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Relationship-Specific Assets and the Pricing of Underwriter Services

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ABSTRACT

This paper investigates the effect of setup costs on the pricing of investment banking services. The existence of setup costs is predicted to result in lower underwriter spreads in IPOs for firms that are expected to issue again. Consistent with this prediction, I find significantly lower spreads for firms that make subsequent issues. I also find that a firm's likelihood of changing underwriters in a subsequent offer is related to the time between offerings and the underwriter's pricing performance in the IPO. These results suggest that the deviations from optimal IPO pricing carry a penalty for the underwriter.

RESEARCH ON THE SECURITY issuance process focuses on the role of investment bankers in certifying the issue price and monitoring the managers of the firm (see, for example, Smith (1986)). These activities are likely to require an investment banker to invest in firm-specific information (for example, information concerning the issuing firm's line of business, management strengths, and any inside information that may diminish firm values). If the information acquired is durable (i.e., useful in future dealings with the firm), investment banking will have economies of scale through repeat dealings similar to those that appear to exist in commercial banking and in auditing (see Sharpe (1990), Rhajan (1992), Lummer and McConnell (1989), and DeAngelo (1981)).

The existence of relationship-specific information or other setup costs can, in turn, significantly affect the relationship between marginal cost and the price of a particular service. In particular, DeAngelo (1981), and Farrell and Shapiro (1989) show that with setup costs, the equilibrium intertemporal price path requires charging a price for an initial transaction below marginal cost and then increasing the price so that the supplier earns quasi rents on subsequent transactions (so-called "low balling").

This paper analyzes the pricing of underwriting services in the context of a long-term relationship with the issuing firm. My analysis is based on a sample of firms that made initial public offerings (IPOs) of equity using firm

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commitment underwriting contracts during 1980 through 1983. For these firms, I identify subsequent public securities offerings through year-end 1988. Using these data, I examine the intertemporal pattern of underwriter fees and the determinants of firms switching underwriters in subsequent security offerings.

Twenty-four percent of the firms in my sample make at least one public security offering in the period up to 8 years after the IPO. Common stock offerings represent the majority of subsequent offerings. About 35 percent of the firms that have additional offerings use a different lead underwriter in their seasoned offering, i.e., they "switch".

I find that the underwriter spread is significantly lower in IPOs in which the issuing firm makes a subsequent equity offer than in IPOs in which the firm does not subsequently issue equity—a pattern consistent with initial engagement discounting. The determinants of the decision to switch underwriters are also examined. I find that switching is more likely the longer the time between the IPO and the subsequent security issue and the poorer the investment banker's pricing performance in the IPO.

The remainder of the paper is organized into four sections. Section I reviews the theoretical literature on equilibrium pricing with setup costs and extends the analysis to the market for underwriting services. Section II describes the data. Section III describes the empirical tests and my results. The final section provies a summary of the results.

I. Pricing Underwriter Services

A. Background: Pricing with Setup Costs

In many markets, buyers and sellers invest in durable transactor or relationship-specific assets. Williamson (1979) defines a durable transactor-specific asset as an asset that is required for the transaction but not marketable or transferable to transactions involving different parties. Examples of transactor-specific assets include firm-specific training in labor markets and firm-specific information associated with establishing a credit relationship with a bank. In such markets, if transactions are expected to recur, then the buyer (or seller) realizes that selecting a particular supplier creates bilateral monopoly power. In particular, the existence of a transactor-specific asset creates a "lock in" effect by making it costly to switch suppliers. Therefore, even if the market is perfectly competitive ex ante, once the relationship is established there is some ex post bilateral monopoly power. The size of the investment in relationship-specific assets and, therefore, the cost of switching determine the degree of ex post monopoly power.

Optimal pricing with "lock ins" has been extensively analzyed (see, for example, Klein, Crawford, and Alchian (1978), Farrell and Shapiro (1989), and DeAngelo (1981)). In particular, when the incumbent supplier can earn quasi rents arising from the switching costs, competition among potential suppliers at the initial award stage results in discounting, i.e., setting

the initial price below marginal cost by the present value of the costs of switching.

The nature of underwriter services suggests that underwriters may also invest in durable transactor-specific assets. In particular, in the process of evaluating the offer, the investment banker obtains information concerning the firm's operations and management that would be useful in underwriting subsequent offerings.[1] The investment banker may also identify an informed client base for the firm's stock which is also a durable transactor-specific asset (see Benveniste and Spindt (1989)).

While the existence of substantial setup costs makes the underwriting relationship similar to banking or auditing relationships, there are important differences that may affect the pricing of underwriter services.[2] For example, a seller's willingness to discount the initial price when there are setup costs is based on the expectation that quasi rents will be earned on subsequent transactions. In the context of auditing or banking, there is little uncertainty concerning the likelihood of repeat transactions. However, public security issues are much less frequent or certain events. To the extent that the transactor-specific asset depreciates over time, the longer the expected interval between transactions, the less costly it will be to switch underwriters. Therefore, the less likely a firm is to make a subsequent offer and the longer the expected time until a subsequent issue, the less important will be the intertemporal linkage in the pricing of investment banking services.

The frequency of public security issues, however, is probably a downwardly biased estimate of the frequency of repeat dealings with investment banking firms. For example, investment bankers participate in the private placement market, provide consulting services, and are actively engaged in merger and other acquisition activities of the firm.[3] In the empirical analysis that follows, I assume that the only subsequent dealing with an investment banker is in public security offerings. This assumption biases against finding any intertemporal link in the pricing of underwriter services.

B. A Model of the Pricing of Investment Banking Services

This section develops a simple model of the pricing of underwriter services with switching costs. The model is used to illustrate the relationship between the spread in the initial offering, the probability of subsequent issues, and

[1] The investment banker's legal obligation to perform due diligence may require the investment banker to reevaluate the firm even though information obtained from past offers is still useful.

[2] See Sharpe (1990), Rhajan (1992), Simon and Francis (1988), and Flannery (1982) for analyses of the role of setup costs in accounting and banking.

