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Evidence of Early-Mover Advantages in Underwriting Spreads

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Abstract

I use a sample of 2370 public security offerings, comprising 64 financial security innovations and 4 traditional securities, to examine how investment banks are compensated for bearing underwriting risks related to new product development. I find strong evidence that underwriting fees decline as the innovation is widely adopted and competition enters the market, suggesting that underwriters be compensated for the additional risk associated with innovative securities. The data also reveal that underwriters seek greater compensation for security features that increase price volatility, which is consistent with the notion that underwriters value their position as a put option on the security. Finally, the inverse relationship between underwriting spreads and underwriter prestige suggests that larger, more reputable underwriters experience economies of scale.

Key words: early-mover advantages, underwriting spreads, innovations, corporate securities

Innovative securities play a major role in our security markets. Between 1974 and 1986, corporations raised almost $280 billion in capital through public offerings of 58 financial innovations (Tufano, 1989). Although innovative investment banks put their reputations on the line and often make significant ''risky'' investments when developing innovative securities, imitators can take a free ride on innovators' developing costs and some of the investment in educating regulators, issuers, and investors. For these reasons, Van Horne (1985), Ross (1989), and Amihud and Mendelson (1988) hypothesize that underwriting spreads should decline as more competition enters the market and as a financial product becomes standardized. Despite these arguments, Tufano (1989) finds no evidence of declining underwriting spreads as competition increases. Tufano shows that innovative investment banks are more prestigious firms and gain a significant market share in the products they innovate. Tufano posits that, by charging lower prices, derived from potential economies of scale, innovators gain a large and valuable market share. A greater market share may compensate the innovator for its risk, but early imitators also incur information costs and liquidity risk. If these costs are significant, underwriting spreads should decline as the security becomes more standardized.

Using a sample of 64 innovative debt and preferred stock securities and a control sample of 4 traditional securities, I test for early-mover advantages in underwriting spreads after controlling for security features and underwriter reputation. For security features that decrease price volatility, I document that underwriters seek less compensation, which is consistent with the notion that underwriters value their position as a put option on the

security. For more prestigious underwriters, I document lower spreads, which suggests that larger, more reputable underwriters experience greater economies of scale. Finally, and most important, after controlling for security features and investment bank prestige, I show that underwriting spreads decrease significantly as more rival investment banks enter the market.

This study's findings differ from those of Tufano (1989). Tufano does not find evidence of decreasing underwriting spreads as more rival banks enter the market. This difference is due to incorporating additional control variables for security features and underwriter reputation, which Johnson and Miller (1988), Carter and Dark (1990), and Becker and Long (1997) show to be significant in explaining underwriting spreads. Based on Tufano's findings, there is evidence that the hypothesis variable may be correlated with the omitted control variables. An omitted variable can bias the estimated coefficient of any variable correlated with the omitted variable (Greene, 1990, pp. 259–263). After controlling for this potential bias, I find that underwriting spreads decline as the number of rival investment banks in a new security increases.

The remainder of this paper is organized as follows. In the next two sections, I identify the features of financial innovations, analyze the fixed and variable components of underwriting spreads, review the process and risks involved in underwriting innovative securities, develop my primary hypotheses, and present how omitting relevant variables biases a coefficient. I describe my sample of corporate security offerings in the third section. In the fourth section, I present the empirical model and examine the empirical results, which document declining underwriting spreads as competition enters the market. Finally, a discussion of my findings concludes the paper.

1. Innovative securities

Innovative securities differ from existing securities in that they include characteristics or features not previously packaged as a single security. For this sample of 68 security types, the 12 distinguishing features are (1) classification as a bond or preferred stock, (2) conversion into common stock, (3) adjustable interest rate, (4) auction rate reset process, (5) remarketed rate reset process, (6) puttable provision, (7) discount feature, (8) reset provision, (9) exchangeable into another security (not common stock), (10) denominated in a foreign currency but issued in the U.S. domestic market, and (11) based on a commodity index or (12) a capital security.[1] The first two features are considered traditional features, existing prior to 1974. The other 10 features are innovative, first used subsequent to 1974. For each of the 64 innovative securities, I list their features and a feature description in table 1.[2]

2. Underwriting spreads

Underwriters serve as intermediaries in the security issue process, providing three basic services to the issuer: (1) designing and timing the security issue, (2) underwriting the risk involved in issuing the security, and (3) making a market for the issue (Mandelker and

