is similarly defined. $CBLoan_{ji}$ (non-junk issuers) is 1 if $firm_i$'s issue is investment grade, $bank_j$ is a commercial bank and $bank_j$ ever acted as an arranger in a loan agreement for the firm in the given issue during the 1980-1992 period, and 0 otherwise. $CBLOAN_{ji}$ (junk issuers), $IBLOAN_{ji}$ (non-junk issuers) and $IBLOAN_{ji}$ (junk issuers) are similarly defined. Inclusive Value is the inclusive value as discussed in the text. INVGRADE is 1 if the issue is rated by Moody's as investment grade, and 0 otherwise. Ln(Amount) is the natural log of size of the issue in $millions. LOWMAT is 1 if the bond maturity is shorter than 5 years, and 0 otherwise. HIMAT is 1 if the bond maturity is longer than 15 years, and 0 otherwise. FIRST TIME is 1 if the firm had no previous issues of non-convertible bonds. SIC dummies refer to dummy variables for primary SIC codes of issuing firms. SIC2 is 1 if the issuer's primary SIC code is in the 2000's, etc. Point estimates and standard errors for these industry dummies are not reported though they are included in the demand estimation. ***, **, * denotes that the coefficient is statistically significantly different from zero at the 1, 5, and 10 percent levels, respectively.

Number of Observations: 1535

Panel A: Demand estimates Dependent variable: Choice of underwriting bank			
Explanatory variables	Estimate		std.err.
UNDERWRITING FEE (non-junk issuers)	-1.5823	***	(0.1338)
UNDERWRITING FEE (junk issuers)	-0.4113	***	(0.0583)
CBLOAN (non-junk issuers)	1.0040	***	(0.2291)
CBLOAN (junk issuers)	1.6612	***	(0.3319)
IBLOAN (non-junk issuers)	0.7893	**	(0.3128)
IBLOAN (junk issuers)	1.1404	***	(0.4255)
Inclusive Value	0.8018	***	(0.2606)
INVGRADE	0.0642		(0.1748)
Ln(AMOUNT)	-0.4544	***	(0.0654)
LOWMAT	-0.1255		(0.2285)
HIMAT	-0.6243	**	(0.2431)
FIRST TIME	0.4913	***	(0.1599)
SIC dummies	yes		

Table III. Estimation Results of Junk vs. Non-Junk Model (continued)

This table reports the EM algorithm estimation result of the Junk vs. Non-Junk model as described in the text. Panel A presents estimates of the demand model; Panel B presents estimates of the fee equations. The dependent variables in Panel B are the underwriting fees, or the gross spread (measured as a percentage of principal) charged by banks in the given issue. Bank1-bank5 are commercial banks; bank6-bank16 are investment banks. Ln(MATURITY) is the natural log of the bond maturity in years. Ln(# OF ISSUE +1) is the natural log of the number of previous bond issues plus 1. MTN dummy is 1 if the issue is under the Medium-Term Notes (MTN) program, and 0 otherwise. ln(AMOUNT) is the natural log of size of the issue in $ millions. AA dummy – CCC (or below) dummy are credit rating dummies corresponding to the issue's Moody's ratings. AA = 1 if the issue's rating is AA, etc. $LOAN_j$ is 1 if $bank_j$ ever acted as an arranger in a loan agreement for the firm in the given issue in the period prior to the sample period (1980-1992), and 0 otherwise. No LOAN coefficients are estimated for Bank14 and Bank15 because there are no observations where $LOAN_j$ = 1 for these banks. Year dummies are dummies corresponding to the issue date. YEAR94 = 1 if the issue date is in 1994, etc. SIC dummies refer to dummy variables for primary SIC codes of issuing firms. SIC2 is 1 if the issuer's primary SIC code is in the 2000's, etc. Point estimates and standard errors for constant term, year dummies and SIC dummies are not reported though they are included in the fee equations. ***, **, * denotes that the coefficient is statistically significantly different from zero at the 1, 5, and 10 percent levels, respectively.