[3] One measure of the importance of underwriting revenues for investment bankers is the proportion of total revenue derived from underwriting. For investment banks that are members of the New York Stock Exchange, revenues from underwriting averaged about 10% of gross revenues during the period 1972–1987. Trading-related revenues, securities commission, and other income account for 75% of revenue during this period (see Hayes and Hubbard (1990), p. 115).

the spread in subsequent issues. The model is similar to the one developed by DeAngelo (1981) to analyze auditing fees, but it has two modifications. First, I assume that the investment banker invests in a durable transaction-specific asset that depreciates at a constant rate such that δ^n of the asset remains after n periods ($0 < \delta$ and $\text{Lim}_{n \to \infty} \delta^n = 0$ where n equals the number of periods between transactions). This asset could be firm-specific information necessary to determine or certify the offer price, or the identification and development of a knowledgeable client base for the firm's securities. For simplicity, I assume that the investment required does not vary with offer size or with the type of security offered and must be acquired to underwrite an offering.[4]

The cost of acquiring this asset is assumed to be K. If the same underwriter is used in a subsequent offer made n periods after the initial offering, the required investment for the subsequent offering is $K - \delta^n K$. Therefore, the difference in setup costs associated with engaging a new underwriter n periods after the initial offering and employing the same underwriter is $\delta^n K$. The difference in setup costs represents the maximum quasi rent the incumbent underwriter can earn without inducing the issuing firm to switch.

As shown by DeAngelo and Farrell and Shapiro, competition in the award stages implies that the initial fee charged will reflect the discounted present value of the quasi rents that the supplier expects to earn from the relationship. In the present context, if the cost per share (exclusive of setup costs) associated with underwriting an offering is C, and if it is assumed that all firms issue again once at most n periods from their IPO, then assuming competition in the market for underwriter services, the equilibrium per share underwriting fees must satisfy the following zero profit condition:

$$(F_1 - C)S_1 - K + \phi((F_2 - C)S_2 + (1 - \delta^n)K)/(1 + R)^n = 0, \qquad (1)$$

where

F_1 = per share fee or underwriting spread in the initial offering,
F_2 = per share fee in the subsequent offering n periods hence,
C = per share costs of underwriting an issue exclusive of setup costs,
K = setup costs associated with the initial offer,
ϕ = offer probability,
S_i = number of shares offered, $i = 1$ or 2,
R = discount rate, and
n = number of periods until the subsequent offer.

Since the maximum quasi rent the underwriter can extract in period n associated with the existence of fixed setup costs is $\delta^n K$, competition in the initial award stages implies that the fee per share in the subsequent offer

[4] This assumption does not affect the comparative static predictions regarding intertemporal links in pricing or the likelihood of switches.

and in the IPO will be

$$F_2 = C + \frac{K(1 - \delta^n)}{S_2} + \frac{\delta^n K}{S_2} = C + \frac{K}{S_2} \tag{2}$$

and

$$F_1 = C + \frac{K}{S_1} - \phi \frac{\delta^n}{(1 + R)^n} \frac{K}{S_1}, \text{ respectively.} \tag{3}$$

Equation (2) is simply the condition that the underwriter will charge a price that extracts the quasi rents.[5] From equation (1), this implies that the fee in the IPO will be reduced by the present value of the quasi rent. The last term in equation (3) is the initial engagement discount, which is the present discounted value of the rents. This is a standard result in the literature on pricing with switching costs.[6]

Equation (3) implies a cross-sectional relationship between underwriter spreads in the first offering (F_1) and the probability of a subsequent issue (ϕ). In particular, if the underwriter pays the setup costs (K) given the per share costs of underwriting (C), the per share spread is expected to be lower the higher the probability of a subsequent offer.[7]

This empirical relation is based on several simplifying assumptions. First, the initial offering discount is based on the assumption that the probability and timing of future offerings are observable at the time of the initial offering. If the probability of a subsequent offering is known only to the issuer at the time of the offering and if offer probabilities differ across issuing firms, then a potential adverse selection problem exists in which firms with a low probability of making a subsequent issue (or firms with longer intervals between issues) have an incentive to falsely portray their issue probability and receive larger first-period discounts. The resulting equilibrium may

[5] A competitor's cost in the second period for underwriting a single offer is $C + \frac{K}{S_2}$. Therefore, the incumbent can charge F_2 and not induce the issuer to switch.

[6] In the case of more than one subsequent offer, the underwriter's pricing strategy is to extract the maximum available quasi rents by setting a spread in each subsequent offer so that the issuer is indifferent between staying and switching to another underwriter. Consider for example the case of two subsequent offers. The spread another underwriter will bid for the firm's business in a subsequent offer reflects the quasi rents it could earn in the second and final seasoned offer. The competing underwriter bids away the rents from the final offer in the spread it charges in the first subsequent offer. Intuitively, the initial underwriter's cost advantage only lasts through the first subsequent offer. This implies that the discount at the initial offering will equal the probability of an additional offer times the present value of the quasi rents that can be earned if an additional offer occurs. As a result, the discount associated with the IPO represents only the present value of rents expected from the first seasoned offering.

[7] The IPO fee will vary inversely with the time between offerings (if known). In particular, differentiating equation (3) with respect to n yields $\frac{\partial F_1}{\partial n} = \frac{\phi \delta^n K}{(1 + R)^n} \ln(1 + R) - \frac{\phi \delta^n K \ln \delta}{(1 + R)^n} > 0$ since $(1 + R) > \delta > 0$.

involve high-probability issuers subsidizing low-probability issuers. This pooling equilibrium will obscure the intertemporal linkage in fees.[8]

The second assumption is that there is no uncertainty concerning the quality of the underwriting services that will be provided. For example, one measure of quality may be the degree to which the initial offering is underpriced given the ex ante uncertainty concerning the firm's value. This measure of the quality of the underwriting effort is observed after the initial spread or fee is established. If issuers believe that the quality of underwriting services in the initial offering is related to the quality of services that will be provided for subsequent issues, then greater underpricing (i.e., greater than is commensurate with the firm's ex ante uncertainty) will induce switching, even though switching involves reinvestment in relationship-specific assets.[9]

The third assumption is that there is no other mechanism to capture quasi rents other than the investment banker's underwriting another security offer. If other mechanisms do exist (e.g., acquisition advising or consulting services), then this assumption should bias against finding relationship-specific assets to be important.

II. Data

To empirically investigate the importance of relationship-specific assets in investment banking, I constructed a sample of firms that made initial public offerings of equity during the period January 1, 1980 through December 31, 1983.[10] I assume that the IPO represents the issuing firm's initial engagement of an underwriter. Consistent with this assumption, none of the firms in my sample had publicly traded securities outstanding prior to their IPO's.