Table 1. Features of securities

	Preferred Stock[a]	Bond[b]	Convertible[c]	Adjustable[d]	Auction Rate[e]	Remarket[f]	Puttable[g]	Discount[h]	Reset[i]	Exchangeable[j]	Foreign Denominated[k]	Commodity Linked[l]	Capital[m]
Floating rate notes													—
Puttable (Treasuries)	—	Yes	—	Yes	—	—	Yes	—	—	—	—	—	—
Not puttable	—	Yes	—	Yes	—	—	—	—	—	—	—	—	—
Convertible	—	Yes	—	Yes	—	—	—	—	—	Yes	—	—	—
Stepped coupon	—	Yes	—	Yes	—	—	—	—	—	—	—	—	—
Collar	—	Yes	—	Yes	—	—	—	—	—	—	—	—	—
Maximum	—	Yes	—	Yes	—	—	—	—	—	—	—	—	—
LIBOR	—	Yes	—	Yes	—	—	—	—	—	—	—	—	—
Extendible	—	Yes	—	Yes	—	—	Yes	—	—	—	—	—	—
Exchangeable	—	Yes	—	Yes	—	—	—	—	—	Yes	—	—	—
Capital	—	Yes	—	Yes	—	—	—	—	—	—	—	—	Yes
Inverse	—	Yes	—	Yes	—	—	—	—	—	—	—	—	—
New Zealand denominated	—	Yes	—	Yes	—	—	—	—	—	—	Yes	—	—
Auction rate	—	Yes	—	—	Yes	—	—	—	—	—	—	—	—
Australian denominated	—	Yes	—	Yes	—	—	—	—	—	—	Yes	—	—
CPI indexed	—	Yes	—	Yes	—	—	—	—	—	—	—	—	—
Rating sensitive	—	Yes	—	Yes	—	—	—	—	—	—	—	—	—
Floating/fixed	—	Yes	—	Yes	—	—	—	—	—	—	—	—	—
Commodity indexed instruments													
Gas indexed	—	Yes	—	—	—	—	—	—	—	—	—	Yes	—
Silver indexed	—	Yes	—	—	—	—	—	—	—	—	—	Yes	—
Oil indexed	—	Yes	—	—	—	—	—	—	—	—	—	Yes	—
Volume indexed	—	Yes	—	—	—	—	—	—	—	—	—	Yes	—
Exchange rate indexed	—	Yes	—	—	—	—	—	—	—	—	—	Yes	—
Market indexed	—	Yes	—	—	—	—	—	—	—	—	—	Yes	—
Gold indexed	—	Yes	—	—	—	—	—	—	—	—	—	Yes	—
Foreign currency denominated (fixed rate)													
Yen	—	Yes	—	—	—	—	—	—	—	—	Yes	—	—
European currency unit	—	Yes	—	—	—	—	—	—	—	—	Yes	—	—
English pound	—	Yes	—	—	—	—	—	—	—	—	Yes	—	—
Australian	—	Yes	—	—	—	—	—	—	—	—	Yes	—	—
New Zealand	—	Yes	—	—	—	—	—	—	—	—	Yes	—	—
Canadian dollar	—	Yes	—	—	—	—	—	—	—	—	Yes	—	—
Danish kroner	—	Yes	—	—	—	—	—	—	—	—	Yes	—	—

Table 1. (continued)

	Preferred Stock[a]	Bond[b]	Convertible[c]	Adjustable[d]	Auction Rate[e]	Remarket[f]	Puttable[g]	Discount[h]	Reset[i]	Exchangeable[j]	Foreign Denominated[k]	Commodity Linked[l]	Capital[m]
Equity linked bond instruments													
Exchangeable bonds	—	Yes	Yes	—	—	—	—	—	—	—	—	—	—
Convertible discount	—	Yes	Yes	—	—	—	—	Yes	—	—	—	—	—
Puttable convertible	—	Yes	Yes	—	—	—	Yes	—	—	—	—	—	—
Equity notes	—	Yes	Yes	—	—	—	—	—	—	—	—	—	—
Convertible exchangeable	—	Yes	Yes	—	—	—	—	—	—	Yes	—	—	—
Convertible capital	—	Yes	Yes	—	—	—	—	—	—	—	—	—	Yes
Convertible floating rate notes	—	Yes	Yes	Yes	—	—	—	—	—	—	—	—	—
Adjustable rate convertible	—	Yes	Yes	Yes	—	—	—	—	—	—	—	—	—
Liquid yield option notes	—	Yes	Yes	—	—	—	Yes	Yes	—	—	—	—	—
Other fixed rate nonconvertible bonds													
Capital	—	Yes	—	—	—	—	—	—	—	—	—	—	Yes
Puttable fixed rate	—	Yes	—	—	—	—	Yes	—	—	—	—	—	—
Zero coupon	—	Yes	—	—	—	—	—	Yes	—	—	—	—	—
Original issue discount	—	Yes	—	—	—	—	—	Yes	—	—	—	—	—
Extendible	—	Yes	—	—	—	—	Yes	—	—	—	—	—	—
Zero coupon capital	—	Yes	—	—	—	—	—	Yes	—	—	—	—	Yes
Reset	—	Yes	—	—	—	—	—	—	Yes	—	—	—	—
Remarketed reset	—	Yes	—	—	—	Yes	—	—	Yes	—	—	—	—
Zero/coupon paying	—	Yes	—	—	—	—	—	Yes	Yes	—	—	—	—
Extendible reset	—	Yes	—	—	—	—	Yes	—	—	—	—	—	—
Stepped coupon	—	Yes	—	—	—	—	—	—	—	—	—	—	—
Floating rate preferred stock													
Treasuries	Yes	—	—	Yes	—	—	—	—	—	—	—	—	—
Convertible	Yes	—	Yes	Yes	—	—	—	—	—	—	—	—	—
Auction rate	Yes	—	—	—	Yes	—	—	—	—	—	—	—	—
LIBOR	Yes	—	—	Yes	—	—	—	—	—	—	—	—	—
Commercial paper	Yes	—	—	Yes	—	—	—	—	—	—	—	—	—
Exchangeable auction	Yes	—	—	—	Yes	—	—	—	—	Yes	—	—	—
Remarketed	Yes	—	—	—	—	Yes	—	—	—	—	—	—	—
Exchangeable	Yes	—	—	Yes	—	—	—	—	—	Yes	—	—	—
Convertible auction	Yes	—	Yes	—	Yes	—	—	—	—	—	—	—	—
Exchangeable remarketed	Yes	—	—	—	—	Yes	—	—	—	Yes	—	—	—
Other fixed rate preferred													
Convertible exchangeable	Yes	—	Yes	—	—	—	—	—	—	Yes	—	—	—
Delayed preferred	Yes	—	Yes	—	—	—	—	—	—	—	—	—	—
Exchangeable	Yes	—	—	—	—	—	—	—	—	Yes	—	—	—

Raviv, 1977; Baron and Holstrom, 1980). The underwriter's primary compensation is the underwriting spread.