Panel B: Fee Estimates

Dependent variable: Underwriting fees

Explanatory Variables	Bank1 Estimate		std.err.	Bank2 Estimate		std.err.	Bank3 Estimate		std.err.	Bank4 Estimate		std.err.
ln(MATURITY)	0.2077	***	(0.0024)	0.0785	***	(0.0017)	0.3720	***	(0.0024)	0.3336	***	(0.0016)
ln(# OF ISSUES +1)	-0.0373	***	(0.0015)	0.1151	***	(0.0011)	-0.0013		(0.0015)	-0.1722	***	(0.0010)
MTN dummy	0.0083		(0.0069)	-0.0573	***	(0.0051)	-0.1086	***	(0.0070)	-0.0495	***	(0.0047)
ln(AMOUNT)	0.0291	***	(0.0022)	0.0154	***	(0.0016)	0.0182	***	(0.0023)	0.0261	***	(0.0015)
AA dummy	0.0615	***	(0.0173)	-0.0534	***	(0.0127)	0.1437	***	(0.0175)	0.1202	***	(0.0116)
A dummy	0.0722	***	(0.0163)	0.0478	***	(0.0120)	0.1248	***	(0.0164)	0.3590	***	(0.0110)
BBB dummy	0.0215		(0.0162)	-0.0559	***	(0.0119)	0.1406	***	(0.0164)	0.1969	***	(0.0109)
BB dummy	0.7397	***	(0.0166)	1.0295	***	(0.0122)	1.2370	***	(0.0168)	1.0726	***	(0.0112)
B dummy	1.7304	***	(0.0164)	2.2289	***	(0.0120)	2.1016	***	(0.0166)	1.9294	***	(0.0110)
CCC dummy	2.5013	***	(0.0309)	2.7870	***	(0.0227)	2.7502	***	(0.0312)	2.2030	***	(0.0208)
LOAN	-0.1238	***	(0.0065)	-0.2037	***	(0.0055)	0.1534	***	(0.0056)	-0.2047	***	(0.0038)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Table III. Estimation Results of Junk vs. Non-Junk Model (continued)

Panel B: Fee Estimates (continued)