The sample consists of equity offerings using firm commitment underwriting agreements that were announced in the *Investment Dealer's Digest*. I exclude stock offerings in which warrants were offered as part of a unit offering.[11] Offers with warrants are excluded for two reasons. First, the existence of warrants complicates the measurement of offer size. Second, computing initial returns in IPOs with warrants is complicated by the fact that the offer price is stated in units (containing both stock and warrants)

[8] See Farrell and Shapiro (1989).

[9] The expected *future* underpricing or other losses from the provision of poor underwriting services in seasoned offerings must be expected to exceed the cost of switching. An important issue related to uncertainty concerning the likelihood of issue and the quality of underwriting services provided is why the issuer and the investment banker transact through a series of short-term contracts as opposed to entering into a long-term contract for the provision of underwriting services. Farrell and Shapiro (1989) show that only in the case where switching costs (or offer probabilities) are private information to the buyer will long-term contracts dominate a series of short term contracts.

[10] I excluded firms with exchange-traded IPOs (i.e., NYSE and AMEX) since the IPO was unlikely to be the first engagement of an investment banker. In 1980–1983 there were 22 IPOs initially listed on the NYSE or AMEX. (Source: Ritter's IPO Data Base).

[11] Warrants are sometimes issued as compensation to underwriters (see Barry, Muscarella, and Vetsuypens (1991)). None of the offers in my sample involved compensation with warrants.

while the secondary market price is often reported only for the stock.[12] Financial corporations (primarily S & Ls converting from mutual to stock form) are also excluded from the sample.[13]

Information on the financial characteristics of the firm at the time of the IPO, the name of the lead underwriter, and the underwriter's spread in the IPO come from the prospectus of the issuing firm and from the *Investment Dealer's Digest*. Initial returns based on the first day of trading associated with the IPO are from Ritter's IPO data base. The resulting sample consists of 520 issues.

Information on subsequent issues of securities was obtained from a search of *Moody's OTC* and *Industrial Manuals* for 1988 for each firm in the sample. If the firm was not listed in the Moody's manual for 1988, I searched the manuals for years prior to 1988 but subsequent to the IPO. Of the 520 firms in my sample, I was able to locate 512 firms in the Moody's manual in the years subsequent to the IPO.[14] For these firms, I read the "Long Term Debt" and "Capital Stock" portions of the Moody's manual for any information on public securities offerings. Of the original sample of 520, I identified 121 firms that reported public securities offers after their IPO. The Moody's entries gave the type of security offered, the amount offered, and the name of the lead underwriter used.

For firms making subsequent offerings, I compared the lead underwriter in the IPO to the lead underwriter in the subsequent offering. If the lead underwriter in the subsequent offering is different from the lead underwriter in the IPO, the offering is classified as one involving a switch in underwriters. To account for mergers of investment banking firms, I assume that if the IPO underwriter merged with or was acquired by the firm underwriting the subsequent offering, a switch did not occur.[15]

[12] During the 1980–1981 period, only 46 firms that issued stock and warrants are contained in Ritter's comprehensive IPO data base. The average percentage underwriting spread for those firms is 9.88%.

[13] These firms were excluded because the regulatory apparatus for financial firms may affect the nature of investment banking services provided and, therefore, may affect underwriter spreads.

[14] The remaining 8 firms were not listed in any Moody's manual after their IPO, nor were they listed on the CRSP *OTC* header file.

[15] A co-lead underwriter was used in 142 of the IPOs in the sample. Most of these (137) involve the use of a national underwriter as the first listed underwriter (i.e., a top bracket underwriter based in New York) and a regional underwriter as the co-lead underwriter. Of the firms using co-lead underwriters, 36 made subsequent security offers. Twenty-nine of these firms used the same lead and co-lead in the subsequent offer, and they were classified as not switching. The existence of a co-lead may limit the extent to which the lead underwriter can extract quasi rents in subsequent offers and, as a result, affect the initial engagement discount provided at the IPO. To the extent that regional and national underwriters are not perfect substitutes for one another (for example, because the regional does not have a national sales network), the potential influence of a co-lead as a competitor will be limited. The potential influence of a co-lead is also mitigated by the fact that it is in the joint interest of the lead and co-lead to collude and realize quasi rents in subsequent offers.

Since Carter and Manaster (1990) and others find that underwriter reputation is related to IPO underpricing, underwriters were ranked according to the Carter-Manaster rankings. This is an ordinal ranking from 0 to 9 with 9 indicating the most prestigious underwriter. Carter-Manaster rankings are based on IPO offerings during the 1980 through 1983 period. For seasoned offerings during the 1980 through 1988 period, I also use the Carter-Manaster rankings.[16]

III. Empirical Results

A. Analysis of Subsequent Offers

As discussed in the previous section, the initial fee for underwriting services will reflect a discount for setup costs if the issuing firm and the underwriter expect repeat dealings. Table I shows that of the 520 firms in the IPO sample, 121 (23 percent) made at least one public offering in the period following the IPO. In addition, 29 of the 121 firms made two offerings, 6 firms made three offerings, and one firm made 4 offerings.

As reported in Table I, the most frequent subsequent security offering is common stock; 19 percent of the firms had at least one seasoned stock offering. Welch (1989) reports 28 percent of firms who went public in the 1977 through 1982 period made seasoned equity offerings in the period up to 10 years following the IPO. The smaller percentage of seasoned offerings in my sample may result from differences in samples (I exclude best-efforts issues and issues with warrants, and I follow firms for up to 8 years).[17]

Debt offerings are rare for firms in my sample. Only about 4 percent of the firms issued debt in their first public offering after the IPO and only 28 firms (7 percent) issued debt in any subsequent public offering. In contrast, Mikkelson and Partch (1986) report 28 percent of the firms in their sample of NYSE and AMEX firms made some form of public debt offering.

Two characteristics of the subsequent security offerings merit emphasis. First, the subsequent equity issues are similar in size to the IPOs. For example, the IPO averaged 98% of the seasoned equity offerings (the seasoned offering is deflated by the change in the price level (CPI) from the IPO to the seasoned offer). Second, subsequent offerings are usually made soon after the IPO. For example, the average time between the IPO and first subsequent offering is 24 months, and the median time is 20 months.