In this study, I focus on firm-commitment offerings, where underwriters incur a loss if the security's share price drops after the offering price is set. Furthermore, due to the National Association of Securities Dealers' (NASD) Rule of Fair Practice, if the security's price rises, the underwriter is prevented from selling it above the offering price. Given this constraint, the underwriter's position can be described as a combination of a fixed fee and a short position in a put option (Smith, 1977, 1979). As with any put option, the cost of this option is positively related to price volatility and inversely related to the exercise price, the time to expiration, and the risk-free rate. For underwriting spreads, the primary factor is the price volatility. In the following sections, I review how fixed costs, variable costs, and new product development costs affect underwriting spreads.

2.1. Fixed underwriting cost

Certain issuance costs are fixed regardless of offering size, implying the existence of economies of scale. Ederington (1975); Kidwell, Marr, and Thompson (1984); Foster (1989); and Tufano (1989) empirically document an inverse relationship between spreads and offering size.

Furthermore, Stoll (1976) and Johnson and Miller (1988) hypothesize that more experienced underwriters with a larger volume of business enjoy economies of scale permitting them to charge lower underwriting fees. As underwriters increase their market share and prestige, the fixed underwriting costs can be spread over a larger volume of

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Notes: Each security is listed along with the primary features of the security. For a description of the features, see the notes to this table.

[a]Preferred stock includes all innovative and traditional securities designated as preferred stock for tax purposes.

[b]Bonds include all innovative and traditional securities designated as debt.

[c]Convertible securities include all bonds and preferred stock that are convertible into common stock.

[d]Adjustable rate securities include all adjustable securities including auction rate and remarketed securities.

[e]Auction rate securities are securities whose rates are reset at the end of a prespecified period through a special auction process, where a firm is set in charge of accepting bids and determining the new interest rate level for the next period.

[f]Remarketed securities have their rates reset periodically by a prespecified agent, who determines the price at which these securities should sell at par value.

[g]Puttable securities give the investor the option to give the security back to the company at prespecified rates and times.

[h]Discount securities are sold below par value. For this sample, a security is considered a discount security if it originally was issued at less than 80% of par.

[i]Reset securities have a provision where the interest rate is reset according to some contractual time schedule.

[j]Exchangeable securities allow the investor to exchange one type of security for another. This is different from the conversion feature in that the security for which it may be exchanged is not common stock.

[k]Foreign denominated securities repay interest or principal in another currency or base the payment on the exchange rate prevailing on the date of payment.

[l]Commodity linked securities have an interest rate that varies over time, based on a given commodity.

[m]Capital securities give the issuer the option to repay the principal at maturity through an exchange of capital securities of equal market value.

offerings.[3] For equity offerings, Carter and Dark (1990) and Galloway (1994) document that more prestigious underwriters have lower underwriting spreads than less prestigious underwriters.

2.2. *Variable underwriting cost*

Underwriters assume the market risk associated with carrying an inventory of securities when they guarantee security offering proceeds. The greater is the security's price volatility, the greater is the risk that the price may drop below the offer price, resulting in a loss for the underwriter. Ederington (1975); Smith (1977); Kidwell et al. (1984); Foster (1989); and Tufano (1989) empirically document the inverse relationship between spreads and credit risk, suggesting that underwriters charge higher spreads for greater underwriting risk.

A security's price volatility also is dependent upon its features. Finnerty (1988) states that adjustable, auction rate, and remarketed securities are designed to reduce price volatility. Also, lowering agency or asymmetric information costs should reduce the riskiness of newly issued securities. Finnerty suggests that auction rate, remarketed, and reset features reduce agency costs through the dividend-reset process. Jensen and Meckling (1976) and Green (1984) show how convertible bonds may reduce the asset substitution problem. The put feature reduces price volatility by allowing the investor the right to sell the security to the issuer at a prespecified price. If a feature reduces a security's riskiness, it also will reduce the underwriter's inventory risk. Lower inventory risk should lead to lower underwriting spreads. Alternatively, preferred stock and securities with conversion, capital, or exchange features may introduce additional price risk since the security's price contains an equity component.[4] The discount feature increases risk by extending the securities duration. Assuming no hedging benefits for issuers, foreign currency-denominated and commodity-linked securities have greater risk due to linking the security's price to another asset.[5] Using a sample of six securities, Becker and Long (1997) show the importance of including security features when analyzing underwriting spreads. They find that informationally complex or tax-complex securities have higher spreads, while securities that reduce price risk have lower spreads.

2.3. *Security development*

Bloch (1989) describes the development of successful financial innovations that promote more competitive markets as a four-part sequence

1. Innovation
2. Imitation
3. Institutionalization
4. Internationalization

Financial innovation is a special sort of risk taking, involving ''the willingness to underwrite and trade a new type of security even though its return variance is yet untested in a market setting'' (Bloch, 1989, p. 81). Bloch states that the market can develop because, at inception, the margin is wide enough for both the innovator and the imitators. The profit margins are offset by the increased volume and the risk reduction implicit in a deepening marketplace. However, the displaced producers of traditional securities have no such compensation. Therefore, competitors, concerned about losing market share, follow the innovator in underwriting the new security.