Dependent variable: Underwriting fees

Explanatory Variables	Bank5 Estimate		std.err.	Bank6 Estimate		std.err.	Bank7 Estimate		std.err.	Bank8 Estimate		std.err.
ln(MATURITY)	0.2009	***	(0.0018)	0.1702	***	(0.0044)	0.1963	***	(0.0028)	0.1551	***	(0.0054)
ln(# OF ISSUES +1)	-0.0216	***	(0.0012)	-0.0305	***	(0.0028)	-0.0081	***	(0.0018)	-0.0432	***	(0.0035)
MTN dummy	-0.0248	***	(0.0052)	-0.1543	***	(0.0128)	-0.0980	***	(0.0082)	-0.3842	***	(0.0159)
ln(AMOUNT)	0.1389	***	(0.0017)	-0.0253	***	(0.0042)	-0.0945	***	(0.0027)	-0.0876	***	(0.0052)
AA dummy	-0.0389	***	(0.0131)	0.1288	***	(0.0320)	0.0600	***	(0.0204)	-0.1518	***	(0.0397)
A dummy	-0.0265	**	(0.0123)	0.1186	***	(0.0301)	0.0334	*	(0.0192)	-0.2094	***	(0.0374)
BBB dummy	0.0566	***	(0.0123)	0.1416	***	(0.0300)	0.0434	**	(0.0191)	-0.2274	***	(0.0373)
BB dummy	1.2782	***	(0.0126)	1.0008	***	(0.0308)	0.7032	***	(0.0196)	0.7653	***	(0.0382)
B dummy	1.8090	***	(0.0124)	2.0553	***	(0.0303)	2.1270	***	(0.0194)	1.6583	***	(0.0377)
CCC dummy	2.3202	***	(0.0234)	2.4925	***	(0.0572)	2.4278	***	(0.0365)	2.0024	***	(0.0710)
LOAN	0.6456	***	(0.0084)	-0.0458	*	(0.0248)	0.0460	**	(0.0196)	-0.1287	***	(0.0396)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Explanatory Variables	Bank9 Estimate		std.err.	Bank10 Estimate		std.err.	Bank11 Estimate		std.err.	Bank12 Estimate		std.err.
ln(MATURITY)	0.1929	***	(0.0029)	0.1782	***	(0.0039)	-0.2097	***	(0.0042)	0.2008	***	(0.0016)
ln(# OF ISSUES +1)	-0.0085	***	(0.0019)	-0.0052	**	(0.0025)	-0.1227	***	(0.0027)	-0.0373	***	(0.0010)
MTN dummy	-0.1000	***	(0.0085)	-0.2992	***	(0.0113)	-0.1985	***	(0.0122)	0.0256	***	(0.0046)
ln(AMOUNT)	-0.0070	**	(0.0028)	-0.1068	***	(0.0037)	0.0532	***	(0.0040)	-0.0001		(0.0015)
AA dummy	-0.0106		(0.0213)	0.4037	***	(0.0282)	0.0144		(0.0305)	0.1662	***	(0.0114)
A dummy	0.0382	*	(0.0200)	0.4075	***	(0.0266)	-0.3090	***	(0.0287)	0.0146		(0.0107)
BBB dummy	0.0860	***	(0.0200)	0.4884	***	(0.0264)	-0.4716	***	(0.0286)	0.0380	***	(0.0107)
BB dummy	1.2635	***	(0.0205)	1.5446	***	(0.0271)	0.8155	***	(0.0293)	0.3749	***	(0.0110)
B dummy	1.9801	***	(0.0202)	2.4657	***	(0.0268)	1.4030	***	(0.0289)	2.1478	***	(0.0108)
CCC dummy	2.5528	***	(0.0380)	2.8259	***	(0.0504)	1.8865	***	(0.0545)	2.3569	***	(0.0204)
LOAN	0.4437	***	(0.0106)	0.0493	**	(0.0208)	-0.1689	***	(0.0426)	-0.2507	***	(0.0276)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Explanatory Variables	Bank13 Estimate		std.err.	Bank14 Estimate		std.err.	Bank15 Estimate		std.err.	Bank16 Estimate		std.err.
ln(MATURITY)	0.2042	***	(0.0015)	0.2685	***	(0.0011)	0.1790	***	(0.0009)	0.2407	***	(0.0008)
ln(# OF ISSUES +1)	-0.1079	***	(0.0009)	-0.0611	***	(0.0007)	0.0265	***	(0.0006)	-0.0616	***	(0.0005)
MTN dummy	-0.4573	***	(0.0042)	0.0304	***	(0.0033)	0.1655	***	(0.0027)	0.1902	***	(0.0024)
ln(AMOUNT)	-0.2942	***	(0.0014)	-0.0249	***	(0.0011)	0.0198	***	(0.0009)	0.0625	***	(0.0008)
AA dummy	0.3795	***	(0.0106)	-0.2433	***	(0.0083)	-0.2857	***	(0.0068)	0.1332	***	(0.0059)
A dummy	0.1724	***	(0.0100)	0.0433	***	(0.0079)	-0.1012	***	(0.0064)	0.0595	***	(0.0055)
BBB dummy	0.1165	***	(0.0099)	-0.1403	***	(0.0078)	0.0178	***	(0.0064)	-0.0336	***	(0.0055)
BB dummy	1.4993	***	(0.0102)	1.3637	***	(0.0080)	1.2555	***	(0.0065)	1.7183	***	(0.0057)
B dummy	1.9808	***	(0.0100)	1.9844	***	(0.0079)	2.0755	***	(0.0064)	1.9128	***	(0.0056)
CCC dummy	2.5922	***	(0.0189)	2.2661	***	(0.0149)	2.3525	***	(0.0121)	2.6233	***	(0.0105)
LOAN	0.3420	***	(0.0150)							0.2656	***	(0.0117)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Table IV. Estimation Results of First-Time vs. Seasoned Model

This table reports the EM algorithm estimation result of the First-Time vs. Seasoned model as described in the text. Panel A presents estimates of the demand model; Panel B presents estimates of the fee equations. The dependent variable in Panel A is a discrete variable corresponding to the choice of underwriting bank. Thus it is a multinomial variable equaling j if the issuing firm chooses $bank_j$ in the given observation (j = 1-16) for lower-nest choice in Figure 2, and a binary variable equaling 1 if the chosen bank is a commercial bank, and 0 otherwise for upper-nest choice. Underwriting fee_{ji} (seasoned issuers) is the gross spread (measured as a percentage of principal) charged by $bank_j$ in the given issue if $firm_i$ is a seasoned issuer, and zero otherwise. Underwriting fee_{ji} (first-time issuers) is similarly defined. $CBLoan_{ji}$ (seasoned issuers) is 1 if $firm_i$ is a seasoned issuer, $bank_j$ is a commercial bank and $bank_j$ ever acted as an arranger in a loan agreement for the firm in the given issue during the 1980-1992 period, and 0 otherwise. $CBLOAN_{ji}$ (first-timeissuers), $IBLOAN_{ji}$ (seasoned issuers) and $IBLOAN_{ji}$ (first-time issuers) are similarly defined. Inclusive Value is the inclusive value as discussed in the text. INVGRADE is 1 if the issue is rated by Moody's as investment grade, and 0 otherwise. Ln(Amount) is the natural log of size of the issue in $millions. LOWMAT is 1 if the bond maturity is shorter than 5 years, and 0 otherwise. HIMAT is 1 if the bond maturity is longer than 15 years, and 0 otherwise. FIRST TIME is 1 if the firm had no previous issues of non-convertible bonds. SIC dummies refer to dummy variables for primary SIC codes of issuing firms. SIC2 is 1 if the issuer's primary SIC code is in the 2000's, etc. Point estimates and standard errors for these industry dummies are not reported though they are included in the demand estimation. ***, **, * denotes that the coefficient is statistically significantly different from zero at the 1, 5, and 10 percent levels, respectively.