Table I, Panel C provides information on the frequency of switching lead underwriters in the first subsequent offering. A switch in lead underwriters

[16] In cases in which the lead underwriter in the seasoned offering is a combination of firms in the Carter-Manaster rankings, I used (1) the rank of the IPO underwriter if the firm did not switch underwriters or (2) the highest ranked underwriter of the combined entity.

[17] Mikkelson and Partch (1986) report 22 percent of their sample of NYSE and AMEX traded firms made seasoned equity offerings during the 10-year period following their IPO.

Table I

Percentage of Firms Issuing Public Securities up to Eight Years After an Initial Public Offering of Equity, Average Time to Subsequent Offer, and the Average Amount of the Subsequent Offer. Based on a Sample of 520 Firm Commitment IPOs, 1980 through 1983

This table provides characteristics of firms making securities offers following IPOs. The "Average Amount of Offer" refers to the amount of the subsequent security offer as measured by the gross proceeds to the firm. "Firms Switching Underwriters" refers to firms that use a different lead underwriter in their offering following the IPO than they used in the IPO.

Panel A: Characteristics of First Subsequent Public Security Offers

Type of Offer	Percent Issuing (Number of Firms)	Average Amount of Offer in Millions[a] (Standard Deviation)	Average Amount of IPO Relative to First Subsequent Offer	Average Number of Months from IPO to First Subsequent Offer (Standard Deviation)
Common stock	19% (N = 101)	$22.49 (19.37)	98%	24 (15.2)
Straight debt	1.3% (N = 7)	$47.00 (34.84)	36%	26 (17.4)
Convertible debt	2.5% (N = 13)	$27.80 (22.73)	75%	24 (10.7)
Common stock with warrants	0.4% (N = 2)	$5.10 (8.31)	57%	15.5 (3.5)
Common stock and straight debt	0.2% (N = 1)	$406.00 (N/A)	9%	64 (N/A)

Panel B: Other Subsequent Offers

Type of Offer	Number of Second Subsequent Offer	Percent Issuing a Second Offer	Third Subsequent Offer	Percent Issuing A Third Offer
Common stock	18	3.5%	5	1.0%
Straight debt	5	1.0%	1	0.2%
Convertible debt	6	1.1%	0	0

Panel C: Firms Switching Underwriters In First Subsequent Offers

	Percent Switching Lead Underwriter (Number of Firms)	Average Amount of IPO Relative to First Subsequent Offer
Common stock	28% (N = 28)	113%
Debt issues	35% (N = 7)	24%

[a] Amount of subsequent offer is deflated by the change in the CPI from the month of the IPO offer to the month of the subsequent offer. Data on the change in the CPI are from Ibbotson and Sinquefield (1991).

Table II

Descriptive Statistics Concerning Underwriter Spreads and Underpricing for Initial Public Offerings of Equity

This table provides descriptive statistics concerning underwriter spreads and underpricing for a sample of 520 initial public offerings of equity made during 1980–1983. Percentage underwriter spread is measured as the difference between the offer price and the per share proceeds to the firm divided by the offer price. IPO underpricing is measured as the difference between the first secondary market price and the offer price divided by offer price. Firms making subsequent offers are firms that made public securities offerings in the period up to eight years after the IPO. Firms switching underwriters are firms that used a different lead underwriter in the offering following the IPO than they used in the IPO.

Classification	Percent of IPO Sample (Number)	Mean, Median Percentage IPO Spread (Standard Deviation)	Mean, Median Percentage IPO Initial Returns (Standard Deviation)
All IPOs	100% (520)	8.0%, 7.4% (1.36%)	12.1%, 3.1% (31.5%)
Firms making subsequent offers	23% (121)	7.3%, 7.1% (1.36%)	11.6%, 2.4% (22.2%)
Firms not making subsequent offers	77% (399)	8.2%, 7.8% (1.35%)	12.2%, 3.2% (33.8%)
Firms making subsequent equity issues	19% (101)	7.4%, 7.1% (1.28%)	13.5%, 4.4% (23.2%)
Firms not making subsequent equity offers	81% (419)	8.1%, 7.6% (1.36%)	11.8%, 2.2% (32.2%)
Firms switching lead underwriters in first subsequent equity offer	5% (28)	7.9%, 7.7% (1.16%)	11.1%, 2.1% (25.1%)
Firms not switching lead underwriters in first subsequent equity offer	14% (73)	7.2%, 7.0% (1.31%)	14.4%, 4.8% (21.1%)

is defined as a change in the lead underwriter from the IPO to the subsequent offering. As shown, 28 percent of the firms switched underwriters in their first seasoned common stock offerings and 35 percent switched underwriters when they issued debt following the IPO.

B. Analysis of IPO Spreads

Two tests of the existence of setup costs are performed. The first test compares underwriting spreads in IPOs for firms that make subsequent securities offers to the spreads of those that do not make subsequent offers. Table II contains information on the mean and median percentage underwriter spreads for my sample of IPOs classified by whether the firm made subsequent securities offers and, if so, whether the firm switched lead underwriters in the subsequent offers. Notice that the mean and median percentage spreads for firms that make subsequent offers are lower than the mean and median percentage spreads for firms that do not make subsequent offerings. The difference in the means and medians is statistically significant

at the 0.01 level.[18] This difference is consistent with the hypothesis of fixed setup costs in the underwriting relationship.

The mean percentage spread for firms switching underwriters in subsequent offerings is also less than the mean percentage spread for non-issuers, but it is higher than the percentage spread for non-switchers. The mean percentage spread for switchers is significantly greater than the spread for firms that do not switch ($t = 2.07$).[19] This result is consistent with the hypothesis that some switching is anticipated at the time of the offer and reflected in the spreads.[20]

It is interesting to note that the mean IPO percentage underpricing for firms that do not make subsequent offers is greater than the mean underpricing of firms that make subsequent offers. This difference is not, however, statistically significant (at the 0.10 level).[21] The mean percentage underpricing is larger for firms that make subsequent offers of equity than for firms that do not make security offerings, but the difference is not statistically significant at the 0.10 level.

