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*Coexistence and Specialization of  
Investment Banks and Commercial  
Banks: Evidence from Corporate Bond  
Underwriting*

by  
**Wei-Ling Song**

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# Coexistence and Specialization of Investment Banks and Commercial Banks: Evidence from Corporate Bond Underwriting

Wei-Ling Song\*

Bennett S. LeBow College of Business  
Drexel University  
Philadelphia, PA 19104, USA  
Phone: (215) 895-2937  
Fax: (215) 895-2955  
E-mail: [wlsong@drexel.edu](mailto:wlsong@drexel.edu)

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# **Coexistence and Specialization of Investment Banks and Commercial Banks: Evidence from Corporate Bond Underwriting**

## **Abstract**

Prior research documents that commercial banks underwrite bonds with lower net yields than investment banks and concludes that commercial banks are superior underwriters. However, such a conclusion is inconsistent with the observed prominent role of investment banks in underwriting. This paper demonstrates that the findings of prior research are driven by the empirical methodology employed. This methodology does not permit individual underwriters to possess different comparative advantages and to serve different clienteles. When such factors are included, the results are markedly different from those of prior studies. On average, both types of underwriters serve their bond-issuing clients better than the other would and obtain significantly higher bond prices for them. The findings demonstrate that firms select rationally between underwriter types, seeking to minimize the total costs of bond issuance.

## 1. Introduction

Empirical studies comparing commercial and investment bank bond underwriting have allowed for three possibilities – commercial banks are better than, worse than, or the same as investment banks. They rule out a fourth, alternative possibility, that commercial bank underwriters are better than investment banks at serving some segments of the market, and vice versa. This paper provides evidence that strongly supports the fourth alternative.

Recent papers, such as Ang and Richardson (1994), and Puri (1996) for the pre-Glass-Steagall period, and Gande, Puri, Saunders and Walter (1997) for the post-Section-20 era, document, somewhat puzzlingly, that commercial banks are superior to investment banks based upon the evidence that commercial banks underwrite bonds with lower net yields.<sup>1</sup> These findings are inconsistent with the empirical observation that investment banks are prominent underwriters today and prior to the Glass-Steagall Act of 1933. In fact, Puri (1996, p. 384) asks, “If initial yields are lower for bank-underwritten issues, why do firms go to investment-house underwriters at all?” Although the existence of investment banks is an ex post fact, the empirical literature does not seem to provide a role for these investment banks to coexist with commercial banks and to maintain their major role in bond underwriting.

Prior studies have explicitly addressed two main differences between investment banks and commercial banks (e.g. Puri (1996)). First, commercial banks are seen to have a stronger certification role. Combined lending and underwriting allows commercial banks to reduce

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<sup>1</sup> In 1987, the Federal Reserve reinterpreted Section 20 of the Glass-Steagall Act and permitted commercial banks to underwrite corporate securities with a revenue limitation. The underwriting subsidiaries of commercial banks were referred to as “Section 20 subsidiaries” later on. Thus, I follow the legal definition to classify the type of underwriting, specifically, if the lead underwriter is a Section 20 subsidiary, then it is considered as commercial bank underwriting. For discussions on the regulatory environment regarding bank underwriting, such as revenue limitations and firewall restrictions, see J.P Morgan & Co. Inc., The Chase Manhattan Corp., Bankers Trust New York Corp., Citicorp, and Security Pacific Corp., Federal Reserve Bulletin 75 (1989): 192-217. With the enactment of the Gramm-Leach-Bliley Act in 1999, commercial banks with underwriting capacity are also allowed to organize as financial holding companies.

information costs and to provide better financing options to their clients (See Kanatas and Qi, 1998). Second, the dual roles as lenders and underwriters also provide banks the opportunity to misuse information. Banks can misrepresent private information acquired through lending relationships with their clients and pass off the bad loans to the capital markets (See Kroszner and Rajan, 1997). In addition to the above two differences, commercial banks are recent entrants into the underwriting market. Since it takes time and is costly to build distribution channels, commercial banks may have a disadvantage in handling large issues. These comparative advantages are tested in three competing, but not mutually exclusive, hypotheses: (1) the bank certification hypothesis, (2) the conflicts of interest hypothesis, and (3) the distribution disadvantage of commercial banks hypothesis.

The pros and cons of commercial bank underwriting suggest that it is doubtful that either type of financial intermediary possesses a dominant underwriting technology. Different types of underwriters are likely to specialize in serving different issuer clienteles, consistent with their respective comparative advantages. This implies that the observed client-underwriter matching is not random. Clients are sorted into two groups depending on their special needs for underwriting services. Moreover, the bond price investors are willing to pay should reflect the corresponding underwriting strengths, i.e., the price sensitivity (beta coefficients) of exogenous factors will be different for different underwritings. Therefore, one should use two net yield regressions to describe two distinct underwriting technologies. The one-net-yield regression used in prior studies cannot serve the purpose.

Formally, to more appropriately capture the comparative advantages of different underwriters, I use a switching regressions with endogenous switching model explained in

Maddala (1983).<sup>2</sup> The model consists of a probit regression describing the clienteles of different underwriters and two net-yield regressions contrasting the distinct technologies of different underwriters. The analysis assumes that issuers select the underwriter type that produces lower financing costs for their respective bond issues. The test design allows the partition of different factors affecting underwriter choices and the analysis of net yields of bond issues at a finer level for each underwriting. Furthermore, the two-net-yield-regression framework permits one to estimate the net yields of bonds underwritten by *unselected* underwriters for the same clients, which are unobservable empirically. Clearly, only the bond net yields underwritten by the selected underwriters are actually observable.

This framework provides a gauge for the source of specialization in the underwriting market arising from the comparative advantages of different underwriters. More importantly, the improvement in test design permits the comparison of different underwritings for the same client and more consistently evaluates the performance of different underwriters.

Furthermore, this paper provides a comprehensive comparison between two types of underwritings for the entire decade of the 1990s. The parameters of the switching regressions model are estimated using a sample of 4,592 industrial corporate bonds issued between 1991 and 2000. With the revenue limitation imposed on commercial banks increasing from 10% to 25% at the end of 1996, many mergers have occurred between commercial banks and investment banks since then.<sup>3</sup> Therefore, this paper incorporates a control for mergers and also examines the subperiods of 1991-1996 and 1997-2000 to better understand the dynamics of bank entry. In addition, the analysis includes more extensive controls for clients' prior securities issuances, firm and issue characteristics, and the underlying macroeconomic environment.

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<sup>2</sup> See Appendix for more discussions of this model. Also, see Lee (1978) for its application to the study of unionism and wage rates and Dunbar (1995) for the choices of underwriter compensation.

Consistent with the bank certification hypothesis, I find that commercial banks specialize in serving smaller firms. The smaller commercial bank clients experience lower net yields increases than investment bank clients. The options of flexible future financing may explain why commercial banks underwrite for firms with lower cash holdings and less capital investment. Such firms may have more severe financial constraints and should benefit more from the better future financing opportunities provided by combined lending and underwriting. In addition, new bond issuers underwritten by commercial banks do not pay significantly higher net yields than seasoned issuers do. However, investment banks obtain significantly higher net yields for new issuers than for seasoned issuers.

Regarding the controls for endogenous selections in the net yield regressions, all the signs of estimates, regardless of time periods, point towards efficient client-underwriter matching.<sup>4</sup> These signs indicate that conditional on underwriter selections, the bond net yields are lower. However, only for the full sample, the estimate in investment banks' net yield regression is significant. Although the controls for endogenous switching are mostly insignificant, the analysis of specialization based on exogenous factors are also very important. Nonetheless, it was ignored by prior studies due to the inappropriate test design because the one-net-yield-regression framework cannot contrast distinct underwritings on multiple dimensions. More seriously, it cannot evaluate the performance of different underwriting services for the same client when the client-underwriter matching is not random.

Although the evidence shows that commercial banks possess better certification capacity, but it is plagued by the potential for conflicts of interest. Commercial bank clients with high interest expenses (inverse of coverage ratio) pay significantly higher net yields when they issue

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<sup>3</sup> See related work by Song and Goldberg (2002) regarding mergers among debt underwriters.

<sup>4</sup> See Appendix A for a discussion on the interpretation of estimates on endogenous selection terms.

for the purpose of repaying bank debt during the early bank entry period and the decade of the 1990s. The finding implies that, regardless of lending relationships with bank underwriters, investors concern that when banks uncover unfavorable information during a loan examination, there is the potential for commercial banks to dump firms onto the capital market, rather than granting a new loan.<sup>5</sup>

In addition, commercial bank clients with a higher proportion of loans from banks with Section 20 subsidiaries (prestigious bank loans) suffer more price discounts than investment bank clients regardless of time periods. The finding implies that such a lending relationship coupled with commercial bank underwriting does not enhance certification. On the contrary, it raises general worries about conflicts of interest, perhaps because investors are concerned with the possibility that commercial bank underwriters may swap their clients and underwrite for each other's bank clients.

Finally, consistent with the distribution disadvantage hypothesis, commercial banks focus on bonds with smaller issue size during the early entry period. In contrast to investment bank clients, commercial bank clients pay significantly higher net yields when issue sizes increase.

The heterogeneity of clients and the differential abilities of underwriters suggest that the final choice of underwriters depends upon the overall financing cost savings of using a selected underwriter versus using an unselected one. In order to estimate these incremental cost savings, I use both bond net yields and underwriting fees. Using net yield as an example, I subtract the bond's *observed* net yield of selected underwriting service from the *estimated* net yield of the same client's issue, had the client chosen the other underwriting service. This net yield

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<sup>5</sup> Similar to the findings of Roten and Mullineaux (2002) that study commercial bank underwriting during the 1995-1998 period, I find no evidence that lending relationships with underwriters systematically affect bond net yields paid by issuers. In the net yield regressions, the estimates on underwriter loans and its interaction with the indicator if the purpose of the issue is to refinance bank debt are unstable regardless of the control for total loans.

differential measures the incremental benefit of the chosen underwriting in terms of bond pricing. If the selected underwriter obtains a lower net yield than the unselected underwriter, this differential term will be positive. Because the net yield differential is estimated by incorporating information of all proxy variables used in this study for each client, it provides the overall performance assessment of different underwritings for the same client.