Van Horne (1985), Finnerty (1988), and Lieberman and Montgomery (1988) also argue that profits from new products decline over time as competition enters the marketplace. Consistent with this hypothesis, Kidwell, Marr, and Thompson (1985, 1986) find decreasing underwriting spreads as Eurobonds become more seasoned. Lieberman and Montgomery suggest using the number of rival firms in the new product as a measure of increasing competition and product standardization. The clientele hypothesis, the learning curve hypothesis, the marketing hypothesis, or the liquidity hypothesis may explain early-mover advantages.

The clientele hypothesis posits a profit motivation for declining underwriting spreads. According to the clientele hypothesis a security appealing to a niche can attract funds at a cost below the market's required return on securities of comparable risk (Shapiro, 1990, pp. 504–505). The underwriter may share in these higher profits through higher spreads. Shapiro suggests that such a niche is only temporary.

Alternatively, the costs of issuing new securities may decline. Spence (1981) argues that cost savings may be passed on as firms learn more about a new product. Ross (1989) conjectures that the marketing costs of informing the issuer and investor about a new product's benefits decline as a security evolves and becomes a standardized product. The investment bank incurs the cost of presenting and marketing the new product for the issuer and demands compensation for these costs.

Similarly, the risk of issuing new securities may decline. Amihud and Mendelson (1988) hypothesize that standardized financial products have greater liquidity. Peters (1985) provides evidence of a reduction in price variance through time, implying increasing efficiency in new financial products. As with any new product, there always is the probability it will fail and thus become illiquid. Underwriters may demand compensation for the added inventory risk of holding a riskier security. However, as a security becomes more widely used, its liquidity increases, reducing its volatility and lowering underwriting spreads.

Using my sample of financial innovations and traditional securities, I test for early-mover advantages. Given the arguments to control for underwriter reputation (Carter and Dark, 1990; Galloway, 1994) and security features (Becker and Long, 1997), I include not only the control variables used by Tufano (1989) but also a series of 12 indicator variables for security features and 2 indicator variables for the underwriter's reputation.[6] The null hypothesis I test is

> The early-mover hypothesis: As competition increases in a new security market or the product becomes more standardized, the level of underwriting spreads charged by investment banks does not decrease, ceteris paribus.

Tufano (1989) hypothesizes that innovating investment banks may be able to build a premium in the pricing of underwriting spreads. The ability to charge a premium for their underwriting services may be due to greater experience (Schmalensee, 1982) or the ability to lock in customers who face switching costs (Klemperer, 1987). However, when Tufano tests this hypothesis, he finds evidence that pioneer underwriters actually charge lower underwriting spreads. Tufano posits that that the underwriter may be signaling a superior cost position through limit pricing (Milgrom and Roberts, 1982). I also test for a pioneer pricing strategy through the following null hypothesis.

> The pioneer hypothesis: The underwriting fees charged by the pioneer investment bank are not significantly different from the underwriting fees of imitating investment banks, ceteris paribus.

2.4. Biases related to omitting relevant variables

This is not the first study to test the early-mover or the pioneer hypothesis. While Tufano (1989) finds no evidence of the early-mover hypothesis, he finds that pioneers charge significantly lower underwriting spreads than rival investment banks. However, Tufano's study does not control for new security features or the underwriter's reputation.

The alternative model developed in this paper must include explanatory variables that, on theoretical grounds, directly influence the dependent variable and are not accounted for by other included variables. In addition to the variables incorporated in Tufano's paper, several subsequent studies have shown a need to incorporate several additional variables when analyzing underwriting spreads. Becker and Long (1997) show that more complex security structures increase underwriting spreads; however, security features that decrease volatility lower spreads. Johnson and Miller (1988), Carter and Dark (1990), and Galloway (1994) show that more prestigious underwriters charge lower spreads than less prestigious underwriters.

The consequences of using an incorrect set of independent variables fall into two categories: (1) omission of a relevant independent variable or (2) inclusion of an irrelevant variable. Judge et al. (1985, pp. 854–862) show that the consequences of omitting a variable include a biased estimate of the slope coefficients and the error variance. However, the slope coefficient remains unbiased and consistent and the error variance is correctly estimated if the model includes an irrelevant variable. The only penalty paid for including a superfluous variable is that the estimated variances of the coefficients are larger and, as a result, the probability inferences about the parameters are biased toward rejecting an otherwise significant variable.

Greene (1990, p. 259) shows that the bias from omitting a relevant variable is equal to the (cov[Included Variable, Omitted Variable]/var[Included Variable]).y, where y is the omitted variable's coefficient. I expect to observe a downward bias in the RIVALS coefficient. Tufano (1989) shows that prestigious underwriters dominate the innovation of new products and are quick to imitate the new products of other underwriters. Table 2 further supports this early movement of prestigious underwriters with evidence that

prestigous underwriters have a greater share of the innovative security market. Thus, I expect a positive covariance between prestige (BRACKET: 1 for greater prestige, 0 otherwise) and early movers (RIVALS: 1 for the innovator and declining to a value of 0.10 as more underwriters enter). Based on Carter and Dark (1990), the expected sign of the omitted variable's (BRACKET) coefficient is negative. PIONEER also is expected to have a downward bias. This is due to Tufano's evidence that more prestigious underwriters have pioneered more innovations (a positive covariance between BRACKET and PIONEER) and the evidence of a negative coefficient for more prestigious underwriters. A positive covariance multiplied by a negative coefficient shows that the expected direction of the bias is downward (negative). Thus, the omission of BRACKET implies a tendency to find a negative coefficient for PIONEER and RIVALS.[7]