Number of Observations: 1535

Panel A: Demand estimates			
Dependent variable: Choice of underwriting bank			
Explanatory variables	Estimate		std.err.
UNDERWRITING FEE (seasoned issuers)	-1.2012	***	(0.1227)
UNDERWRITING FEE (first-time issuers)	-0.4139	***	(0.0629)
CBLOAN (seasoned issuers)	0.9122	***	(0.2485)
CBLOAN (first-time issuers)	1.0934	***	(0.2800)
IBLOAN (seasoned issuers)	0.5121		(0.3240)
IBLOAN (first-time issuers)	1.6860	***	(0.4167)
Inclusive Value	1.0406	***	(0.3492)
INVGRADE	0.1145		(0.1761)
Ln(AMOUNT)	-0.4579	***	(0.0657)
LOWMAT	-0.0817		(0.2264)
HIMAT	-0.6433	***	(0.2427)
FIRST TIME	0.5808	***	(0.1624)
SIC dummies	yes		

Table IV. Estimation Results of First-Time vs. Seasoned Model (continued)

This table reports the EM algorithm estimation result of the Junk vs. Non-Junk model as described in the text. Panel A presents estimates of the demand model; Panel B presents estimates of the fee equations. The dependent variables in Panel B are the underwriting fees, or the gross spread (measured as a percentage of principal) charged by banks in the given issue. Bank1-bank5 are commercial banks; bank6-bank16 are investment banks. Ln(MATURITY) is the natural log of the bond maturity in years. Ln(# OF ISSUE +1) is the natural log of the number of previous bond issues plus 1. MTN dummy is 1 if the issue is under the Medium-Term Notes (MTN) program, and 0 otherwise. ln(AMOUNT) is the natural log of size of the issue in $ millions. AA dummy – CCC (or below) dummy are credit rating dummies corresponding to the issue's Moody's ratings. AA = 1 if the issue's rating is AA, etc. $LOAN_j$ is 1 if $bank_j$ ever acted as an arranger in a loan agreement for the firm in the given issue in the period prior to the sample period (1980-1992), and 0 otherwise. No LOAN coefficients are estimated for Bank14 and Bank15 because there are no observations where $LOAN_j$ = 1 for these banks. Year dummies are dummies corresponding to the issue date. YEAR94 = 1 if the issue date is in 1994, etc. SIC dummies refer to dummy variables for primary SIC codes of issuing firms. SIC2 is 1 if the issuer's primary SIC code is in the 2000's, etc. Point estimates and standard errors for constant term, year dummies and SIC dummies are not reported though they are included in the fee equations. ***, **, * denotes that the coefficient is statistically significantly different from zero at the 1, 5, and 10 percent levels, respectively.