On average, regardless of time periods, the results show that firms that choose commercial banks would have paid higher net yields than had they chosen investment banks, and vice versa. These findings support the view that commercial banks and investment banks each have comparative advantages in serving different clienteles. Neither possesses a universally dominant underwriting technology. These results directly contrast with the previous literature, which finds that commercial banks have superior underwriting ability. The analysis of underwriting fee differentials shows similar conclusions, though the magnitude of fee differentials appear to be less important compared to that of net yield differentials.

In addition, the estimated unconditional mean net yields, assuming only one type of underwriter had existed in the market in the 1990s, show that, on average, investment banks would have obtained higher bond prices than commercial banks for all clients. The difference is a significant 6.8 basis points. This hypothetical experiment is useful in policy debates, specifically regarding whether re-regulation of the market is necessary. Again, for the subgroup of commercial bank clients, the unconditional mean indicates that commercial banks could better serve them than investment banks, and vice versa. Thus, the findings in this paper can explain why investment banks play a major role in the underwriting business and why commercial banks can penetrate the underwriting business successfully. Furthermore, this study demonstrates that

firms select rationally between underwriter types, seeking to minimize the total costs of bond issuance.

The rest of the paper is organized as follows. Section 2 discusses the testable hypotheses and the variables. Section 3 presents the data and descriptive statistics. Section 4 reports the specializations and comparative advantages of underwriters. Section 5 concludes.

## **2. The selection of underwriters and testable hypotheses**

Much academic research on commercial bank underwriting focuses on the direct net yield comparison between commercial bank and investment bank underwritten bonds. In this study, I focus on the choice between commercial banks and investment banks based on their comparative advantages. There are many forces that may influence both the client/underwriter matching process and the net yield that the underwriter can obtain for the client. Various testable hypotheses that emerge from the theoretical literature, however, can be categorized into three groups: (1) the bank certification ability hypothesis, (2) the conflicts of interest hypothesis, and (3) the commercial bank distribution disadvantage hypothesis.

### *2.1. Certification ability of commercial banks*

Superior information and better financing flexibility are the main arguments for commercial bank reentry into the underwriting business. An issuing firm that borrows from a bank may choose the bank to underwrite for them because the bank may reuse the information generated from monitoring the loan, therefore, certify the bond issue more effectively than an investment bank. In addition, the options of future lending or underwriting by commercial banks can provide first-time clients better financing opportunities even though the two parties do not have an existing lending relationship.

The existing literature provides both theory and evidence for this hypothesis. Fama (1985) argues that banks possess superior information compared to outsiders. Diamond (1991) proposes a reputation-building model for borrowing firms and suggests that bank association could provide a certification function for firms to raise public capital in the future. James (1987) provides evidence that the market reacts positively to the announcement of new bank loans when the clients are re-certified by their lenders. Datta, Iskandar-Datta and Patel (1999) find that the existence of bank debt lowers the at-issue yield spread for a firm's first public straight bond offer. Houston and James (1996) provide evidence that firms with access to the public debt markets tend to use more bank debt when growth opportunities are higher.

To test the bank certification hypothesis, I use firm size, a new issue dummy and Tobin's  $q$  as proxies for the information problem.<sup>6</sup> Smaller firms, new issuers, and firms with higher Tobin's  $q$  should have higher information asymmetries. Therefore, based on bank certification hypothesis, these firms tend to choose commercial banks as their underwriters. The degree to which commercial banks can alleviate these information costs should lower the net yield of commercial bank underwriting bonds.<sup>7</sup>

Moreover, better financing flexibility of commercial banks may provide benefits to firms with low cash and capital investment levels. If a firm has better access to various financing sources, i.e., more flexibility of choosing a bank loan or public financing, it may tend to keep lower cash balances. In an empirical study of corporate cash holdings, Opler, Pinkowitz, Stulz, and Williamson (1999) find that firms with better access to the capital markets tend to hold lower

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<sup>6</sup> Tobin's  $q$  is also a common proxy for growth opportunities. However, both information advantage and financing flexibility predict the same direction of underwriter choice.

<sup>7</sup> The effect of service-efficiency improvement due to "one-stop" financing could create a positive relationship between firm size and commercial bond underwriting because large corporations tend to use more complex services.

cash ratios. Therefore, the relation between choosing commercial banks as underwriters and cash ratios should be negative.

However, since firms cannot signal future prospects credibly, banks could have temporary monopoly power over firms' private information, allowing the banks to expropriate firms' future profits (e.g. see Rajan, 1992; Sharpe, 1990; Greenbaum, Kanatas and Venezia, 1989). In order to circumvent bank power, firms with greater information asymmetry problems, better prospects, more cash, or higher profitability are less likely to be underwritten by a commercial bank. Moreover, the interpretation of the cash variable is complicated by the possibility that commercial bank clients are required to keep more cash as compensating balances as Pinkowitz and Williamson (2001) have suggested. They document that Japanese cash balances are affected by the monopoly power of banks. The interaction between information advantages and bank information monopoly can neutralize the positive effect of commercial bank underwriting.

In addition to exogenous observed information proxies, the choice of underwriter may be driven by endogenous unobserved factors. If the market believes that commercial banks possess better private information or financing flexibility that can be revealed when commercial banks underwrite for the firms, the net yields of bonds should be lower when they are conditional on commercial bank underwriting.

There is an operational difficulty to this conceptually simple test. By its nature, bank information is private and hence cannot be substituted for by any publicly observable variables, including the credit ratings provided by rating agencies. In an econometric sense, the net yield regression has an omitted-variable problem due to the endogeneity problem and the estimates could be inconsistent. However, the empirical model used in this study provides an outlet to

solve this problem by estimating the endogenous selection adjustment terms revealed from the underwriter choices. The definitions of variables are listed in Table 1.

**[Table 1 about here]**

## 2.2. *Conflicts of interest of commercial banks*

Potential conflicts of interest are one of the main rationales behind the Glass-Steagall Act. These conflicts may arise if banks discover unfavorable information through loan monitoring but pass the “lemon” firms onto the public market in order to protect their own private loans. This lemon-dumping behavior could also occur for first-time borrowers when banks uncover adverse information during the loan granting examination.

There is theoretical and empirical evidence that capital markets rationally discount for conflicts of interest. Kanatas and Qi (1998) develop a theoretical model where customers of intermediaries that both lend and underwrite securities suffer from conflicts of interest. The market anticipates this conflict and rationally discounts the prices of securities. However, if there are sufficiently large economies of scope in combined lending and underwriting, firms could choose to use such intermediaries. Kroszner and Rajan (1994, 1997) document that investors rationally discount the prices of commercial bank underwriting bonds to compensate for commercial banks’ potential conflicts of interest in the pre-Glass-Steagall era. Gompers and Lerner (1999) find evidence for rational discounting in the IPO market. The overall implication is that, conditional on bank underwriting, the net yield of bonds will be higher.

Potential conflicts of interest have further implications on underwriter selection. Firms with greater information asymmetries will suffer more from conflicts of interest through a more severe bond price discount. Such firms will in turn have the highest incentive to avoid the conflicts of interest in the first place. Therefore, new issue and Tobin’s  $q$  will have a negative

relationship with the selection of commercial banks as underwriters, and firm size will have a positive relationship. The effects of bank certification and conflicts of interest work in opposite directions on bond pricing for these information proxies, so the empirical results are the net effects of both forces.

To more directly examine potential conflicts of interest, the purpose of a bond issue, interest expense relative to operating income (the inverse of coverage ratio), and the lending relationship with commercial bank underwriters and prestigious banks (those with Section 20 subsidiaries) are used as additional proxies. When the purpose of an issue is to refinance bank debt and the coverage ratio is low, the likelihood of conflicts of interest is greater and the price discount should be more severe. Therefore, the probability of choosing a commercial bank as an underwriter should be lower. On the other hand, investment banks should reject firms with unfavorable information. Empirically, these actions may cancel each other out, resulting in no effect on underwriter selection. In any case, investors will discount the price of commercial bank underwriting bonds when the perceived potential for conflict of interest is high.

At the time of bond issuance, a firm's lending relationship with a commercial bank can be used as a proxy for conflicts of interest of the existing loan. However, this measure is contaminated by the benefits of monitoring and information advantage of banks. If conflicts of interest outweigh the benefits of monitoring and information advantage, then the beta coefficient on the lending relationship with underwriters in the net yield regression should be positive. Moreover, instead of granting a new loan, a bank could underwrite for an unfavorable new client. The existing bank exposure would not capture this new conflict of interest but interest expense would. In addition, this effect can be captured by the endogenous selection adjustment term estimated from the current underwriter selection decision at the time of bond issuance.

Consequently, the estimate from the endogenous selection adjustment term also represents the net effect of conflicts of interest of new loans and the certification ability of banks.

Alternatively, firms could have chosen independent investment banks as underwriters if the negative effect of conflicts of interest outweighs the benefit of information advantages to enhance bond prices endogenously.

### 2.3. *Distribution disadvantage of commercial banks*

During the sample period prior to the enactment of the Gramm-Leach-Bliley Act in 1999, commercial banks were permitted to underwrite securities only to a limited extent. The limitation is measured by the revenue generated from ineligible activities (such as underwriting corporate securities) as a percentage of total revenue from both ineligible and eligible activities (such as dealing in treasury securities). The revenue limitation was 10 percent from 1991 to 1996, and was raised to 25 percent at the end of 1996.<sup>8</sup> Due to this regulatory restriction, the amount of issues commercial banks could underwrite was limited. In addition, as entrants, commercial banks had to develop distribution channels. Both factors predict that the relation between issue size and selecting commercial banks should be negative. However, the disadvantage should diminish over time as the regulatory constraint is relaxed and commercial banks have cultivated their distribution abilities. A regulatory change dummy to indicate the period of 1997-2000 is employed to test the improvement of distribution ability following the lifting of the revenue limitation.