The second test of the existence of setup costs involves examining the determinants of the underwriter's spread in IPOs. In particular, I estimate a model in which the percentage spread in the IPO (i.e., the ratio of the dollar spread per share to offer price) is assumed to be a function of: (1) the size of the offering, (2) the offer price, (3) the Carter-Manaster rank of the underwriter, (4) whether the firm makes a subsequent equity issue during the period from the IPO through 1988, and (5) a set of variables designed to proxy for differences in firm risk. The percentage underwriter spread is used as a dependent variable to measure the underwriting expenses per dollar of external funds raised.

I measure firm risk by the age of the firm in years. The asset size of the company and the standard deviation of the firm's common stock returns in the aftermarket are also used as proxies for firm risk (but are not reported). The results using these proxies do not differ substantially from those reported in the text.

[18] The t-statistic for the difference in means test is 4.85. The χ^2 statistic for the difference in medians test is 18.74.

[19] The difference in medians is statistically significant at the 0.05 level.

[20] It is interesting to note that the mean percentage spread for firms that issue warrants in their IPO is significantly larger than the mean percentage spread for firms that do not issue warrants (see footnote 12). One explanation for the higher percentage spread when warrants are issued is that these firms are not expected to make subsequent offers using an underwriter and are therefore not provided an initial engagement discount.

[21] The lack of a significant difference is unsupportive of the arguments made by Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989) and (indirectly) by Ibbotson (1975) that firms have an incentive to underprice more if they anticipate making a future seasoned offering. For example, in the context of Allen and Faulhaber (1989), IPO underpricing is assumed to affect investor's beliefs about firm prospects. Benefits arise from underpricing if investors' reevaluations of the firm based on subsequent events depends on investors' priors concerning firm type.

I include measures of firm risk in the empirical model of IPO spreads for two reasons. First, the greater the uncertainty concerning firm value, the greater the risk borne by underwriters in a firm commitment offer. Therefore, a positive relation is expected between spreads and measures of uncertainty concerning firm value. Second, one potential explanation for lower underwriter spreads for firms that subsequently issue is that there is less uncertainty concerning the value of these firms at the time of the IPO. As a result, even without economies of repeat dealings, firms that are more likely to issue may have lower spreads.

In the cross-sectional analysis of IPO spreads, I initially assume perfect foresight concerning subsequent equity offerings, so that for firms that subsequently issue equity, the probability of issue at the time of the IPO is assumed to equal 1 and for firms that do not issue equity, the probability of issue is assumed to equal zero.[22] To test whether repeat issuers are provided a discount in terms of underwriter fees, I estimate the following model:

$$\begin{aligned}\text{PSpread}_{1j} = {} & \alpha_1 + \alpha_2 \text{IssueE}_j + \alpha_3 \text{LAmount}_j + \alpha_4 \text{Age}_j + \alpha_5 \text{Rank}_j \\ & + \alpha_6 (1/\text{Price}_j) + \varepsilon_j, \end{aligned} \tag{4}$$

where

PSpread_{ij} = ratio of the per share dollar spread in IPO to offer price for firm j,
IssueE_j = 1 if the firm issues equity subsequent to the IPO, zero otherwise,
LAmount_j = the natural logarithm of the size of the offer (in thousands of dollars),
Age_j = the age of the firm (in years),
Rank_j = the Carter-Manaster rank of the underwriter used in the IPO, and
Price_j = offer price in IPO.

Equation (4) is also estimated by replacing IssueE with a binary variable, NoSwitch, which equals one if the firm issues public securities and does not switch lead underwriters, zero otherwise.

The results of estimating equation (4) are reported in Panels A and B of Table III. Consistent with the hypothesis of an initial engagement discount for repeat issues, I find a negative and statistically significant (at the 0.10 level) relation between the spread in the IPO and subsequent equity issues. The coefficient on IssueE implies that controlling for offer characteristics the percentage spread is 0.2 percentage points lower for firms that make subsequent issues.

Estimates of equation (4) that account for underwriter switching are reported in Panel B. The coefficient on the binary variable NoSwitch is negative and statistically significant at the 0.05 level. The results reported in

[22] Whether the firm actually issues is assumed to be a proxy for probability of issuing again at the time of the IPO.

Table III

Estimate of the Relation Between Percentage Underwriter Spreads in IPOs and Subsequent Securities Offerings for a Sample of Firms Making IPOs During 1980 through 1983

The dependent variable in each regression in Panels A and B is the ratio of underwriter per share dollar spread to offer price in the IPO. IssueE equals one if the firm makes a subsequent equity issue, zero otherwise. LAmount is the natural log of the offer size calculated by multiplying the offer price by the number of shares issued in the IPO. Age is the age of the firm at the time of its IPO. Rank is the Carter-Manaster rank of the underwriter ranging from 9 for the most prestigious underwriter to 0 for the least prestigious underwriter. Price is the IPO offer price. NoSwitch is a binary variable that equals one if the firm makes a subsequent issue and does not switch lead underwriters, zero otherwise. (Data are from *Moody's Manuals*, the *Investment Dealers Digest* and Ritter's IPO data base.)

Panel A: Dependent Variable: Ratio of IPO Per Share Dollar Spread to Offer Price

Variable	Intercept	IssueE	LAmount	Age	Rank	1/Price
Estimate	0.136	−0.002	−0.006	−0.001	−0.001	0.023
t-Statistic	(29.14)	(−1.93)	(−10.65)	(−1.96)	(−6.67)	(7.73)
$R^2 = 0.56$		$F = 117.0$		Number of Observations: 492		

Panel B: Dependent Variable: Ratio of IPO Per Share Dollar Spread to Offer Price

Variable	Intercept	NoSwitch	LAmount	Age	Rank	1/Price
Estimate	0.136	−0.003	−0.006	−0.001	−0.001	0.023
t-Statistic	(29.27)	(−2.11)	(−11.21)	(−2.10)	(−5.94)	(7.88)
$R^2 = 0.56$		$F = 115.0$		Number of Observations: 492		

Table III are consistent with the hypothesis that the spreads in IPOs reflect an initial engagement discount as predicted by models of pricing with setup costs. The estimated coefficients on the probability of repeat dealings, reported in Table III, suggest that the initial engagement discount results in a percentage spread that is 0.3 percentage points lower for switchers than for non-switchers. This represents 5 percent of the mean IPO underwriting spread.