The relation between FEATURE and the hypothesis variables is less tractible. Innovative securities have a feature not previously used. Since the number of rivals can only increase for innovative securities and a firm can only pioneer a security with a new feature, the RIVALS and PIONEER variables are positively correlated with the FEATURE variables. However, the direction of the bias is also related to the expected sign of the omitted variables. As shown in the section discussing variable underwriting costs, some of the security features are expected to increase underwriting spreads, while others are expected to decrease underwriting spreads. Without a consistent sign for the omitted variables, the direction of the bias for this group of variables cannot be determined prior to empirically testing the model.[8]

3. Sample design and description

I limit the sample to bond and preferred stock securities due to the homogeneity of these categories. Maintaining an adequate number of innovations, while increasing the homogeneity of the sample, provides an improved testing environment. Unlike asset- and mortgage-backed securities, the repayment of bond and preferred stock securities relies on the issuer and not the underlying asset pool. Also, unlike the factors used in explaining underwriting spreads of common stock, the factors used by prior studies to explain spreads for bonds and preferred stock are relatively homogeneous. Therefore, innovations included in this study are limited to bond or preferred stock securities

1. First publicly issued in the United States between January 1, 1974, and December 31, 1988, and
2. Identified in either the *Institutional Investor, Investment Dealer's Digest Directory of Corporate Offerings, Investment Dealer's Digest* weekly, or *Moody's* listing of "Corporate Bond Offerings."

From these sources, I obtain 1307 innovative securities. The underwriting spread, issue characteristics, file date, announcement date, and offering date are obtained from the primary sources as well as the *Wall Street Journal Index* and the Registered Offering Statistics (ROS) tape.[9] After eliminating securities with incomplete information, the final sample encompasses 1207 offerings.

Table 2. Innovative and traditional security (means by security category)

	Nonconvertible Bonds			Nonconvertible Preferred			Convertible Bonds			Convertible Preferred		
	Innov.	Trad.	*t*-Stat.	Innov.	Trad.	*t*-Stat.	Innov.	Trad.	*t*-Stat.	Innov.	Trad.	*t*-Stat.
Number of issues before reduction[a]	812	812		297	169		92	92		106	94	
Number of issues after reduction[a]	727	811		287	169		88	91		105	92	
Issue characteristics:												
Underwriting Spread	1.28	1.38	(−1.40)	2.06	2.57	(−3.51)**	2.89	2.71	(0.76)	3.93	5.19	(−4.94)**
Rating of the security												
Aaa	0.15	0.06	(6.57)**	0.33	0.01	(11.50)**	0.01	—		—	—	
Aa	0.20	0.24	(−1.79)	0.17	0.12	(1.41)	0.05	0.01	(1.66)	0.02	—	
A	0.30	0.35	(−2.22)*	0.26	0.24	(0.62)	0.16	0.07	(2.10)*	0.09	0.03	(1.84)
Baa	0.08	0.10	(−1.46)	0.12	0.28	(−4.08)**	0.14	0.20	(−0.98)	0.23	0.07	(3.10)**
Less than Baa	0.16	0.18	(−1.13)	0.06	0.26	(−5.46)**	0.42	0.50	(−-1.03)	0.55	0.47	(1.11)
Type of offering												
Shelf registration	0.43	0.45	(−0.60)	0.25	0.41	(−3.70)**	0.03	0.03	(0.00)	0.03	0.05	(−0.88)
Competitive Bid	0.02	0.00	(3.33)**	0.02	0.23	(−5.92)**	0.01	—		—	—	
Issuer characteristics:												
Industry												
Utility industry	0.02	0.04	(−1.31)	0.16	0.76	(−15.13)**	0.07	0.04	(0.65)	0.05	0.05	(−0.19)
Financial industry	0.46	0.46	(0.25)	0.62	0.09	(14.96)**	0.25	0.23	(0.34)	0.20	0.28	(−1.30)
Stock Listing												
NYSE	0.56	0.58	(−0.95)	0.57	0.63	(−1.24)	0.59	0.62	(−0.45)	0.75	0.46	(4.47)**
Amex	0.02	0.03	(−1.46)	0.01	0.02	(−0.65)	0.09	0.10	(−0.25)	0.08	0.12	(−0.99)
OTC	0.07	0.08	(−0.68)	0.07	0.04	(1.51)	0.17	0.24	(−1.09)	0.09	0.23	(−2.67)**
Size of offering and issuer												
Amount offered	131	141	(−1.13)	99	56	(7.18)**	76	60	(1.71)	82	58	(2.40)*
Equity value of issuer[b]	3,746	3,074	(1.86)	2,809	1,661	(2.67)**	900	450	(2.67)**	880	344	(3.42)**
Amount/equity value[b]	0.23	0.18	(0.86)	0.22	0.11	(1.74)	0.24	0.24	(0.11)	0.28	0.34	(−1.08)
Underwriter characteristics												
Bulge bracket firms[c]	0.63	0.62	(0.56)	0.68	0.44	(5.24)**	0.36	0.26	(1.44)	0.49	0.28	(3.18)**
Major bracket firms[d]	0.27	0.30	(−1.32)	0.28	0.38	(−2.38)*	0.47	0.36	(1.50)	0.34	0.38	(−0.63)

I also construct a control sample of ''traditional securities''. Including traditional securities provides the opportunity to compare traditional securities with no new features with the characteristics of nontraditional securities and their issuers. Furthermore, since it is hypothesized that a new security's liquidity increases with the security's standardization, comparison of innovative securities to standard traditional securities controls for the increased liquidity of standardized products. Controlling for firm and security characteristics, the liquidity of a new security should approach the liquidity of a traditional security as the product becomes more standardized.