### 2.4. *Additional control variables*

Theoretical work by Titman and Trueman (1986) and Chemmanur and Fulghieri (1994) shows that underwriters with better information technologies tend to underwrite for higher

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<sup>8</sup> For discussions on revenue limitations, see Federal Register 61 (1996), 68750-68756.

quality firms and reject firms with risky projects. The above discussion suggests that there is a need to control for the quality of firms. For this reason, in addition to the proxies used to test bank certification, conflict of interest, and distribution ability hypotheses, the analysis also includes operating income, leverage, and credit ratings as control variables.

Since this study covers the entire decade of 1990s, the underlying interest rate environment, such as short-term rates, slope of the yield curve, and credit spreads between BBB and AAA bonds are included as control variables. Because the revenue limitation imposed on commercial banks changed from 10% to 25% in 1996, I also analyze the subperiods of 1991-1996 and 1997-2000. In the later period there are many mergers between commercial banks and investment banks, so I control for these hybrid mergers.

Bond issuers tend to have repeated securities issuances. Therefore, the securities issuing activities and underwriter relationships prior to the current bond issuance may affect the choice of underwriters and bond pricing. Krigman, Shaw, and Womack (2001) show that clients reusing IPO (initial public offering) underwriters in a subsequent seasoned equity issuance raised significantly larger proceeds than those who switched underwriters. Therefore, this paper considers and controls for the potential impact of prior securities issuance. Finally, selective issue characteristics are also controlled for in the analysis. Table 1 lists the definition of each variable. In order to ensure that the results are not driven by too many control variables, the analyses are repeated with fewer variables by dropping the insignificant ones. The findings remain robust. Therefore, I report the full specification

### **3. Data and descriptive statistics**

The data used in this paper consist of fixed-rate nonconvertible domestic corporate bond issues from the Thomson Financial Securities Data (SDC Platinum) U.S. Corporate New Issues

database. Only non-utility and non-financial firms are used in the analysis. If the lead underwriter is a Section 20 subsidiary or an affiliate of a financial holding company, the bonds are classified as commercial bank underwriting bonds. The sample period covers January 1, 1991 through December 31, 2000.

The initial data contains 4,592 bond issues of which 3,727 issues contain useful net yield information; 392 of these are co-lead underwritten by more than one underwriter. Among them, 50 co-lead syndicates contain only commercial banks, and 122 contain only investment banks. The remaining 220 are hybrid syndicates contain both types. Since the cooperative arrangement between different underwriters has a profound impact on the bond pricing, this study also control for hybrid syndicates.<sup>9</sup>

All firm variables are constructed from the COMPUSTAT database with the exception of the market value of equity variable, which is obtained from the CRSP daily return database. These variables are measured at the end of the year prior to the bond offerings. The bank loan information is acquired from the Dealscan database provided by the Loan Pricing Corporation. The amounts of loan deals are aggregated for each bond issue if the issuing date is between loan origination date and loan maturity date. Loans from commercial banks with Section 20 subsidiaries (prestigious bank loans) and from commercial bank underwriters are pro rata based on lender share or loan syndicate size where lender share information is not available.

**[Table 2 about here]**

Table 2 presents the frequency of bond issues for each year by underwriter type from 1991 to 2000. Commercial banks underwrite 944 issues and investment banks underwrite 3,648

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<sup>9</sup> See Song (2002) for an empirical study of coalitions between different types of underwriters and its impact on bond issuing firms.

issues. The proportion of bonds underwritten by commercial banks, which is 7.1% in 1991, grows to 43.8% in 2000. Over the 10-year sample period, the average proportion is 20.6%.

**[Table 3 about here]**

Summary statistics for firm and issue characteristics are reported in Table 3. Compared to the median investment bank client, the median client of commercial banks pays lower underwriting fees, issues a bond with shorter maturity, and issues a smaller amount. However, there is no difference in bond net yields between commercial and investment bank underwritings. There is also no statistical difference in total loans, but the loans from prestigious banks for commercial bank clients are significantly larger for the mean client. Clients do not differ in the frequency of prior securities issuances or the number of underwriter relationships within the 5-year period prior to the current bond issuance.

The commercial bank median client is significantly smaller than that of investment banks in terms of total assets and market value of equity. Tobin's  $q$ , operating income, and leverage of clients of both underwriters do not differ significantly. Compared to investment bank clients, commercial bank clients invest less, their cash balance (in mean) and interest expense relative to operating income (in median) are significantly lower.

**[Table 4 about here]**

Table 4 presents the selective frequency of issue characteristics. Commercial bank clients reuse their underwriters from prior bond and/or equity issuances less frequently than investment bank clients do. Table 4 shows that commercial banks underwrite a lower percentage of non-investment grade issues and issues with the purpose of repaying bank debt, but a higher percentage of shelf-registration issues. Among the 220 hybrid co-lead syndicates, 105 have a commercial bank listed as the first underwriter, and 115 have an investment bank as the first

underwriter. A lower percentage of commercial bank-lead syndicates have other commercial banks participate as co-managers than that of investment bank-lead syndicates. The percentage of commercial bank issues underwritten by hybrid merger institutions is higher than that of investment bank underwriting issues.<sup>10</sup>

## **4. Specializations and comparative advantages of underwriters**

### *4.1. Clienteles of different underwritings*

#### **[Table 5 about here]**

Table 5 reports probit estimates of underwriter selection describing the clienteles of different underwritings. The value of the dependent variable is one if the bond issue is underwritten by a commercial bank, zero if by an investment bank. Model (1) uses the subsample from 1991 to 1996, while Model (2) uses the 1997 to 2000 subsample. Model (3) uses full sample. The results across periods are very similar. Among the 22 pairs of estimates reported in Table 5 for both Models (1) and (2), only 3 pairs have different signs. However, two pairs are insignificantly different from zero. They are the estimates on Ln(number of prior bond issuance) and non-investment grade indicator. The only significant estimates with signs change are leverage. During the latter period, commercial bank clients have significantly higher leverage than investment bank clients.

The issue size of commercial bank underwritten bonds increases over time. During the 1997-2000 period, there was no difference in clients' issue size between commercial banks and investment banks. The probit estimates on issue size support the bank distribution disadvantage hypothesis for the early entry stage (1991-1996).

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<sup>10</sup> Song (2003) provides a list of major debt underwriters and their merger types.

Estimates on all of the conflict of interest proxies, the purpose of issue is to repay bank debt, interest expense and related interaction variables, are all insignificant for the early entry period. During the later period, commercial banks underwrite for clients with lower interest expenses. This effect is neutralized if the clients issue bonds for the purpose of repaying bank debt. The interaction term, REFBD\*interest expense, is significantly positive in Model (2). As discussed in Section 2.2, clients that try to avoid price discounts should prefer investment bank underwriting. However, investment banks should reject clients with unfavorable information that can cause high potential for conflicts of interest in the first place.

Consistent with the notion that banks possess information advantage, commercial banks specialize in underwriting for clients that are smaller. In addition, commercial bank clients have lower cash balances, and invest less capital. Such clients can benefit more from the better financing opportunities provided by commercial banks. The insignificant results for information proxies, Tobin's q and new issue, are consistent with the explanation that the selection of underwriters based on bank certification ability is neutralized by the potential for conflicts of interest.

Regarding the control variables, investment bank clients tend to reuse their underwriters' service more frequently partly due to the fact that commercial banks are new entrants into the underwriting business.<sup>11</sup> Commercial bank lead syndicates tend to have fewer other commercial banks participate as co-managers than investment bank lead syndicates. Perhaps the commercial banks' certification enhancing role as co-managers found in Song (2002) is more important in investment bank lead syndicates than in commercial bank lead syndicates because, in the latter, there is less complement effect.

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<sup>11</sup> Model (1) does not control for whether the clients use the same prior equity underwriters because, for commercial bank clients, there are only 6 observations using the same prior equity underwriters during 1991-1996.

#### 4.2. *Net yield analysis: underwriting technology*

**[Table 6 about here]**

Table 6 reports the results of second-stage net yield regressions for the 1991-1996 period allowing for comparative advantages of different underwriters. The significantly positive estimate on issue size in the commercial bank net yield regression and the insignificant estimate for investment bank underwriting are consistent with the bank distribution disadvantage hypothesis. Although the probit estimates in Table 5 show that commercial banks can handle larger issue size in the later stage, the estimates on issue size in Table 7 (for the period of 1997-2000) indicates that bank clients still suffer steeper price discounts when issue size increases than investment bank clients do. Overall, during the 1990s, commercial bank underwriting is worse than investment bank underwriting in distribution ability as indicated by the estimates on issue size in Table 8 (for the period of 1991-2000). The finding is consistent with the notion that commercial banks are entrants and it is not easy to establish distribution channels.

**[Table 7 about here]**

**[Table 8 about here]**

Estimates for the interaction between interest expense relative to operating income (inverse of coverage ratio) and the issue purpose to repay bank debt (REFBD) in Tables 6 and 8 are consistent with the conflicts of interest hypothesis. Both estimates in the commercial bank net yield regression are significantly positive. Therefore, if a firm with a relatively low coverage ratio is underwritten by commercial banks, its bond issue will incur a larger price discount, especially when the issue is to repay bank debt. In Table 7, the effect is captured by the estimate on REFBD, which is highly significantly positive. However, the magnitude is still not large enough to counter the significantly negative estimates on its interactions with underwriter loans

and with interest expense. It is possible that, for the 1997-2000 period, the estimates were affected by the Internet bubble frenzy. In other words, investors may not have been concerned with conflicts of interest when the markets were so optimistic.

Besides, compared to investment bank clients, commercial bank clients pay higher net yields as the proportion of their loans borrowed from banks with Section 20 subsidiaries increases. The result indicates that a higher percentage of loans from banks with Section 20 subsidiaries (prestigious bank loans) do not better certify an issuing firm when its underwriter is a commercial bank. In fact, such a lending relationship raises general concerns of conflict of interest, which reduces the bond price that client receives. Perhaps investors are concerned about the possibility that bank underwriters can swap clients and underwrite for each other's.

The lower magnitude of estimates on firm size in the commercial bank regressions relative to that in the investment bank regressions in Tables 6, 7, and 8 indicate that bank underwriting is less beneficial to large firms. The flip side is that the net yields of issuing firms increase less when firm size declines if commercial banks underwrite for these smaller clients. These findings are consistent with the information advantage of commercial banks and this conclusion is robust across time periods.