Consistent with results reported by Bhagat and Frost (1986) and others, I find, for both specifications, a negative relation between the underwriter's spread and the total size of the offer. I also find a positive relation between underwriting spreads and firm risk as measured by age of the company.

The analysis reported in Table III is based on the assumption that subsequent offering experience provides a measure of issue probability at the time of the offering. An alternative approach is to estimate the probabilities of issuing and continuing with the same underwriter based on firm characteristics at the time of the IPO.

I assume that the probability of repeat business (i.e., issuing equity and using the same underwriter) is related to (1) growth of sales revenues of the company in the three years prior to the IPO, (2) the natural logarithm of size of the original offer, (3) the age of the firm at the IPO, (4) the book equity of the firm at the time of the IPO, and (5) the lead underwriter used in the IPO.

Growth in sales is included to account for demand for external funds. In particular, faster growing firms are assumed to be more likely to issue securities. Growth in sales is measured as the continuously compounded growth rate in sales revenue over the three years prior to the IPO. Data on sales growth are from Ritter's data base (through 1982) and *Moody's*.[23]

The natural logarithm of the dollar value of the IPO (LAmount) is included because size of the offering may be related to the probability that the firm survives and therefore issues again. Age of the company is included because firms with longer operating histories are more likely to survive and issue in the future. Alternatively, the older the firm at the time of the IPO, the less frequent its needs for external financing and the less likely it will issue securities.

Book equity is the book value of equity at the time of the IPO, and is another proxy for the firm's ability to generate funds internally.[24] A firm with larger book equity prior to its IPO is expected to be less reliant on external financing and, therefore, less likely to have a subsequent issue.

The final explanatory variable included in the logit model is National, which equals 1 if a national underwriter is used (ranked greater than or equal to 6), zero otherwise.[25] There are two reasons why firms that expect to issue equity again may be more likely to use a national underwriter than firms that do not make subsequent offers. First, national underwriters are assumed to be more likely to have a continuing presence in the underwriting market (for example, because of their size) than regional underwriters. If this assumption is correct, firm-specific capital is less likely to be lost when a national underwriter is used (this advantage will be reflected in the spread the underwriter charges in the IPO). Second, national underwriters, because of their size, may have a comparative advantage in underwriting relatively large offers. As a result, firms that anticipate making a large subsequent offer may select a national underwriter (see Section III.*C* below).

Estimates of the logit model are contained in Panel A of Table IV.[26] I find a positive and statistically significant relation between the probability of con-

[23] The growth rate in sales is computed as

$$\text{Growth Sales} = \tfrac{1}{2}[\log(\text{Sales}_{t-1}) - \log(\text{Sales}_{t-3})]$$

where Sales_{t-1} = sales revenues in the year prior to the IPO. For firms without sales data, sales growth is set equal to zero.

[24] Marsh (1982) uses book equity to forecast equity issues.

[25] This rank was chosen because it corresponds to the division between regional underwriters (those located outside New York City) and national underwriters (those located within New York City). This classification is contained in Ritter's comprehensive IPO data base.

[26] The mean estimated probability of continuing with the same underwriter (PNoSwitch) for firms that make subsequent equity offers with the same underwriter is 0.26. In contrast, the mean value of PNoSwitch for firms that do not make subsequent offers or switch lead underwriters' in subsequent offers is 0.14. If one assumes the cost of misclassifications are equal, a classification probability of 0.27 minimizes the sum of Type I and Type II errors. Using this classification probability, the model misclassifies 9 percent of the issuing firm as non-issuers (or switchers) and 15 percent of the non-issuers (or switchers) as having a continuing relationship.

Table IV

Estimate of the Relation Between Percentage Underwriter Spreads in IPOs and Estimated Probability of Subsequent Securities Offerings for a Sample of Firms Making IPOs During 1980 through 1983

Panel A contains the estimate of a logit model relating the likelihood of subsequent equity issues underwritten by the same underwriter used in the IPO to firm characteristics at the time of the IPO. Panel B contains an estimate of the relation between IPO spreads and the probability of issuing (using estimates from Panel A). NoSwitch is a binary variable that equals one if the firm makes a subsequent issue and does not switch lead underwriters, zero otherwise. LAmount is the natural log of the offer size calculated by multiplying the offer price by the number of shares issued in the IPO. National is a binary variable that equals one if a national underwriter was used in the IPO, 0 otherwise. Age is the age of the firm at the time of its IPO. Growth in Sales is the continuously compounded growth in sales revenues for the three-year period prior to the IPO. BookEquity is the book value of equity at the time of the IPO (in thousands). PNoSwitch is an estimate of the probability, obtained from a logit model, of an equity offer using the same lead underwriter. Rank is the Carter-Manaster rank of the underwriter ranging from 9 for the most prestigious underwriter to 0 for the least prestigious underwriter. Price is the IPO offer price. (Data are from *Moody's Manuals*, the *Investment Dealers Digest*, and Ritter's IPO data base.)

Panel A: Dependent Variable: NoSwitch Equals 1 if Firm Makes Subsequent Equity Offer With Same Underwriter, 0 Otherwise.

Variable	Intercept	LAmount	National	Age	Growth in Sales	BookEquity
Estimate	−5.18	0.32	1.34	−0.04	−0.08	−2.08 E-5
t-Statistic	(−3.60)	(1.96)	(4.31)	(−1.98)	(−1.99)	(−1.25)
pseudo-R^2 = 0.56		Number of Observations: 502				

Panel B: Dependent Variable: Ratio Per Share Dollar Spread in IPO to Offer Price

Variable	Intercept	PNoSwitch	LAmount	Age	Rank	1/Price
Estimate	0.127	−0.010	−0.004	−0.001	−0.001	0.020
t-Statistic	(25.43)	(−2.42)	(−7.36)	(−2.74)	(−7.33)	(6.87)
R^2 = 0.59		F = 126.3		Number of Observations: 492		

[a] The pseudo-R^2 equals $c/n + c$ where c is the χ^2 statistic calculated from the likelihood ratio and n is the number of observations (n). See Aldrich and Nelson (1984).

tinuing with the same underwriter (NoSwitch) and (1) the size of the IPO, and (2) the use of a national underwriter. The probability of a continuing relationship is negatively related to growth in sales revenue and company's age at the time of the IPO.[27]

I re-estimated the model given by equation (4) replacing the binary variable NoSwitch with the continuing relationship probability calculated using the coefficient estimates from the logit model. The results reported in Table IV indicate a negative and statistically significant (at the 0.02 level) relation between underwriter spreads and the probability of a continuing

[27] Similar results are obtained when IssueE is used as the dependent variable and if issue size, as opposed to the natural log of issue size, is included as a variable in the spread regression.

relationship. This result is consistent with the hypothesis that the underwriter's spread in IPOs reflects an initial engagement discount.