I categorize securities as nonconvertible bonds, convertible bonds, nonconvertible preferred stock, and convertible preferred stock. Firms issuing innovative securities are randomly matched on a one-to-one basis within their product category with a firm issuing a traditional security in the same year as the innovative security's issuance.[10] Due to the dominance of innovative security issues in the nonconvertible preferred stock and convertible preferred stock markets, the control sample's size is smaller for these two groups than the number of innovative securities in the sample (see the first two rows of table 2 for the sample size by category). The sample of traditional securities includes 1163 publicly underwritten offerings of traditional bond and preferred stock securities. The full sample comprises 68 different types of bond and preferred stock securities that were underwritten in the United States between 1974 and 1988 and consists of 2370 underwritten issues (1207 in the innovative sample and 1163 in the traditional sample).

Table 2 briefly describes some of the issue-specific characteristics of the security offerings by product category and sample. The statistics show that (1) underwriting spreads are higher for convertible issues than for nonconvertible issues, (2) underwriting spreads for preferred stock are higher than those for bonds, (3) shelf registrations are used primarily for issuing nonconvertible securities, and (4) issuers of convertibles have smaller offerings and lower security ratings than issuers of nonconvertibles.

Table 2 also shows that issuers of innovative securities have higher ratings, larger offerings (with the exception of nonconvertible bonds), are larger firms, and use more

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Notes: For each category of securities, the average for the innovative and the traditional securities samples are provided. The first column is the average for the innovative sample; the second column is the average for the traditional securities sample; and the third column is the *t*-statistic for the difference in means test.

[a]The sample before reduction is the total number of each security category collected for this study (the entry of rivals is determined based on this sample). The sample after reduction includes all securities with complete information regarding underwriting spread, offering size, credit rating, shelf registration, and competitive bid.

[b]These values are limited to issuers listed on the NYSE, Amex, or OTC stock exchanges.

[c]An indicator equal to 1 for investment banks identified by Johnson and Miller (1988) as bulge bracket firms: The First Boston Corporation; Goldman, Sachs & Company; Merrill, Lynch, Pierce, Fenner & Smith, Inc.; Morgan Stanley & Company, Inc.; and Salomon Brothers; 0 otherwise.

[d]An indicator equal to 1 for investment banks identified by Johnson and Miller (1988) as major bracket firms: Bear, Stearns & Company, Inc.; A.G. Becker; Paribas; Blyth Eastman Paine Webber, Inc.; Dean Witter Reynolds, Inc.; Dillon, Read & Company, Inc.; Donaldson, Lufkin & Jenrette Securities Corporation; Drexel, Burnham, Lambert, Inc.; E.F. Hutton & Company, Inc.; Kidder, Peabody & Company, Inc.; Lazard Freres & Company; Lehman Brothers; Kuhn; Loeb, Inc.; Prudential-Bache Securities, Inc.; Shearson/American Express, Inc.; Smith, Barney, Harris, Upham & Company; and Wertheim & Company, Inc.; 0 otherwise.

*Indicates significance at 0.05 level.

**Indicates significance at 0.01 level.

prestigious underwriters (preferred and convertible securities). Since innovative security issuers use more prestigious underwriters, it is important to control for underwriter prestige prior to testing for early-mover advantages.[11] In general, innovations are no more likely to be issued via shelf registration or by firms listed on one of the major exchanges. The dominance of financial firms in issuing preferred stock innovations also is evident in this study. Houston and Houston (1990) and Linn and Pinnegar (1988) report that a large percentage of the preferred stock issues have been made by financial firms. In this sample, utilities issued 16% of the nonconvertible preferred stock innovations, while financial firms issued 62% of the nonconvertible preferred stock innovations. This compares to only 9% of financial firms and 76% of utilities issuing traditional preferred stock.

4. Analysis of underwriting spreads

4.1. Model development

The underwritten deal's price is central to testing my hypothesis. The underwriting spread includes not only the investment bank's compensation for fixed distribution costs but also a variable component related to the underlying security's risk and the bank's pricing strategies. I employ an ordinary least squares (OLS) regression to investigate the cross-sectional variation in underwriting spreads. Based on prior literature and my hypotheses, the general model has the following form and hypothesized signs:

$$SPREAD_j = f\left(\overset{(-)}{SIZE}, \overset{(-)}{CREDIT}, \overset{(-)}{SHELF}, \overset{(-)}{BID}, \overset{(+/-)}{FEATURES}, \overset{(-)}{BRACKET}, \overset{(+)}{RIVALS}, \overset{(+/-)}{PIONEER}\right)$$

As in Ederington (1975), Kidwell et al. (1984), Foster (1989), and Tufano (1989), the SPREAD is the gross underwriting spread as a percentage of the offer price. The log of the offer amount represents SIZE. CREDIT is a series of five indicator variables for the credit rating of the issuing firm. As in Tufano (1989), unrated offerings are the omitted category. SHELF and BID are indicator variables for firms issuing securities using the shelf registration and the competitive bid process, respectively.