The bank certification hypothesis is further supported by coefficient estimates of new issues in all Tables 6, 7 and 8. New issuers using an investment bank underwriter must pay a significantly higher net yield than seasoned issuers do. However, this is not the case for issuing clients of commercial banks. Coefficient estimates of Tobin's  $q$  are insignificant in both underwriters' net yield regressions.

The estimates of the endogenous selection terms for commercial bank underwriting are all negative, indicating that conditional on selecting commercial banks as underwriters, mean net

yields are lower. However, these estimates are insignificantly different from zero. It is very possible that informational advantages are neutralized by conflicts of interest. The only significant estimate on the endogenous selection term is that in Table 8 for investment bank underwriting.<sup>12</sup> The coefficient estimate in Table 6 for investment bank underwriting is marginally significant at the 17% level. The positive estimates indicate that, conditional on choosing investment bank underwriting, the bond net yields are lower because the endogenous selection term  $\left(\frac{-\phi(Z\gamma)}{\Phi(Z\gamma)}\right)$  is always a negative number. Although mostly insignificant, as discussed in Appendix A, negative estimates for commercial bank underwriting and positive estimates for investment bank underwriting do point towards efficient client distribution as firms appear to be sorting based on the endogenous comparative advantages of underwriters.

#### 4.3. *Incremental financing cost savings of using selected underwriters*

Panel A, Table 9 reports the net yield differentials estimated by subtracting observed bond net yields of selected underwriting from the fitted bond net yields of unselected underwriting. These net yield differentials are derived using estimates from Tables 6, 7, and 8.<sup>13</sup> Panel B of Table 9 presents the underwriting fee differentials, which are estimated by using the results in Appendix B.<sup>14</sup>

#### **[Table 9 about here]**

Consistent with the proposition that clients seek to reduce interest costs and select underwriters rationally, the net yield differentials are all significantly positive for both

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<sup>12</sup> Table 8 reports the results without the control for Tobin's q and whether the debt issue is senior because, with both variables, the estimate on endogenous selection term is marginally significant at the 13% level. Both Tobin's q and senior bond indicators are highly insignificant in the regressions. This finding is robust to dropping insignificant variables.

<sup>13</sup> The estimates do not include bonds with credit ratings of C because commercial banks do not underwrite any bond with C ratings in the final sample.

commercial and investment bank underwritings. The results demonstrate that both underwriters serve their clients better than the other would. On average, the client-underwriter matching is efficient in the 1990s. This finding, contrary to the results of prior research that commercial banks are superior underwriters, is consistent with the empirical observation that investment banks are valuable and important underwriters in the industry. In other words, there appears to be no complete dominance between these two types of underwriters as their unique services are each valued by different clients. The puzzle left by the previous studies as to why investment banks, which appeared to be worse underwriters, coexisted with commercial banks prior to the passage of Glass-Steagall Act is resolved.

The subperiod analysis in Panel A, Table 9 shows that the net yield differentials of commercial bank underwriting decline from 37.41 basis points to 5.68 basis points following the revenue limitation increase to 25%. On the contrary, investment bank differentials increase. This finding is consistent with commercial banks entering the underwriting market by selecting firms with the highest net yield differentials. The high level of positive differentials could dissipate if the improvement of commercial bank underwriting does not catch up with the speed of declining differentials as clients with lower net yield differentials switch from investment banks to commercial banks over time. On the other hand, as more and more clients who investment banks cannot serve well switch to commercial bank underwriting, the differentials of investment bank underwriting increase.

The fee analysis reported in Panel B of Table 9 also demonstrates the same efficient client-underwriter matching as the net yield analysis does. All the fee differentials are positive regardless of time periods. Finally, the magnitude of savings from net yield differentials appears

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<sup>14</sup> See Song (2003a) for discussions of these regression results. Also see Yasuda (2003) for the analysis of fees in the context of pricing underwriting services as differentiated products due to different bank-client relationships.

to be much larger than that from fee differentials. The findings also demonstrate that net yields are a more significant factor in determining underwriter selection than underwriting fees are.

#### *4.4. Implications if only one type of underwriter had existed in the market*

An interesting feature of the empirical model employed in this paper is that it permits the estimation of unconditional means (on underwriter selections), which may be important under some circumstances. For example, if policy makers desire to “re-regulate” the underwriting market and need to choose only one type of bank to exist in the bond underwriting market, then one should compare the unconditional mean net yields of both underwritings because the benefits of better client-underwriter matching are no longer relevant in this hypothetical economy. I use the regression results from Table 8 to estimate the unconditional means presented in Table 10, thus excluding the effect of endogenous selection.

Panel A of Table 10 shows that for the 1990s, if only commercial banks had existed in the market, then issuing firms would have paid, on average, 143.3 basis points in bond net yields. On the other hand, if investment banks were the sole choice of underwriters, then the average net yields would have been 136.5 basis points. The results show that investment banks would have been better than commercial banks for this hypothetical economy during the 1990s.

However, the subgroup analysis still demonstrates that commercial banks obtain higher bond prices for clients that have chosen commercial bank underwriting than investment banks do, and vice versa. Commercial bank clients would have paid 9.5 basis points higher in net yields if investment banks were the only underwriters available during the decade of 1990s. Similarly, investment bank clients are better off having investment banks compete. Without them, they would have paid 11 basis points higher in net yields. Again, Table 10 demonstrates that commercial banks serve their clients better than investment banks, and vice versa. Finally,

Panel B, Table 10 shows that, as incumbents, investment banks would have charged significantly lower fees than entrant commercial banks. However, the pattern of efficient client-underwriter matching is reassured in Panel B.

## **5. Conclusion**

This paper examines the differences between commercial banks and investment banks as bond underwriters under three hypotheses— (i) the bank certification hypothesis, (ii) the conflicts of interest hypothesis, and (iii) the bank distribution disadvantage hypothesis. Although the first two hypotheses have been explicitly discussed in prior literature, this paper is the first to partition these factors in net yield regressions for each type of underwriting and to examine formally the different underwriters' comparative advantages of exogenous factors.

The findings demonstrate that the superior commercial bank underwriting documented by the prior empirical literature, which contradicts the fact that investment banks are prominent underwriters, is the result of model misspecification. The restrictive assumptions implicit in the prior empirical literature rule out the possibilities that neither type of underwriters possesses a universally dominant underwriting technology. However, if there are differences between commercial banks and investment banks, as these prior studies have explicitly suggested, then each underwriter could specialize in certain segments of the market and serve these segments better than the other would.

The findings in this study strongly support the argument that both types of underwriters coexist because they produce unique services that are each valued by different clients. Commercial bank reentry into the underwriting market is beneficial for those clients switching to commercial bank underwriting. Similarly, investment banks better serve the clients choosing investment bank underwriting. These findings explain why commercial banks could penetrate

the underwriting market and coexist with investment banks, while investment banks remained as major players in the 1990s. The evidence in this paper presents a very different picture of bank underwriting from that of prior studies.

Very often, studies in the corporate finance literature examine the *outcome* of different corporate choices, such as, “Why do we observe that firm A follows one strategy but firm B chooses another?” It is quite possible that these firms have *chosen* what is optimal for them. Observed firm distributions have been sorted into two groups. Thus, when evaluating the benefits and/or costs of different choices, the relevant comparison is the outcomes of different choices by the same firm, rather than comparisons between firms A and B, since they are different firms in the first place. We should observe them choosing different strategies. The client switching phenomenon and the corresponding econometric issues demonstrated in this paper provides a useful framework for future research, not only in bank underwriting, but also in many areas of finance, particularly when the observed distributions of sample firms are censored by important corporate decisions.

## Appendix A: The Switching Regressions with Endogenous Switching Model

In this appendix, I start with a more general model that includes factors, other than the net yield differential, that could determine the choice of underwriter. Formally, the empirical model is as follows:

$$y_{1i} = X_i \beta_1 + u_{1i} \quad (\text{A.1}) \text{ (for CB underwritten issues)}$$

$$y_{2i} = X_i \beta_2 + u_{2i} \quad (\text{A.2}) \text{ (for IB underwritten issues)}$$

$$y_{3i} = X_i \beta_3 + u_{3i} \quad (\text{A.3}) \text{ (for non-net yield factors)}$$

$$I_i^* = -(\delta(y_{1i} - y_{2i}) + \lambda y_{3i} + \gamma^* Z_i^* - \varepsilon_i^*) \quad (\text{A.4}) \text{ (underwriter choice equation)}$$

where CB stands for commercial banks, IB for investment banks;  $y_i$  in equations (A.1) and (A.2) represent the net yield of bonds for firm  $i$ ; subscript 1 refers to issues underwritten by commercial banks; subscript 2 refers to those underwritten by investment banks;  $y_{3i}$  represents non-net yield factors, such as the cost of switching to a new underwriter or incremental underwriting fees that could also determine the underwriter selection;  $I_i^*$  is the underlying value of underwriting services;  $X_i$ ,  $Z_i^*$  are vectors of exogenous firm or issue characteristics. By replacing all the  $y_i$ 's in Equation (A.4), its reduced form can be written as:

$$I_i^* = -(\delta(X_i \beta_1 - X_i \beta_2) + \lambda X_i \beta_3 + \delta(u_{1i} - u_{2i}) + \lambda u_{3i} + \gamma^* Z_i^* - \varepsilon_i^*) \quad (\text{A.5})$$

By collecting terms,

$$I_i^* = -(X_i(\delta(\beta_1 - \beta_2) + \lambda \beta_3) + \gamma^* Z_i^* + \delta(u_{1i} - u_{2i}) + \lambda u_{3i} - \varepsilon_i^*) \quad (\text{A.6})$$

Equation (A.6) can be rewritten as:

$$I_i^* = -(Z_i \gamma - \varepsilon_i) \quad (\text{A.7})$$

where  $Z_i$  includes  $X_i$  and  $Z_i^*$ , and  $\varepsilon_i$  is the combination of all error terms in equation (A.6).

$$I_i = 1 \text{ iff } I_i^* > 0 \quad (\text{A.8})$$

$$I_i = 0 \text{ iff } I_i^* \leq 0 \quad (\text{A.9})$$

$I_i$  is a dummy variable taking the value 1 if firm  $i$  chooses a commercial bank as its underwriter, and 0 otherwise.