C. Related Issues: The Determinants of Repeat Business and Switching

The preceding analysis examined the likelihood of a continuing relationship based on characteristics that are observable at the time of the IPO. An examination of the determinants of switching using information from after the IPO can provide additional insights into the importance of setup costs in underwriting relationships. For example, the existence of a durable relationship-specific asset that depreciates implies that the cost of switching declines during the time from the IPO to subsequent offerings. As a result, one would expect that the greater the time between the IPO and subsequent offers, the more likely firms are to switch underwriters.

Switching may also be a function of the type of underwriter used in the IPO. In particular, suppose that in the IPO a small regional investment banker is used to underwrite a small offering. In addition, suppose that the seasoned offering is large relative to the IPO. If national underwriters have a cost advantage in underwriting relatively large issues, then firms that use regional underwriters in their initial offering and make large seasoned offerings will be more likely to switch.

To examine this issue, I estimated the relationship between the Carter-Manaster underwriter rank and the offer size for the IPOs in my sample. I then used this estimated relationship to forecast underwriter rank in the seasoned offering based on the amount of the seasoned offering. Next, for firms that used regional underwriters for the IPO (underwriters ranked less than 6), I compared the forecasted rank of the underwriter to the rank of the underwriter in the IPO. I constructed a variable ERank which equals 1 if the forecasted underwriter rank for these firms is greater than or equal to 6, zero otherwise. I expect a positive relation between the probability of switching and ERank.

The third factor affecting switching is the performance of the underwriter in the IPO. Beatty and Ritter (1986) find that changes in underwriter market shares in the IPO market are related to the degree of underpricing. In particular, underwriters whose offerings have average initial returns that differ substantially from the initial returns expected, based on the offering firm's characteristics, lose market share. Beatty and Ritter's finding suggests a relationship exists between the probability of switching and IPO underpricing. In particular, the loss of underwriter market share may be reflected in firms using different underwriters in subsequent offers (because the original underwriter goes bankrupt, loses reputation with investors, etc.). Alternatively, firms may switch underwriters if the IPO underwriter underprices too much and thus leaves too much money "on the table." For these reasons, the likelihood of changing underwriters in subsequent offerings is expected to be positively related to the absolute value of the difference between the actual amount of underpricing and the expected level of underpricing.

Previous studies of IPO underpricing find that the degree of IPO underpricing is related to measures of ex ante uncertainty. Measures of ex ante uncertainty used in prior studies include: the size of the offering, the number of risk factors listed in the prospectus, the age of the company at the time of the IPO, the rank of the underwriter, whether the firm has bank loans or long-term debt outstanding at the time of the IPO, and whether the IPO occurs during a "Hot" issues market (see Beatty and Ritter, Carter and Manaster, Muscarella and Vetsuypens (1988), and Ritter (1984) for empirical evidence on the determinants of IPO underpricing).

I use these measures of ex ante uncertainty to estimate the expected level of IPO underpricing. Specifically, I regress the initial IPO return on these measures of ex ante uncertainty. Next, I calculate the residuals from the regression estimates. I assume that the probability of switching is greater the greater the absolute value of the residuals from the regression.

Finally, the likelihood of switching is assumed to be a function of the investment in relationship-specific capital required (K_1 in equation (1)). I assume that the investment required is increasing in the demand for certification. The demand for certification is in turn assumed to be a function of the degree of uncertainty in the firm's prospects at the time of the IPO. I assume (as do Muscarella and Vetsuypens (1988)) that the age of the company is a proxy for the degree of uncertainty at the time of the IPO. The greater the age of the company at the time of the IPO, the lower the demand for certification (therefore, the smaller is K_1) and the more likely the firm will switch underwriters in a subsequent IPO.

Based on the preceding discussion, I estimate the following logit model:

$$\text{Switch}_i = \alpha_1 + \alpha_2 \text{Timeto}_i + \alpha_3 |\text{Res}_i| + \alpha_4 \text{ERank}_i + \alpha_5 \text{Age}_i, \qquad (5)$$

where

Switch = 1 if firm switches lead underwriters in first seasoned offering, zero otherwise,
Timeto = time (in months) from IPO to seasoned equity offering,
|Res| = absolute value of the residuals from IPO underpricing model,
ERank = 1 if firm used a regional underwriter in IPO and made a large seasoned offering, zero otherwise, and
Age = age of the firm at IPO, in years.

Table V provides the results of the empirical analysis. Panel A in Table V provides an estimate of the relationship between the rank of the underwriter and the size of the IPO (Offersize). As expected, the rank of the underwriter is positively related to the size of the IPO offering. The estimated coefficients from this regression are used to forecast the rank of the underwriter in the seasoned offering. I construct a binary variable, ERank, which is equal to one if the firm used a regional underwriter for its IPO and the forecast rank of the underwriter in the seasoned offering is greater than or equal to 6, zero otherwise.

Table V

Determinants of Firms Changing Underwriters in Seasoned Equity Offerings in an 8-Year Period Following an IPO

Panel A contains an estimate of the relationship between Carter-Manaster underwriter rank and IPO offer size. Carter-Manaster rankings range from 9 (most prestigious) to 0 (least prestigious). Offersize equals the number of shares issued times the offer price (in thousands of dollars). Panel B contains estimates of the determinants of IPO underpricing. Return is the initial return measured by the change from offer price to the first closing price in the secondary market. DebtDum is a binary variable that equals one if the firm has long-term debt or bank loans outstanding at the time of the IPO, zero otherwise. Age is the number of years from incorporation to the IPO. Hot is a dummy variable for the hot issues IPO market of 1980. RSKF is the number of risk factors listed in the prospectus and is from Ritter's IPO data base. Panels C and D contain estimates of logit models of the probability of switching underwriters. Switch equals 1 if the firm switched lead underwriters in the subsequent equity offer. Res and |Res| equal the residuals and absolute value of the residuals from the IPO underpricing model (Panel B). Timeto is the time from IPO to subsequent offer in months. ERank equals 1 if the firm used a regional underwriter for its IPO and the size of the seasoned offering would predict, based on the model estimated in Panel A, that a national underwriter will be used for the seasoned offering. Data are from the IPO offering prospectus, *Moody's Manuals*, and Ritter's IPO data base. (t-Statistics are in parentheses.)