Panel B: Fee Estimates
Dependent variable: Underwriting fees

Explanatory	Bank1			Bank2			Bank3			Bank4		
Variables	Estimate		std.err.	Estimate		std.err.	Estimate		std.err.	Estimate		std.err.
ln(MATURITY)	0.2070	***	(0.0024)	0.0772	***	(0.0017)	0.3715	***	(0.0024)	0.3416	***	(0.0016)
ln(# OF ISSUES +1)	-0.0364	***	(0.0015)	0.1301	***	(0.0011)	0.0032	**	(0.0015)	-0.1651	***	(0.0010)
MTN dummy	0.0058		(0.0069)	-0.0550	***	(0.0050)	-0.1100	***	(0.0070)	-0.0354	***	(0.0047)
ln(AMOUNT)	0.0292	***	(0.0022)	0.0167	***	(0.0016)	0.0125	***	(0.0023)	0.0176	***	(0.0015)
AA dummy	0.1162	***	(0.0173)	-0.0394	**	(0.0125)	0.1931	***	(0.0174)	0.1447	***	(0.0117)
A dummy	0.1298	***	(0.0163)	0.0533	***	(0.0118)	0.1580	***	(0.0164)	0.3655	***	(0.0110)
BBB dummy	0.0794	***	(0.0162)	-0.0412	***	(0.0117)	0.1684	***	(0.0163)	0.2185	***	(0.0109)
BB dummy	0.8027	***	(0.0166)	1.0897	***	(0.0120)	1.2941	***	(0.0168)	1.1477	***	(0.0112)
B dummy	1.7973	***	(0.0164)	2.2914	***	(0.0119)	2.1715	***	(0.0165)	2.0042	***	(0.0111)
CCC dummy	2.5737	***	(0.0309)	2.8658	***	(0.0224)	2.8282	***	(0.0312)	2.2821	***	(0.0209)
LOAN	-0.1277	***	(0.0065)	-0.2170	***	(0.0054)	0.1519	***	(0.0055)	-0.2114	***	(0.0038)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Table IV. Estimation Results of First-Time vs. Seasoned Model (cont'd)

Panel B: Fee Estimates (continued)

Dependent variable: Underwriting fees

Explanatory Variables	Bank5 Estimate		std.err.	Bank6 Estimate		std.err.	Bank7 Estimate		std.err.	Bank8 Estimate		std.err.
ln(MATURITY)	0.2034	***	(0.0018)	0.1703	***	(0.0044)	0.1965	***	(0.0028)	0.1550	***	(0.0054)
ln(# OF ISSUES +1)	-0.0066	***	(0.0011)	-0.0302	***	(0.0028)	-0.0071	***	(0.0018)	-0.0427	***	(0.0035)
MTN dummy	0.0008		(0.0052)	-0.1548	***	(0.0128)	-0.1011	***	(0.0082)	-0.3846	***	(0.0159)
ln(AMOUNT)	0.1380	***	(0.0017)	-0.0251	***	(0.0042)	-0.0945	***	(0.0027)	-0.0879	***	(0.0052)
AA dummy	-0.0373	***	(0.0130)	0.1286	***	(0.0320)	0.0609	***	(0.0204)	-0.1514	***	(0.0397)
A dummy	-0.0308	**	(0.0122)	0.1181	***	(0.0301)	0.0328	*	(0.0192)	-0.2093	***	(0.0374)
BBB dummy	0.0793	***	(0.0122)	0.1413	***	(0.0300)	0.0431	**	(0.0191)	-0.2266	***	(0.0372)
BB dummy	1.3583	***	(0.0125)	1.0019	***	(0.0308)	0.7081	***	(0.0196)	0.7681	***	(0.0382)
B dummy	1.8899	***	(0.0123)	2.0571	***	(0.0303)	2.1294	***	(0.0194)	1.6617	***	(0.0377)
CCC dummy	2.3939	***	(0.0232)	2.5046	***	(0.0572)	2.4417	***	(0.0365)	2.0051	***	(0.0710)