The observed  $y_i$  are defined as

$$y_i = y_{1i} \text{ iff } I_i = 1 \quad (\text{A.10})$$

$$y_i = y_{2i} \text{ iff } I_i = 0 \quad (\text{A.11})$$

$$COV(u_{1i}, u_{2i}, \varepsilon_i) = \begin{bmatrix} \sigma_{11} & \sigma_{12} & \sigma_{1\varepsilon} \\ \sigma_{12} & \sigma_{22} & \sigma_{2\varepsilon} \\ \sigma_{1\varepsilon} & \sigma_{2\varepsilon} & 1 \end{bmatrix} \quad (\text{A.12})$$

The error terms  $u_{1i}, u_{2i}, \varepsilon_i$  are trivariate normal with means  $(0, 0, 0)$  and the covariance matrix defined in equation (A.12). Ceteris paribus, firms should select the underwriter who can obtain the lowest possible yield. If  $y_{1i} < y_{2i}$ , they tend to have CBs underwrite for them, which also implies that  $\beta_1 < \beta_2$ , and one tends to observe  $y_{1i}$  instead of  $y_{2i}$ . If the converse is true, then firms tend to choose IBs, and one tends to observe  $y_{2i}$ .

The conditional mean net yields of CB and IB underwritten issues are given by the following:

$$E(y_{1i} | I_i = 1) = X_i \beta_1 + \sigma_{1\varepsilon} \frac{\phi(Z\gamma)}{1 - \Phi(Z\gamma)} \quad (\text{A.13})$$

$$E(y_{2i} | I_i = 0) = X_i \beta_2 - \sigma_{2\varepsilon} \frac{\phi(Z\gamma)}{\Phi(Z\gamma)} \quad (\text{A.14})$$

where  $\phi(\cdot)$  and  $\Phi(\cdot)$  are, respectively, the standard normal density and distribution functions.

The tests of endogenous selectivity bias are tests for  $\sigma_{1\varepsilon} = 0$  and  $\sigma_{2\varepsilon} = 0$  in equations (A.13) and (A.14).

As equations (A.13) and (A.14) indicate, in order to collapse two net yield regressions into one, one must assume that  $\beta_1 = \beta_2$  and  $\sigma_{1\varepsilon} = \sigma_{2\varepsilon}$ . The economic interpretation of the first restriction is that the underwriting abilities of commercial banks and investment banks are the same on observed exogenous characteristics of firms and issues. The interpretation of the second restriction is that when commercial bank underwriting possesses selectivity bias or a signaling effect, investment bank underwriting must possess the same magnitude of selectivity bias, but in a different direction. In this paper, I relax both implicit assumptions as in prior studies and allow the commercial banks and investment banks to have different combinations of underwriting abilities and selectivity bias.

If the endogenous selection is based on comparative advantage, then  $\sigma_{1\varepsilon} - \sigma_{2\varepsilon}$  is less than zero, but  $\sigma_{1\varepsilon}$  and  $\sigma_{2\varepsilon}$  may have any sign. For example, if  $\sigma_{1\varepsilon} < 0$  and  $\sigma_{2\varepsilon} > 0$ , then the conditional mean net yields of both CB and IB underwritten issues are less than their unconditional means  $E(y_{1i})$  and  $E(y_{2i})$ , respectively. Here, both commercial bank clients and investment bank clients have matched with the underwriters based on endogenous factors that provide better services for them. Commercial banks and investment banks coexist in the market because they possess distinct technologies in resolving the information problem of issuers or because the association with selected underwriters is beneficial to the issuers. This is the best scenario for the economy.

Equation (A.7) is parallel to a probit estimation equation, which provides the estimate of  $-(Z_i\gamma)$ . If  $\beta_1 < \beta_2$  and  $\delta > 0$  for a particular variable, a commercial bank has a comparative advantage on this dimension of the firm over an investment bank. The probit estimate is positive ( $-\delta(\beta_1 - \beta_2) > 0$ ) for this characteristic, which indicates a higher tendency to choose

commercial banks as underwriters.<sup>15</sup> Comparison of these beta coefficient differentials and the signs of probit estimates can identify the abilities of underwriters and the determinants of underwriter selection. However, as equation (A.6) demonstrates, the final underwriter choice could also depend on factors other than the net yield differential. The positive tendency of choosing a commercial bank ( $-\delta(\beta_1 - \beta_2) > 0$ ) could be neutralized or even be dominated by other factors ( $-\lambda\beta_3 < 0$ ). I follow the two-stage estimation procedure described in Maddala (1983) to estimate the parameters  $\beta_1, \beta_2, \sigma_{1\varepsilon}$  and  $\sigma_{2\varepsilon}$ .<sup>16</sup>

Another advantage of this three-equation model is that we can compare the performance of different underwritings while holding the client constant. If commercial banks can serve firm  $i$  better in bond pricing, then  $y_{1i}$  is less than  $E(y_{2i} | I_i = 1)$ . In other words, the observed mean net yields of commercial bank underwritten bonds are lower than the expected mean net yields had investment bank underwritten these bonds. The net yield differential for firm  $i$  underwritten by a commercial bank rather than by an investment bank is given by the following equation:

$$E(y_{2i} | I_i = 1) - y_{1i} = X_i\beta_2 + \sigma_{2\varepsilon} \frac{\phi(Z\gamma)}{1 - \Phi(Z\gamma)} - y_{1i} \quad (\text{A.15})$$

The net yield differential for firm  $i$  choosing investment bank underwriting can be defined similarly.

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<sup>15</sup> If the issuing firm is rational and tends to choose underwriters that could obtain a higher bond price, then  $\delta$  should be positive.

<sup>16</sup> The procedure is discussed in Chapter 8 of Maddala (1983), pp.: 224-8.

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**Table 1**  
**List of variables**

<b>Variable name</b>	<b>Variable definition</b>
<i><b>Syndicate type</b></i>	
Commercial bank underwriting	Bonds lead-underwritten by Section 20 subsidiaries or financial holding companies, which are the legal organizational forms that the Federal Reserve Board permits commercial banks to underwrite corporate securities. If more than one underwriter leads the syndicate, then the first underwriter on the list is used to determine underwriter type.
Hybrid syndicate	Equals 1 if current bond issuance is co-led by commercial banks and investment banks; 0 otherwise.
CB-co-manage	Equals 1 if commercial banks participate in the underwriting syndicate as co-managers; 0 otherwise.
Hybrid merger <sup>a</sup>	Equals 1 if the lead underwriter engaged in a merger between a commercial bank and an investment bank during 1990s; 0 otherwise.
<i><b>Issue characteristics</b></i>	
Net yield (basis point spread)	The premium of the ex-ante yield spread of a bond over the ex-ante yield of a U.S. Treasury security of similar maturity.
Underwriting fees (spread)	Dollars charged per \$1,000 of bond issue (includes management fees, underwriting fees, and selling concession).
Issue size	The principal amount of bond issuance (in \$MM).
Issue maturity	Number of years to maturity.
New issue	Equals 1 if there is no bond issuance within 20 years prior to the current bond issuance; 0 otherwise.
REFBD	Equals 1 if the purpose of issue is to refinance existing bank debt; 0 otherwise.
Non-callable	Equals 1 if the bond is classified as “Not-callable” or “Noncall life” in SDC Platinum; 0 otherwise.
Shelf-registration	Equals 1 if the bond is classified as shelf-registered in SDC Platinum; 0 otherwise.
Senior	Equals 1 if the bond is classified as senior in SDC Platinum; 0 otherwise.
Non-investment grade	Equals 1 if the Moody’s credit rating for the bond issuance is Ba or below; 0 otherwise.
Credit rating Aa	Equals 1 if the Moody’s credit rating for the bond issue is Aa; 0 otherwise. Other credit rating dummies are defined in a similar fashion.
Period[1997-2000]	Equals 1 if the bond is issued during 1997-2000.

**Table 1** (continued)

<b>Variable name</b>	<b>Variable definition</b>
<b><i>Lending relationships</i></b>	
Ln(total loans)	Log of (one plus existing total bank loans in \$MM).
Ln(prestigious loans)	Log of (one plus existing loans borrowed from banks with Section 20 subsidiaries in \$MM).
Ln(underwriter loans)	Log of (one plus existing loans borrowed from commercial bank underwriters in \$MM).
<b><i>Prior securities issuance</i></b>	
Ln(no. of prior bond issues)	Log of one plus total number of bonds issued within the 5-year period prior to the current bond issuance.
Ln(no. of prior equity issues)	Log of one plus total number of equity issued within the 5-year period prior to the current bond issuance.
Use same prior bond (equity) underwriter	Equals 1 if a client used the current lead underwriter in prior bond (equity) issuance within the 5-year period; 0 otherwise.
Number of underwriter relationships	Number of different underwriters used in the prior bond and/or equity issuance within the 5-year period.
<b><i>Firm characteristics</i></b>	
Tobin's q	(Book value of debt plus market value of equity) divided by total assets.
Interest expense/operating income	Interest expense as a percentage of operating income. (This is the inverse of coverage ratio.)
Other firm characteristics	Cash, capital expenditure, operation income, and total debt are as a percentage of total assets $\frac{\phi(Z\gamma)}{1 - \Phi(Z\gamma)}$ and $\frac{-\phi(Z\gamma)}{\Phi(Z\gamma)}$ in equations (A.13) and (A.14), respectively, used to control for endogenous switching.
Endogenous selection terms (inverse Mill's ratio)	Estimated by using the results of first-stage probit estimation in Table 5.

<sup>a</sup> Bond issued lead-underwritten by JP Morgan Chase group is always coded as 0 because Chase Manhattan merged with Chemical Bank in 1996, but with Hambrecht & Quist at the end of 1999, then with J. P Morgan at the end of 2000. The merger pattern is quite different from other hybrid mergers; therefore, it is classified as a different group.