FEATURE is a series of 12 indicator variables for each of the features listed in table 1. Each indicator variable is equal to 1 when the issue has the characteristic specified and 0 otherwise. Traditional nonconvertible bonds are the omitted category. BRACKET has two indicator variables. I use Johnson and Miller's (1988) identification, where the first indicator variable is for bulge bracket underwriters and the second indicator variable is for major bracket underwriters. Underwriters not identified as bulge or major bracket underwriters are the omitted category (see the table 3 footnotes for a list of bulge and major bracket underwriters).

Lieberman and Mongomery (1988) and Tufano (1989) use the number of rivals in the market to measure a new product's development. I hypothesize that early-mover advantages decline as more rival investment banks enter the market. RIVALS is equal to the inverse of the number of investment banks that have lead underwriting syndicates for the innovative security, including the current offering. Use of the inverse allows for

decreasing marginal benefits as more rivals enter the market. Since traditional securities already have many rivals in the market, the number of investment banks in a traditional security market is set to 10, which also is the maximum value used for the number of rivals entering a new security. This implies an assumption that the uniqueness of a market has disappeared after the entry of 10 rival investment banks in a market.[12] PIONEER is an indicator variable equal to 1 if the offering is underwritten by the pioneer of that product.

The first two models in table 3 include the complete sample of traditional and innovative securities. Model 1 is the base model utilized for comparison with Tufano (1989). Model 2 adds a series of indicator variables identifying the security features and two indicator variables identifying underwriter prestige. Model 3 uses the same variables as model 2, but limits the sample to innovative securities. The linear regression explains a significant portion of the variation in spreads, with an R^2 ranging from 68.8% for the full sample to 73.3% for the innovative security sample.

4.2. Empirical results for the base model

Model 1 is presented for comparison with prior studies. Consistent with prior studies by Ederington (1975, 1978), Kidwell et al. (1984, 1985), Foster (1989), and Tufano (1989), the cross-sectional regression results for model 1 show that larger offerings have lower underwriting spreads (economies of scale), lower-rated securities (greater credit risk) have higher spreads, and securities issued via shelf registration or competitive bid have lower underwriting spreads.[13] As in Tufano, convertible securities and preferred stock securities have higher underwriting spreads and RIVALS is insignificant (model 1 excludes the variables for FEATURE and BRACKET). PIONEER has an insignificant negative coefficient.[14]

As shown earlier, the omission of FEATURE and BRACKET is expected to bias the estimates in the first model. The omission of BRACKET implies a tendency to find smaller (and negative) coefficients for PIONEER and RIVALS. Due to the variety of variables included in FEATURE, the direction of the bias due to the omission of the FEATURE variables is unable to be determined prior to empirically testing the model.

4.3. Empirical results for hypothesis models

Models 2 and 3 include the variables for FEATURE and BRACKET. The significant improvement in the F-statistic and the adjusted R^2 shows the importance of the FEATURE and BRACKET variables. Features designed to reduce the security's volatility or reduce agency or asymmetric information costs generally have lower underwriting spreads. With the exception of puttable and resettable securities,[15] adjustable securities, auction rate, and remarketed securities have significantly lower underwriting spreads. Each of these securities was designed to lower the issued security's price volatility. Therefore, underwriters have passed these savings on to the issuers. Five of the seven features (in model 2) that increase a security's volatility have positive coefficients. Preferred stock,

Table 3. Cross-sectional models for underwriting spreads

	Model 1, All Securities	Model 2, All Securities	Model 3, Innovative Securities
Control Variables:			
Intercept	4.95(47.52)**	4.99 (47.12)**	4.59 (30.38)**
SHELF (shelf registration)[a]	– 0.33 (– 6.73)**	– 0.27 (– 5.63)**	– 0.26 (– 4.29)**
BID (competitive bid)[b]	– 0.30 (– 2.40)*	– 0.46 (– 3.79)**	– 0.18 (– 1.03)
SIZE (log of offering size)	– 0.36 (– 14.50)**	– 0.27 (– 10.85)**	– 0.31 (– 9.38)**
CREDIT (indicator variables)[c]			
Aaa	– 2.43 (– 24.43)**	– 2.03 (– 19.70)**	– 1.46 (– 12.51)**
Aa	– 2.39 (– 25.86)**	– 2.09 (– 22.50)**	– 1.41 (– 12.22)**
A	– 2.43 (– 28.75)**	– 2.10 (– 24.36)**	– 1.47 (– 13.78)**
Baa	– 2.08 (– 22.66)**	– 1.84 (– 20.07)**	– 1.36 (– 11.78)**
Less than Baa	– 0.52 (– 6.39)**	– 0.37 (– 4.53)**	– 0.03 (– 0.30)
FEATURE (indicator variables)[d]			
Features lowering price volatility			
Adjustable		– 0.21 (– 3.66)**	– 0.27 (– 3.50)**
Auction rate		– 0.50 (– 4.89)**	– 0.65 (– 5.42)**
Remarketed		– 0.44 (– 2.34)*	– 0.56 (– 3.19)**
Puttable		0.16 (2.45)*	0.26 (3.46)**
Resettable		0.36 (1.65)	0.49 (2.55)*
Features increasing price volatility			
Preferred stock	0.97 (20.29)**	1.19 (20.55)**	1.35 (16.32)**
Convertible	0.48 (7.67)**	0.35 (5.48)**	0.36 (4.13)**
Exchangeable		0.04 (0.43)	0.12 (1.24)
Discount		0.33 (3.32)**	0.41 (3.47)**
Capital		– 0.04 (– 0.41)	0.08 (0.68)
Foreign denominated		– 0.24 (– 1.93)	– 0.26 (– 1.91)
Commodity linked		0.25 (1.27)	0.28 (1.48)
BRACKET (indicator variables)			
Bulge bracket[f]		– 0.86 (– 11.52)**	– 0.91 (– 9.16)**
Major bracket[e]		– 0.68 (– 9.20)**	– 0.70 (– 6.93)**
RIVALS (inverse of number of rivals)[g]	0.09 (0.84)	0.22 (1.78)*	0.33 (3.02)**
PIONEER (1 for pioneer underwriter)[h]	– 0.04 (– 0.45)	0.02 (0.24)	– 0.02 (– 0.24)
Sample size	2,370	2,370	1,207
F-Statistic	433	241	135
Probability > *F*	0.0001	0.0001	0.0001
R^2	68.8%	71.2%	73.2%
Adj. R^2	68.6%	70.9%	72.7%