Panel A: Relation Between Underwriter Rank and IPO Offer Size

$$\underset{}{\text{Rank}} = \underset{}{5.62} + \underset{}{3.92\text{ E-5 Offersize}}$$
$$\qquad\quad (2.30)\quad (3.87)$$
$$R^2 = 0.09 \quad N = 520$$

Panel B: Estimates of IPO Underpricing

$$\text{Return} = 0.35 - 2.64\text{ E-07 Offersize} - 0.01\text{ Rank} - 0.002\text{ Age} - 0.19\text{ DebtDum} + 0.15\text{ Hot} - 0.004\text{ RSKF}$$
$$\qquad\quad (7.57)\quad (-0.32)\qquad\quad (-1.62)\qquad (-1.76)\qquad (-4.35)\qquad\quad (3.16)\qquad (-1.56)$$
$$R^2 = 0.11 \quad N = 434$$

Panel C: Logit Model of the Probability of Switching (All Equity Offers)

$$\text{Switch} = -5.96 + 6.88|\text{Res}| + 0.109\text{ Timeto} + 2.24\text{ ERank} + 0.085\text{ Age}$$
$$\qquad\quad (-4.12)\quad (2.66)\qquad\quad (3.42)\qquad\quad (2.20)\qquad\quad (1.49)$$
$$\text{Pseudo-}R^2 = 0.49 \quad N = 72$$

Panel D: Logit Model of the Probability of Switching

$$\text{Switch} = -3.18 + 1.03\text{Res} + 0.084\text{ Timeto} + 2.05\text{ ERank} + 0.05\text{ Age}$$
$$\qquad\quad (-4.18)\quad (1.56)\qquad\quad (3.09)\qquad\quad (2.10)\qquad\quad (0.98)$$
$$\text{Pseudo-}R^2 = 0.38 \quad N = 72$$

Panel B of Table V provides the estimate of the IPO underpricing model. Consistent with the results of previous studies, I find a negative and statistically significant relationship between IPO underpricing and (1) the age of the company (measured in years), and (2) whether the firm has debt outstanding at the time of the offering (Debtdum). I find a positive and statistically significant relation between IPO underpricing and whether the IPO occurred during 1980 (a "Hot" issues market). I find no statistically significant relation between the IPO underpricing and the size of the offering (Offersize), rank of the underwriter (Rank) or the number of risk factors listed in the prospectus.[28]

Panel C of Table V provides an estimate of the logit model of the underwriter switching. The t-statistics reported in Table V are calculated using the asymptotic standard errors of the logit regression.[29] Consistent with the hypothesis of depreciable relationship-specific assets, I find a positive relationship between the likelihood of switching and the time from IPO to the seasoned offering.

IPO underpricing is also related to the probability of switching. In particular, the probability of switching is positively related to the absolute value of the residuals from the underpricing model (although it is significant only at the 0.05 level). Finally, the positive coefficient on ERank is consistent with the hypothesis that national underwriters (i.e., highly ranked underwriters) have a comparative advantage in underwriting relatively large issues. In particular, switching is more likely to occur when firms that use regional underwriters for the IPO make relatively large subsequent offers.

Panel D of Table V provides an estimate of the logit model using the residuals of the underpricing model (and not their absolute value). While the estimated coefficient is positive, it is not statistically significant. This result, together with the results in Panel C, suggests that issuers are no more likely to change underwriters if they are underpriced too much than if they are underpriced too little in the IPO.

[28] The correlations among these risk factors are:

	Hot	Age	DebtDum	Rank	LAmount
Hot	1				
Age	−0.07	1			
Debtdum	−0.11	0.16	1		
Rank	−0.04	0.15	0.22	1	
LAmount	−0.08	0.15	0.18	0.47	1

[29] To investigate the sensitivity of the results to the use of asymptotic standard errors, I obtained estimates of the standard errors for each of the coefficient estimates using a bootstrap procedure described in Jeong and Maddala (1992), and Efron and Gong (1988). The bootstrap procedure involved constructing a bootstrap sample from the original sample by randomly selecting with replacement observations from the original sample. The logit model is then estimated 1,000 times using random bootstrap samples of 72 observations. Estimates from these logit models are used to calculate bootstrap standard errors for the coefficient estimates reported in Table V Panel C. The t-statistics computed using bootstrap standard errors are generally higher than the t-statistics generated using asymptotic standard errors. In particular, the t-statistics calculated using the bootstrap standard errors for the coefficient estimates on |Res|, Timeto, ERank and Age are 3.05, 4.82, 1.98 and 1.59, respectively.

IV. Conclusions

This paper examines whether underwriter spreads or fees in IPOs exhibit a pattern consistent with the existence of relationship-specific assets or "setup" costs. Relationship-specific assets can create switching costs for subsequent securities offerings. Because of these switching costs, firms that expect to make subsequent equity offerings should receive engagement discounts in the form of lower underwriter spreads in their IPOs than firms that are not expected to make subsequent offers with the same underwriter. My examination of underwriter spreads in IPOs provides evidence consistent with the hypothesis that switching costs arise from relationship-specific assets. In particular, I find that underwriter spreads are significantly lower in IPOs when firms issue equity subsequent to their IPO and continue with the same underwriter than when firms do not continue with the same underwriter or do not issue again.

My analysis of the determinants of switching underwriters provides evidence consistent with the hypothesis that relationship-specific assets associated with underwriting depreciate through time. In particular, if relationship-specific capital depreciates, the likelihood of switching lead underwriters will increase with the time from the IPO to subsequent offer. Controlling for firm and underwriter characteristics, I find a positive and statistically significant relation between the probability of switching and the time between the IPO and the seasoned offering.

Overall, my results indicate the relationship-specific capital and the prospect of repeat dealings significantly affect the structure of investment banking fees in the IPO market.

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