**Table 2**  
**Frequency of issues by year and by underwriter type**

The sample consists of 4,592 domestic non-convertible, fixed-rate industrial corporate bond issues from 1991 to 2000. Bonds lead-underwritten by Section 20 subsidiaries or financial holding companies, which are the legal organizational forms that the Federal Reserve Board permits commercial banks to underwrite corporate securities, are reported under the heading of “Commercial banks.”

Year	Commercial banks		Investment banks		Full sample
	Number	Percentage	Number	Percentage	Number
1991	26	7.1	338	92.9	364
1992	36	9.6	341	90.5	377
1993	44	9.8	404	90.2	448
1994	26	11.9	192	88.1	218
1995	83	20.3	326	79.7	409
1996	99	18.9	424	81.1	523
1997	127	19.0	542	81.0	669
1998	205	25.8	590	74.2	795
1999	157	33.6	310	66.4	467
2000	141	43.8	181	56.2	322
Total	944	20.6	3648	79.4	4592

**Table 3**  
**Descriptive statistics of bond issue and firm characteristics by underwriter type**

This table compares mean and median firm and issue characteristics of bonds lead-underwritten by commercial banks to those lead-underwritten by investment banks with the test significance level reported under the heading of “Commercial banks.” The sample consists of 4,592 domestic non-convertible, fixed-rate industrial corporate bond issues for the period 1991-2000. The sample size for commercial bank underwriting bonds is 944 and that for investment bank underwriting bonds is 3648 except for bond net yields and underwriting fees. The sample size for bond net yields (underwriting fees) is 775 (663) for commercial banks and 2952 (2895) for investment banks. Differences in means are tested by *t*-tests and the differences in medians by Wilcoxon rank-sum tests. See Table 1 for variable definitions.

Variable	Commercial banks		Investment banks	
	Mean	Median	Mean	Median
<i>Issue characteristics</i>				
Net yields (basis point spread)	124.28	90.00	130.31	90.00
Underwriting fees (\$/\$1000)	7.29***	6.25***	8.56	6.50
Issue size (\$MM)	161.70	100.00***	169.76	125.00
Issue maturity (years)	9.83***	8.00***	13.05	10.00
<i>Lending relationships</i>				
Ln(total loans)	5.91	6.87	5.75	6.80
Ln(prestigious loans)	5.44*	6.42	5.23	6.37
Ln(underwriter loans)	3.46	4.25	0.00	0.00
<i>Prior securities issuance</i>				
Ln(number of prior bond issues)	1.81	1.79	1.82	1.79
Ln(number of prior equity issues)	0.24	0.00	0.24	0.00
Number of underwriter relationships	3.07	2.00	2.93	2.00
<i>Firm characteristics</i>				
Total assets (\$ Bn)	23.48	5.43***	23.48	7.51
Market value of equity (\$ Bn)	16.28	4.03***	15.95	5.50
Tobin's q	1.36	1.08	1.34	1.08
Interest expense/operating income	18.95	14.96***	23.29	16.24
Cash/total assets	4.17*	2.42	4.61	2.21
Capital expenditure/total assets	7.95***	6.53***	8.62	7.26
Operating income/total assets	14.55	14.21	14.74	15.00
Total debt/total assets	33.12	30.47	33.04	31.16

\* \*\* \*\*\* Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

**Table 4**  
**Bond issue characteristics by underwriter type**

This table compares issue characteristics of bonds lead-underwritten by commercial banks to those lead-underwritten by investment banks with the test significance level reported under the heading of “Commercial banks.” The sample consists of 4,592 domestic non-convertible, fixed-rate industrial corporate bond issues from 1991 to 2000. Differences in percentages are tested by z-statistics with the null hypothesis that the proportions of a particular issue characteristic between underwriters are the same. See Table 1 for variable definitions.

Issue types	Commercial banks		Investment banks	
	Number	Percentage	Number	Percentage
Total	944	100.0	3648	100.0
Use same underwriter in prior bond issuance	511	54.1 <sup>***</sup>	2367	64.9
Use same underwriter in prior equity issuance	73	7.7 <sup>***</sup>	464	12.7
New issue	110	11.7	458	12.6
Refinance bank debt	111	11.8 <sup>***</sup>	670	18.4
Non-investment grade	99	10.5 <sup>*</sup>	466	12.8
Non-callable	708	75.0	2696	73.9
Shelf-registration	825	87.4 <sup>**</sup>	3082	84.5
Senior	912	96.6	3494	95.8
Hybrid syndicate	105	11.1 <sup>***</sup>	115	3.2
CB participate as co-managers	276	29.2 <sup>*</sup>	1170	32.1
Hybrid merger underwriter	412	43.6 <sup>***</sup>	594	16.3

<sup>\*</sup>, <sup>\*\*</sup>, <sup>\*\*\*</sup> Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

**Table 5**  
**Determinants of underwriter selections**

This table reports the first-stage probit estimates and the values of z-tests of underwriter selections, i.e., equation (A.7) in Appendix A. The dependent variable equals 1 if the lead underwriter is a commercial bank, and 0 if it is an investment bank. The sample consists of 4,592 domestic non-convertible, fixed-rate industrial corporate bond issues from 1991 to 2000. Model (1) contains the subsample for the 10% revenue limitation period (1991-1996). Model (2) uses the subsample for 1997-2000. Model (3) uses the full sample. Yearly dummies and constant terms are included in regressions but estimates are not reported. See Table 1 for variable definitions.

**Table 5** (continued)

Independent variable	(1) 1991-1996		(2) 1997-2000		(3) Full sample	
	Estimate	z-test	Estimate	z-test	Estimate	z-test
<b><i>Distribution disadvantage of commercial banks</i></b>						
Ln(issue size)	-0.26	-7.34***	-0.02	-0.76	-0.20	-6.17***
Ln(issue size)*period[1997-2000]	-	-	-	-	0.19	4.71***
<b><i>Conflicts of interest of commercial banks</i></b>						
Refinance bank debt (REFBD: ind. var.)	-0.17	-1.51	-0.08	-0.63	-0.04	-0.52
Interest expense/operating income	-0.001	-0.53	-0.01	-2.66***	-0.002	-1.76*
REFBD*interest expense	0.001	0.77	0.005	2.16**	0.001	1.19
Ln(total loans)	-0.02	-1.30	-0.01	-0.91	-0.02	-1.73*
Prestigious bank loans/total loans	0.12	0.75	0.11	0.80	0.13	1.30
<b><i>Certification ability of commercial banks</i></b>						
Ln(market value of equity)	-0.11	-3.08***	-0.06	-2.88***	-0.07	-3.66***
Tobin's q	0.06	1.35	0.004	0.15	0.01	0.45
New issue (indicator variable)	-0.19	-1.59	-0.11	-0.91	-0.08	-0.93
Cash/total assets	-0.03	-2.92***	-0.01	-2.44***	-0.01	-2.75***
Capital expenditure/total assets	-0.02	-3.20***	-0.01	-2.13**	-0.01	-3.55***
<b><i>Control variables</i></b>						
Operating income/total assets	0.004	0.6	0.003	0.45	0.001	0.15
Total debt/total assets	-0.003	-1.28	0.01	2.43**	0.002	1.27
Ln(no. of prior bond issues)	-0.05	-1.00	0.04	0.91	-0.01	-0.40
Ln(no. of prior equity issues)	0.08	0.89	0.12	1.16	0.26	3.67***
Same prior bond underwriter (ind. var.)	-0.46	-5.45***	-0.26	-3.18***	-0.34	-5.74***
Same prior equity underwriter (ind. var.)	-	-	-0.14	-1.04	-0.48	-4.86***
CB-co-manage (indicator variable)	-0.24	-2.42***	-0.16	-1.76*	-0.20	-3.06***
Hybrid syndicate (ind. var.)	-	-	0.75	7.01***	0.75	7.42***
Hybrid merger (ind. var.)	-	-	1.09	14.6***	0.80	14.9***
Issue maturity (years)	-0.005	-1.09	-0.01	-1.82*	-0.01	-2.34**
Non-investment grade (ind. var.)	0.03	0.20	-0.23	-1.39	-0.16	-1.51
Shelf-registration (indicator variable)	-0.02	-0.17	-0.08	-0.61	-0.06	-0.74
Non-callable (indicator variable)	0.36	2.82***	0.05	0.58	0.18	2.61***
Senior (indicator variable)	-0.08	-0.43	-0.34	-1.17	-0.19	-1.25
Pseudo-R <sup>2</sup>	0.17		0.16		0.19	
No. of observations	2339		2253		4592	

\*, \*\*, \*\*\* Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

**Table 6**  
**Estimates of net yield regressions by underwriter for subperiod 1991-1996**

This table reports the estimates of second-stage net yield (underwriting technology) regressions for both commercial bank and investment bank underwriting, i.e., equations (A.13) and (A.14) in Appendix A. The dependent variable, net yield (basis point spread), is the premium of the ex-ante yield spread of a bond over the ex-ante yield of a U.S. Treasury security of similar maturity. The sample consists of 1,951 domestic non-convertible, fixed-rate industrial corporate bond issues with bond net yield information during the 10% revenue limitation period (1991 to 1996). Columns 1 and 2 include only commercial bank underwriting issues, while columns 3 and 4 include only investment bank underwriting issues. Endogenous selection terms ( $\frac{\phi(Z\gamma)}{1 - \Phi(Z\gamma)}$  and  $\frac{-\phi(Z\gamma)}{\Phi(Z\gamma)}$  in equations (A.13) and (A.14), respectively), used to control for endogenous switching, are estimated by using the results of first-stage probit estimation in Table 5, Model (1). For commercial bank clients, there is no bond issue with credit rating less than B in the final sample. Monthly 3-month T-bill rate, slope of the yield curve (the rate of a 10-year U.S. Treasury security minus that of a 1-year U.S. Treasury security), and credit spreads between BBB and AAA rated bonds are used to control for underlying macroeconomic conditions, but the results are not reported. Credit ratings dummies, yearly dummies, and intercept are included, but the results are not reported. Credit rating dummies include Moody's ratings of Aa, A, Baa, Ba, B, C, and non-rated. See Table 1 for variable definitions.