LOAN	0.7134	***	(0.0083)	-0.0470	*	(0.0248)	0.0465	**	(0.0196)	-0.1261	***	(0.0396)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Explanatory Variables	Bank9 Estimate		std.err.	Bank10 Estimate		std.err.	Bank11 Estimate		std.err.	Bank12 Estimate		std.err.
ln(MATURITY)	0.1931	***	(0.0029)	0.1785	***	(0.0039)	-0.2203	***	(0.0042)	0.2035	***	(0.0016)
ln(# OF ISSUES +1)	-0.0071	***	(0.0019)	-0.0045	*	(0.0025)	-0.1235	***	(0.0027)	-0.0337	***	(0.0010)
MTN dummy	-0.1007	***	(0.0085)	-0.2998	***	(0.0113)	-0.2031	***	(0.0122)	0.0302	***	(0.0046)
ln(AMOUNT)	-0.0059	**	(0.0028)	-0.1073	***	(0.0037)	0.0532	***	(0.0040)	-0.0001		(0.0015)
AA dummy	-0.0084		(0.0213)	0.4073	***	(0.0282)	0.0283		(0.0305)	0.1689	***	(0.0114)
A dummy	0.0399	**	(0.0200)	0.4133	***	(0.0266)	-0.2931	***	(0.0287)	0.0174		(0.0107)
BBB dummy	0.0897	***	(0.0200)	0.4942	***	(0.0264)	-0.4623	***	(0.0285)	0.0441	***	(0.0107)
BB dummy	1.2707	***	(0.0205)	1.5535	***	(0.0271)	0.8445	***	(0.0293)	0.3980	***	(0.0110)
B dummy	1.9878	***	(0.0202)	2.4743	***	(0.0268)	1.4304	***	(0.0289)	2.1669	***	(0.0108)
CCC dummy	2.5699	***	(0.0380)	2.8452	***	(0.0504)	1.9183	***	(0.0544)	2.3751	***	(0.0204)
LOAN	0.4401	***	(0.0106)	0.0485	**	(0.0208)	-0.1691	***	(0.0426)	-0.2557	***	(0.0276)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Explanatory Variables	Bank13 Estimate		std.err.	Bank14 Estimate		std.err.	Bank15 Estimate		std.err.	Bank16 Estimate		std.err.
ln(MATURITY)	0.2060	***	(0.0014)	0.2694	***	(0.0011)	0.1791	***	(0.0009)	0.2404	***	(0.0008)
ln(# OF ISSUES +1)	-0.1052	***	(0.0009)	-0.0575	***	(0.0007)	0.0350	***	(0.0006)	-0.0527	***	(0.0005)
MTN dummy	-0.4728	***	(0.0042)	0.0281	***	(0.0033)	0.1491	***	(0.0027)	0.1934	***	(0.0023)
ln(AMOUNT)	-0.2963	***	(0.0014)	-0.0212	***	(0.0011)	0.0137	***	(0.0009)	0.0653	***	(0.0008)
AA dummy	0.3962	***	(0.0106)	-0.2057	***	(0.0084)	-0.2658	***	(0.0067)	0.1421	***	(0.0058)
A dummy	0.1929	***	(0.0100)	0.0797	***	(0.0079)	-0.0820	***	(0.0063)	0.0707	***	(0.0055)
BBB dummy	0.1394	***	(0.0099)	-0.1017	***	(0.0078)	0.0249	***	(0.0063)	-0.0161	***	(0.0054)
BB dummy	1.5392	***	(0.0102)	1.4152	***	(0.0080)	1.3033	***	(0.0064)	1.7602	***	(0.0056)
B dummy	2.0163	***	(0.0100)	2.0404	***	(0.0079)	2.1299	***	(0.0063)	1.9516	***	(0.0055)
CCC dummy	2.6253	***	(0.0189)	2.3405	***	(0.0149)	2.4103	***	(0.0120)	2.6701	***	(0.0104)
LOAN	0.3771	***	(0.0150)							0.2408	***	(0.0115)
constant	yes			yes			yes			yes		
year dummies	yes			yes			yes			yes		
SIC dummies	yes			yes			yes			yes		

Table V. Implied Values of Relationships

This table tabulates the implied values of bank-firm relationships (measured as (1) ratios of two key coefficients, $|\beta/\alpha|$ and (2) evaluated at the sample mean issue size of $180 millions) for the three models as presented in Table II-IV. For Junk vs. Non-Junk Model and First-Time vs. Seasoned Model, these values are computed for each of the four segments of the market, such as CBLOAN (non-junk issuers), CBLOAN(junk issuers), IBLOAN (non-junk issuers) and IBLOAN (junk issuers) for the Junk vs. Non-Junk Model. All coefficients are statistically different from zero at either the 5% or 1% significance level except the coefficient for IBLOAN (seasoned issuers) in the First-time vs. Seasoned Model. Note that FEE is expressed in a percent of principal and LOAN is a dummy variable, so $|\beta/\alpha| = 1$ implies that, at sample mean issue size of $180 million, the implied value of relationships = 1 * $180mm / 100 = $1.8mm.

Baseline Model			
Bank Type	Borrower Reputation of Issuers	$\lvert\beta/\alpha\rvert$	in $ millions
All	All	0.874	$1.57

Junk vs. non-Junk Model			
Bank Type	Borrower Reputation of Issuers	$\lvert\beta/\alpha\rvert$	in $ millions
Commercial Banks	Non-Junk issuers	0.635	$1.14
Commercial Banks	Junk Issuers	4.039	$7.27
Investment Banks	Non-Junk issuers	0.499	$0.90
Investment Banks	Junk Issuers	2.773	$4.99

First-time vs. Seasoned Model			
Bank Type	Borrower Reputation of Issuers	$\lvert\beta/\alpha\rvert$	in $ millions
Commercial Banks	Seasoned Issuers	0.759	$1.37
Commercial Banks	First-time Issuers	2.642	$4.75
Investment Banks	Seasoned Issuers	0.426	$0.77
Investment Banks	First-time Issuers	4.073	$7.33

Table VI. Own-Price Elasticities

This table reports the mean own-price elasticities of each of the 16 underwriting banks based on the demand estimates obtained in Table III and IV. For each bank, price elasticities are calculated for the whole sample and separately for subcategories of issuers.

	Panel A: Junk vs. non-Junk Model		
	All issuers	Non-junk issuers	Junk bond issuers
Bank1	-0.9228	-0.9905	-0.7689
Bank2	-1.2091	-1.2943	-1.0155
Bank3	-0.9721	-1.0227	-0.8570
Bank4	-1.1028	-1.2018	-0.8777
Bank5	-0.9870	-1.0385	-0.8699
Bank6	-0.9104	-0.9402	-0.8426
Bank7	-0.9283	-0.9686	-0.8368
Bank8	-0.9234	-0.9555	-0.8502
Bank9	-0.9715	-1.0102	-0.8836
Bank10	-0.9615	-0.9855	-0.9071
Bank11	-1.1022	-1.1530	-0.9868
Bank12	-0.9113	-0.9604	-0.7999
Bank13	-1.2353	-1.3243	-1.0332
Bank14	-1.0471	-1.0857	-0.9593
Bank15	-1.1076	-1.1573	-0.9947
Bank16	-1.1214	-1.1766	-0.9960
Mean	-1.026	-1.079	-0.905
Std. Dev.	0.108	0.124	0.082
prob. for equality			0.00006

	Panel B: First-time vs. Seasoned Model		
	All issuers	Seasoned Issuers	First-Time Issuers
Bank1	-0.8081	-1.0194	-0.5411
Bank2	-1.0958	-1.4683	-0.6249
Bank3	-0.8615	-1.0916	-0.5706
Bank4	-0.8784	-1.0384	-0.6761
Bank5	-0.8739	-1.1185	-0.5646
Bank6	-0.7865	-0.9711	-0.5532
Bank7	-0.8061	-1.0159	-0.5408
Bank8	-0.7905	-0.9693	-0.5645
Bank9	-0.8501	-1.0762	-0.5643
Bank10	-0.8502	-1.0668	-0.5764
Bank11	-0.9104	-1.0969	-0.6747
Bank12	-0.7664	-0.9470	-0.5380
Bank13	-1.0071	-1.2351	-0.7190
Bank14	-0.9015	-1.1238	-0.6205
Bank15	-0.9666	-1.2408	-0.6199
Bank16	-0.9609	-1.2155	-0.6391
Mean	-0.882	-1.106	-0.599
Std. Dev.	0.090	0.133	0.056
prob. for equality			0.00000

Table VII. Robustness Results

This table presents robustness checks to the baseline results in Table II. Panel A presents demand estimates of a logit model (with λ= 1). Panel B shows demand estimates when alternative proxies of bank reputation are included in the fee equations. The point estimates and standard errors of these bank reputation variables in the fee equations are also presented. Panel C shows demand estimates when the effects of LOAN on fees are aggregated across commercial banks and investment banks instead of estimated separately for individual banks. The point estimates and standard errors of these aggregated LOAN coefficients in the fee equations are also presented.

Panel A: Logit Model Estimates			
Demand estimates			
Explanatory variables	Estimate		std.err.
UNDERWRITING FEE	-0.4036	***	(0.0368)
LOAN	1.1163	***	(0.1591)
INVGRADE	0.3154	*	(0.1701)
Ln(AMOUNT)	-0.4780	***	(0.0642)
LOWMAT	0.1721		(0.1724)
HIMAT	-0.6818	***	(0.2390)
FIRST TIME	0.6017	***	(0.1606)
SIC dummies	yes		