**Table 6** (continued)

Independent variable	Commercial bank		Investment bank	
	Estimate	<i>t</i> -test	Estimate	<i>t</i> -test
<b><i>Distribution disadvantage of commercial banks</i></b>				
Issue size/total assets	0.27	2.29**	-0.02	-0.75
<b><i>Conflicts of interest of commercial banks</i></b>				
Refinance bank debt (REFBD: ind. var.)	-17.77	-1.14	-5.62	-1.63*
Ln(underwriter loans)	-6.22	-3.1***	-	-
REFBD*Ln(underwriter loans)	5.68	1.79*	-	-
Interest expense/operating income	0.25	0.99	-0.08	-2.20**
REFBD*interest expense	0.66	2.50***	0.14	2.53***
Ln(total loans)	2.04	1.11	0.10	0.15
Prestigious bank loans/total loans	33.01	2.33**	-2.42	-0.39
<b><i>Certification ability of commercial banks</i></b>				
Endogenous selection term	-6.76	-0.63	15.85	1.35
Ln(market value of equity)	-10.02	-2.45**	-15.09	-9.37***
New issue (indicator variable)	12.08	1.22	15.24	3.68***
Tobin's <i>q</i>	-9.82	-1.36	2.91	1.15
Cash/total assets	2.42	2.58***	1.11	4.1***
Capital expenditure/total assets	0.88	1.36	0.71	3.27***
<b><i>Control variables</i></b>				
Ln(number of prior bond issues)	6.50	1.22	11.76	6.24***
Same prior equity underwriter (ind. var.)	-28.84	-1.34	-15.22	-3.87***
Operating income/total assets	0.34	0.35	-1.40	-5.34***
Total debt/total assets	-0.15	-0.61	0.13	1.27
Shelf-registration (indicator variable)	-12.67	-1.37	-26.62	-6.45***
Non-callable (indicator variable)	-40.94	-3.18***	-17.50	-4.59***
Senior (indicator variable)	64.97	3.04***	22.44	3.34***
Issue maturity (years)	1.30	3.01***	0.61	5.25***
Adjusted R <sup>2</sup>	0.88		0.84	
No. of observations	250		1701	

\*, \*\*, \*\*\* Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

**Table 7**  
**Estimates of net yield regressions by underwriter for subperiod 1997-2000**

This table reports the estimates of second-stage net yield (underwriting technology) regressions for both commercial bank and investment bank underwriting, i.e., equations (A.13) and (A.14) in Appendix A. The dependent variable, net yield (basis point spread), is the premium of the ex-ante yield spread of a bond over the ex-ante yield of a U.S. Treasury security of similar maturity. The sample consists of 1,776 domestic non-convertible, fixed-rate industrial corporate bond issues with bond net yield information from 1997 to 2000. Revenue limitation imposed on commercial bank underwriting was 25% from 1997 to 1999, before the enactment of the Gramm-Leach-Bliley Act. Columns 1 and 2 include only commercial bank underwriting issues, while columns 3 and 4 include only investment bank underwriting issues. Endogenous selection terms ( $\frac{\phi(Z\gamma)}{1-\Phi(Z\gamma)}$  and  $\frac{-\phi(Z\gamma)}{\Phi(Z\gamma)}$  in equations (A.13) and (A.14), respectively), used to control for endogenous switching, are estimated by using the results of first-stage probit estimation in Table 5, Model (2). For commercial bank clients, there is no bond issue with credit rating less than B in the final sample. Monthly 3-month T-bill rate, slope of the yield curve (the rate of a 10-year U.S. Treasury security minus that of a 1-year U.S. Treasury security), and credit spreads between BBB and AAA rated bonds are used to control for underlying macroeconomic conditions, but the results are not reported. Credit ratings dummies, yearly dummies, and intercept are included, but the results are not reported. Credit rating dummies include Moody's ratings of Aa, A, Baa, Ba, B, C, and non-rated. See Table 1 for variable definitions.

**Table 7** (continued)

Independent variable	Commercial bank		Investment bank	
	Estimate	<i>t</i> -test	Estimate	<i>t</i> -test
<b><i>Distribution disadvantage of commercial banks</i></b>				
Issue size/total assets	0.80	3.90 <sup>***</sup>	0.09	7.80 <sup>***</sup>
<b><i>Conflicts of interest of commercial banks</i></b>				
Refinance bank debt (REFBD: ind. var.)	39.42	2.59 <sup>***</sup>	-1.65	-0.30
Ln(underwriter loans)	0.30	0.19	-	-
REFBD*Ln(underwriter loans)	-6.13	-2.15 <sup>**</sup>	-	-
Interest expense/operating income	0.02	0.09	0.26	3.00 <sup>***</sup>
REFBD*interest expense	-1.49	-3.42 <sup>***</sup>	-0.22	-2.54 <sup>***</sup>
Ln(total loans)	-0.28	-0.19	-0.43	-0.58
Prestigious bank loans/total loans	18.46	1.69 <sup>*</sup>	1.09	0.16
<b><i>Certification ability of commercial banks</i></b>				
Endogenous selection term	-32.28	-1.31	2.39	0.27
Ln(market value of equity)	-1.99	-0.93	-4.90	-4.38 <sup>***</sup>
New issue (indicator variable)	-23.02	-2.72 <sup>***</sup>	10.59	2.15 <sup>**</sup>
Tobin's <i>q</i>	-2.62	-0.73	0.51	0.74
Cash/total assets	0.98	2.11 <sup>**</sup>	1.28	5.49 <sup>***</sup>
Capital expenditure/total assets	0.27	0.56	0.53	2.01 <sup>**</sup>
<b><i>Control variables</i></b>				
Ln(number of prior bond issues)	-2.18	-0.86	-2.88	-1.75 <sup>*</sup>
Same prior equity underwriter (ind. var.)	17.82	2.10 <sup>**</sup>	7.65	1.61
Hybrid merger (ind. var.)	-26.55	-1.44	0.56	0.17
Hybrid syndicate (ind. var.)	-37.08	-2.90 <sup>***</sup>	4.57	0.72
Operating income/total assets	-0.60	-1.02	-1.27	-4.90 <sup>***</sup>
Total debt/total assets	0.05	0.20	0.18	1.42
Shelf-registration (indicator variable)	8.92	0.79	28.98	4.86 <sup>***</sup>
Non-callable (indicator variable)	-12.51	-1.90 <sup>*</sup>	-11.42	-3.20 <sup>***</sup>
Senior (indicator variable)	18.38	0.91	-57.07	-3.85 <sup>***</sup>
Issue maturity (years)	1.37	4.82 <sup>***</sup>	0.83	7.13 <sup>***</sup>
Adjusted R <sup>2</sup>	0.75		0.69	
No. of observations	525		1251	

\* , \*\* , \*\*\* Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

**Table 8**  
**Estimates of net yield regressions by underwriter for full sample**

This table reports the estimates of second-stage net yield (underwriting technology) regressions for both commercial bank and investment bank underwriting, i.e., equations (A.13) and (A.14) in Appendix A. The dependent variable, net yield (basis point spread), is the premium of the ex-ante yield spread of a bond over the ex-ante yield of a U.S. Treasury security of similar maturity. The sample consists of 3,727 domestic non-convertible, fixed-rate industrial corporate bond issues with bond net yield information from 1997 to 2000. Revenue limitations imposed on commercial bank underwriting was 10% during the 1991-1996 period and was 25% from 1997 to 1999, before the enactment of the Gramm-Leach-Bliley Act. Columns 1 and 2 include only commercial bank underwriting issues, while columns 3 and 4 include only investment bank underwriting issues. Endogenous selection terms ( $\frac{\phi(Z\gamma)}{1-\Phi(Z\gamma)}$  and  $\frac{-\phi(Z\gamma)}{\Phi(Z\gamma)}$  in equations (A.13) and (A.14), respectively), used to control for endogenous switching are estimated by using the results of first-stage probit estimation in Table 5, Model (3). For commercial bank clients, there is no bond issue with credit rating less than B in the final sample. Monthly 3-month T-bill rate, slope of the yield curve (the rate of a 10-year U.S. Treasury security minus that of a 1-year U.S. Treasury security), and credit spreads between BBB and AAA rated bonds are used to control for underlying macroeconomic conditions, but the results are not reported. Credit ratings dummies, yearly dummies, and intercept are included, but the results are not reported. Credit rating dummies include Moody's ratings of Aa, A, Baa, Ba, B, C, and non-rated. See Table 1 for variable definitions.

**Table 8** (continued)

Independent variable	Commercial bank		Investment bank	
	Estimate	<i>t</i> -test	Estimate	<i>t</i> -test
<b><i>Distribution disadvantage of commercial banks</i></b>				
Issue size/total assets	0.47	4.33 <sup>***</sup>	0.07	7.13 <sup>***</sup>
<b><i>Conflicts of interest of commercial banks</i></b>				
Refinance bank debt (REFBD: ind. var.)	-11.15	-1.01	-3.61	-1.26
Ln(underwriter loans)	-1.96	-1.60	-	-
REFBD*Ln(underwriter loans)	-0.86	-0.38	-	-
Interest expense/operating income	0.13	1.02	-0.02	-0.67
REFBD*interest expense	0.49	2.24 <sup>**</sup>	0.04	1.27
Ln(total loans)	0.89	0.76	-0.60	-1.22
Prestigious bank loans/total loans	20.79	2.37 <sup>**</sup>	7.91	1.71 <sup>*</sup>
<b><i>Certification ability of commercial banks</i></b>				
Endogenous selection term	-7.19	-0.65	20.11	1.97 <sup>**</sup>
Ln(market value of equity)	-5.72	-3.17 <sup>***</sup>	-8.78	-9.42 <sup>***</sup>
New issue (indicator variable)	-6.55	-1.01	14.02	4.26 <sup>***</sup>
Tobin's <i>q</i>	-3.70	-1.15	-	-
Cash/total assets	1.01	2.63 <sup>***</sup>	0.79	4.49 <sup>***</sup>
Capital expenditure/total assets	0.33	0.85	0.68	3.94 <sup>***</sup>
<b><i>Control variables</i></b>				
Ln(number of prior bond issues)	1.62	0.70	3.21	2.56 <sup>***</sup>
Same prior equity underwriter (ind. var.)	1.30	0.15	-6.72	-2.04 <sup>**</sup>
Hybrid merger (ind. var.)	-5.68	-0.70	7.74	1.82 <sup>*</sup>
Hybrid syndicate (ind. var.)	-23.00	-2.82 <sup>***</sup>	15.33	2.26 <sup>**</sup>
Operating income/total assets	-0.10	-0.20	-1.41	-8.10 <sup>***</sup>
Total debt/total assets	-0.18	-1.06	0.23	2.87 <sup>***</sup>
Shelf-registration (indicator variable)	-5.80	-0.78	-13.83	-4.03 <sup>***</sup>
Non-callable (indicator variable)	-21.30	-3.65 <sup>***</sup>	-17.36	-6.47 <sup>***</sup>
Senior (indicator variable)	33.01	2.25 <sup>**</sup>	-	-
Issue maturity (years)	1.25	5.27 <sup>***</sup>	0.67	7.72 <sup>***</sup>
Adjusted R <sup>2</sup>	0.78		0.78	
No. of observations	775		2952	