Panel B: Bank Reputation						
Demand estimates						
	Model 1			Model 2		
Explanatory variables	Estimate		std.err.	Estimate		std.err.
UNDERWRITING FEE	-0.4870	***	(0.0933)	-0.5189	***	(0.0932)
LOAN	0.5480	***	(0.1479)	0.5469	***	(0.1479)
Inclusive Value	1.5404	**	(0.6223)	1.5901	***	(0.6135)
INVGRADE	0.1628		(0.1820)	0.1698		(0.1822)
Ln(AMOUNT)	-0.4140	***	(0.0756)	-0.4075	***	(0.0760)
LOWMAT	-0.0408		(0.2256)	-0.0447		(0.2256)
HIMAT	-0.6637	***	(0.2422)	-0.6578	***	(0.2423)
FIRST TIME	0.5114	***	(0.1603)	0.5067	***	(0.1603)
SIC dummies	yes			yes		
Fee estimates						
	Estimate		sd.err.	Estimate		sd.err.
Alternative Measures of Bank Reputation						
Market share (in %)	3.2558	***	(0.1034)			
HI REPUTATION = 1 if bank's market share in top 8				0.5681	***	(0.0120)
LOW REPUTATION = 1 if bank's market share not in top 8				0.2970	***	(0.0120)

Table VII. Robustness Results (continued)

Panel C: Aggregate Effect of Loans on Fees			
Demand estimates			
Explanatory variables	Estimate		std.err.
UNDERWRITING FEE	-0.2766	***	(0.0908)
LOAN	0.4657	***	(0.1507)
Inclusive Value	0.6713		(0.6215)
INVGRADE	0.0721		(0.1773)
Ln(AMOUNT)	-0.4784	***	(0.0719)
LOWMAT	-0.0281		(0.2265)
HIMAT	-0.7010	***	(0.2417)
FIRST TIME	0.5267	***	(0.1615)
SIC dummies	yes		
Fee estimates			
Explanatory variables	Estimate		sd.err.
Commercial Banks			
LOAN for junk issuers (aggregated)	-0.3425	***	-0.0074
LOAN for non-junk issuers (aggregated)	-0.3259	***	-0.0040
Investment Banks			
LOAN for junk issuers (aggregated)	0.0259	**	-0.0104
LOAN for non-junk issuers (aggregated)	0.0008		-0.0077

Table VIII. Results with Alternative Measures of Relationships

This table presents estimation results of the baseline model when alternative measures of bank-firm relationships are used. In addition to the baseline definition of relationships, three alternative measures of relationships are constructed based on the six bank roles identifiable in the Loanware database: (1) arranger (2) lead-manager, (3) co-lead manager, (4) co-manager, (5) co-agent and (6) participant. Alternative measures of relationships used are: (i) $LOAN_j$ = 1 if $Bank_j$ played any of the roles (1) – (5). (ii) Number of transactions in which $Bank_j$ played any of the roles (1)-(5). (iii) $LOAN_j$ = 1 if $Bank_j$ played any of the roles (1)-(6). Demand estimates are presented.

Demand estimates			
	roles (1)-(5)		
Explanatory variables	Estimate		std.err.
UNDERWRITING FEE	-0.6368	***	(0.0938)
LOAN	0.3401	***	(0.1157)
Inclusive Value	-0.0303		(0.5917)
INVGRADE	0.0399		(0.1890)
Ln(AMOUNT)	-0.5197	***	(0.0755)
LOWMAT	-0.0496		(0.2266)
HIMAT	-0.7002	***	(0.2424)
FIRST TIME	0.5026	***	(0.1604)
SIC dummies	yes		
	No. of deals (roles (1)-(5))		
Explanatory variables	Estimate		std.err.
UNDERWRITING FEE	-0.5958	***	(0.0933)
LOAN	0.0835	**	(0.0365)
Inclusive Value	0.7748		(0.6381)
INVGRADE	0.1582		(0.1993)
Ln(AMOUNT)	-0.4622	***	(0.0769)
LOWMAT	-0.0568		(0.2258)
HIMAT	-0.6767	***	(0.2425)
FIRST TIME	0.5163	***	(0.1603)
SIC dummies	yes		
	roles (1) -(6)		
Explanatory variables	Estimate		std.err.
UNDERWRITING FEE	-0.6500	***	(0.0936)
LOAN	0.0157		(0.1055)
Inclusive Value	0.6684		(0.6884)
INVGRADE	0.1354		(0.1990)
Ln(AMOUNT)	-0.4662	***	(0.0812)
LOWMAT	-0.0550		(0.2259)
HIMAT	-0.6767	***	(0.2430)
FIRST TIME	0.5139	***	(0.1604)
SIC dummies	yes		

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