<sup>\*</sup> <sup>\*\*</sup> <sup>\*\*\*</sup> Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

**Table 9**  
**Performance comparisons of commercial bank underwriting to investment bank underwriting in bond pricing and underwriting fees**

This table reports the net yield and underwriting fee differentials between commercial bank and investment bank underwriting in Panels A and B, respectively. The net yield differentials are the predicted net yields had the clients used the unselected underwriters minus the observed net yields of bonds underwritten by selected underwriters. Thus, the clients are held constant when comparing between different underwritings. Therefore, a positive number indicates that, for a particular client, the selected underwriter obtains a lower net yield (higher bond price) than the unselected underwriter. The differentials for underwriting fee differentials are defined in a similar fashion. The predicted net yields are estimated by using the net yield regressions reported in Tables 6, 7 and 8 depending on the corresponding time periods. The predicted underwriting fees are estimated by using the underwriting fee regressions reported in Appendix B. The sample consists of domestic nonconvertible, fixed-rate industrial corporate bond issues with the credit ratings of B or above in the period from 1991 to 2000 because there are no commercial bank underwriting bonds with credit ratings below B in the final sample. Net yield (basis point spread) is the premium of the ex-ante yield spread of a bond over the ex-ante yield of a U.S. Treasury security of similar maturity. Underwriting fee (spread) is dollars charged for each \$1,000 of bond issue including management fees, underwriting fees, and selling concession. The *t*-statistics are reported. The tested null hypothesis is that the differential is equal to zero.

	Clients have chosen commercial banks			Clients have chosen investment banks		
	N	Mean	<i>t</i> -test	N	Mean	<i>t</i> -test
<i>Panel A. Net yield differential</i>						
Full Sample (1991-2000)	775	40.72	21.0***	2947	18.49	9.7***
Subsample (1991-1996)	250	37.41	11.9***	1697	10.26	5.9***
Subsample (1997-2000)	525	5.68	2.26**	1250	47.58	5.6***
<i>Panel B. Underwriting fee differential</i>						
Full Sample (1991-2000)	593	0.29	2.32**	2685	3.07	26.38***
Subsample (1991-1996)	178	0.02	0.09	1615	3.25	25.03***
Subsample (1997-2000)	415	0.39	2.77***	1070	3.08	5.46***

\*, \*\*, \*\*\* Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

**Table 10****Estimates of net yields and underwriting fees assuming only one type of underwriters had existed in the market**

This table reports the unconditional mean net yields and mean underwriting fees (on underwriter selections) in Panels A and B, respectively. The estimates provide the hypothetical mean net yields and mean underwriting fees assuming only one type of underwriters had existed in the market. The unconditional net yields are estimated by using the net yield regressions (excluding the endogenous selection terms) reported in Table 8. The unconditional underwriting fees are estimated by using the underwriting fee regressions (model 3) reported in Appendix B. The sample consists of domestic nonconvertible, fixed-rate industrial corporate bond issues with the credit ratings of B or above in the period from 1991 to 2000 because there are no commercial bank underwriting bonds with credit ratings below B. Net yield (basis point spread) is the premium of the ex-ante yield spread of a bond over the ex-ante yield of a U.S. Treasury security of similar maturity. Underwriting fee (spread) is dollars charged for each \$1,000 of bond issue including management fees, underwriting fees, and selling concession. CB stands for commercial bank, IB for investment bank. The difference between the two types of underwriters in means is tested by *t*-test.

	N	Only CB could underwrite	Only IB could underwrite	Difference between CB and IB underwriting	<i>t</i> -test
<i>Panel A. Unconditional mean net yields</i>					
All Clients	3722	143.3	136.5	6.8	5.1***
Clients have chosen CB	775	<b>132.5</b>	142.0	-9.5	-11.3***
Clients have chosen IB	2947	146.1	<b>135.1</b>	11.0	6.7***
<i>Panel B. Unconditional mean underwriting fees</i>					
All Clients	3278	11.06	8.59	2.47	28.28***
Clients have chosen CB	593	7.68	7.97	-.29	-3.66***
Clients have chosen IB	2685	11.8	8.73	3.07	30.32***

\* , \*\* , \*\*\* Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.

## **Appendix B**

### **Estimates of underwriting fee regressions by underwriter**

This table reports the estimates of underwriting fee regressions for commercial bank (CB) and for investment bank (IB) underwriting. For detailed discussions of these regression results, see Song (2003a). The dependent variable, underwriting fee (spread) is dollars charged for each \$1,000 of bond issue including management fees, underwriting fees, and selling concession. The sample consists of 3,558 domestic non-convertible, fixed-rate industrial corporate bond issues with underwriting fee information in the period from 1991 to 2000. Columns 1, 3, and 5 include only commercial bank underwriting issues. Columns 2, 4, and 6 include only investment bank underwriting issues. For commercial bank clients, there are no bond issues with credit rating less than B in the final sample. Thus, there are no predicted bond net yield savings for investment bank clients with credit rating less than B. Bank penetration in industry is  $\ln(1 + \text{number of all commercial bank underwriting bonds in the client's industry})$ . Client (underwriter) issue share in the industry is the total number of bonds issued by the client (underwritten by the underwriter) divided by the total number of issues in the same industry classified by 2-digit SIC code. Aggregate issue amount in the industry is in million dollars. Well-connected client equals 1 if a client used 6 or more lead underwriters in prior bond and/or equity issuances within the 5-year period prior to the current bond issuance; 0 otherwise. The estimates for the yearly dummies and constant terms are included in regressions but are not reported. See Table 1 for variable definitions.

**Appendix B** (continued)

Independent variable	(1) 1991-1996		(2) 1997-2000		(3) Full sample	
	CB	IB	CB	IB	CB	IB
Predicted bond net yield saving	-0.07***	0.01***	-0.06***	-0.001***	-0.06***	0.002***
Bank penetration in the industry	0.05	-0.12	-0.74***	-0.25*	-0.26	-0.17*
Client issue share in the industry	-1.67	-2.07***	-0.67	-1.00**	-1.05*	-1.51***
Underwriter issue share in the industry	2.21	-0.51	0.05	0.44	1.38	-0.51
Ln(aggregate issue amount in the industry)	-0.62*	-0.39***	0.03	-0.04	-0.21	-0.31***
Hybrid merger (ind. var.)			-0.29	0.22	-0.38	0.34**
Hybrid syndicate (ind. var.)			1.78***	0.50	1.50***	0.73**
Well-connected client (ind. var.)	-0.92	-0.40	0.07	-0.05	0.12	-0.38*
Ln(no. of prior bond issues)	0.59*	0.43***	0.05	-0.10	0.33**	0.16*
Ln(no. of prior equity issues)	0.49	-0.56**	0.74**	-0.87***	0.12	-0.63***
Same prior bond underwriter (ind. var.)	0.71	0.16	-0.01	-0.06	0.10	0.06
Same prior equity underwriter (ind. var.)	0.11	-0.44	-0.23	0.99***	-0.01	-0.02
Refinance bank debt (REFBD; ind. var.)	0.17	0.07	-1.02*	0.27	-0.14	0.14
Ln(underwriter loans)	0.28*	-	-0.08	-	0.07	-
REFBD*Ln(underwriter loans)	-0.32	-	0.36***	-	0.13	-
Ln(Total loans)	-0.25**	-0.08***	-0.01	-0.08**	-0.06	-0.06***
Ln(issue size)	0.77***	0.40***	-0.01	0.15	0.16	0.21***
Ln(market value of equity)	-0.62***	-0.66***	-0.16*	-0.24***	-0.38***	-0.43***
New issue (ind. var.)	1.16**	1.24***	2.06***	-0.48*	1.92***	0.70***
Shelf-registration (ind. var.)	-2.83***	-2.63***	0.68	-0.26	-1.88***	-2.15***
Non-callable (ind. var.)	-2.17***	-1.13***	-0.54*	-0.99***	-1.08***	-1.18***
Senior (ind. var.)	-2.82**	-2.06***	-3.49***	-4.70***	-0.99	-2.29***
Issue maturity (years)	0.07**	0.08***	0.09***	0.09***	0.09***	0.08***
Credit rating: Aa	-0.70	-0.04	0.91	0.19	1.48	0.63
Credit rating: A	0.89	0.02	-0.88	-0.11	1.14	0.54
Credit rating: Baa	1.01	0.03	-1.73	-0.02	0.62	0.52
Credit rating: Ba	6.74***	7.90***	0.24	7.28***	5.36***	8.21***
Credit rating: B	12.46***	14.26***	13.02***	14.35***	16.51***	15.27***
Credit rating: Non-rated	-	24.56***	-8.90***	15.17***	-5.24*	20.44***
T-bill rate (3-month)	1.27*	0.80***	-0.80	-0.71	1.09**	0.42**
Slope of yield curve (10 yr – 1 yr)	1.80*	0.15	1.44**	1.28**	1.82***	0.32
Credit spread (BBB-AAA)	5.43	-0.58	1.89	0.56	4.06***	1.47**
Adjusted R <sup>2</sup>	0.92	0.83	0.80	0.68	0.85	0.79
No. of observations	178	1615	415	1070	593	2685

\*, \*\*, \*\*\* Significant at the 10, 5, and 1 percent levels, respectively, for a two-tailed test.