Notes: The dependent variable is the underwriting spread as a percent of offer size. Model 1 is the base model for comparison with Tufano (1989). Model 2 adds a series of indicator variables identifying the security features and underwriter prestige. Model 3 uses the same variables as model 2 but limits the sample to innovative securities. Parameter estimates, two-tailed student *t*-statistics for the regression coefficients, and the significance level are reported for each model.

[a]Equals 1 if the issuing firm used shelf registration, 0 otherwise.

[b]Equals 1 if the issuing firm used competitive underwriting, 0 otherwise.

[c]Equals 1 if the offering is rated Aaa (Aa, etc.), 0 otherwise. Unrated securities are the omitted category.

[d]Equals 1 if the offering is convertible into equity (preferred stock, adjustable, action rate, remarketed, etc.), 0 otherwise. See Table 1 for a listing of each security and the security's features.

[e]Equals 1 for firms identified by Johnson and Miller (1988) as bulge bracket firms: The First Boston Corporation;

convertible securities, and discount securities have significantly higher underwriting spreads.

Each model also includes two indicator variables for the underwriter's prestige. Bulge bracket and major bracket underwriters charge significantly lower underwriting spreads than less prestigious underwriters. These results demonstrate that more prestigious underwriters may benefit from greater economies of scale.[16]

The early-mover hypothesis tests for a general trend in pricing new securities. The coefficient for RIVALS is significant at the 5% level in model 2 and the 1% level in model 3. As hypothesized, underwriters are compensated for the increased costs and risks of introducing new securities. Using the estimated coefficients for rivals, as the number of rivals increases from 1 to 10, the reduction in underwriting spreads averages approximately 10.5% for model 2 (coefficient * [change in rival variable]/average spread $= 0.22 \cdot [1/1 - 1/10]/1.89$) and 16.4% for model 3 $(0.33 \cdot [1/1 - 1/10]/1.81)$. Decreasing underwriting spreads are consistent with the clientele hypothesis, the learning curve hypothesis, the marketing cost hypothesis, and the liquidity hypothesis.

The null for the pioneer hypothesis is not rejected. The results for the PIONEER variable are negative but not significant at the 5% level in models 1 and 3 and positive and not significant in model 2. The increasing coefficients for RIVALS and PIONEER are consistent with the earlier discussion of omitted variables.

Additional models, not reported in table 3, also are checked to determine whether these results are robust to changes in the model specifications. Since each of the features affects underwriting risk, the interaction of security features with each other and with the control variables may affect the coefficient estimates. The omission of these variables may result in model misspecification and biased coefficients. To control for this potential, all interactions between two features and all interactions between a security feature and the SIZE, CREDIT, and SHELF variables are added to the second and third models. After inclusion of these interaction terms, the general conclusion for RIVALS remains consistent with the results stated earlier.[17] These results also are robust to the method of computing the RIVALS variable. Replacing the inverse of the number of rivals with the log of the number of rivals or the number of rivals does not affect the final conclusion.[18]

Goldman, Sachs & Company; Merrill, Lynch, Pierce, Fenner & Smith, Inc.; Morgan Stanley & Company, Inc.; and Salomon Brothers; 0 otherwise.

[f]Equals 1 for firms identified by Johnson and Miller (1988) as major bracket firms: Bear, Stearns & Company, Inc.; A.G. Becker; Paribas; Blyth Eastman Paine Webber, Inc.; Dean Witter Reynolds, Inc.; Dillon, Read & Company, Inc.; Donaldson, Lufkin & Jenrette Securities Corporation; Drexel, Burnham, Lambert, Inc.; E.F. Hutton & Company, Inc.; Kidder, Peabody & Company, Inc.; Lazard Freres & Company; Lehman Brothers; Kuhn; Loeb, Inc.; Prudential-Bache Securities, Inc.; Shearson/American Express, Inc.; Smith, Barney, Harris, Upham & Company; and Wertheim & Company, Inc.; 0 otherwise.

[g]Equals the inverse of the number of investment banks that have lead underwriting syndicates for the product, including the current offering.

[h]Equals 1 if the offering is underwritten by the investment bank that pioneered the new product, 0 otherwise.

*Indicates significance at 0.05 level.

**Indicates significance at 0.01 level.

5. Summary of findings

The introduction of many financial innovations in the last two decades provides an opportunity to examine the potential for early-mover advantages. Using a sample of 2370 public security offerings comprising 64 financial security innovations and 4 traditional security products, I extend the results first reported by Tufano (1989) concerning underwriting spreads. After controlling for underwriter prestige and security features, I find evidence that underwriting spreads decrease as competition (the number of rival investment banks) in the new security market increases. This study shows that underwriters are compensated for the risks related to financial innovation not only through greater market share (as shown in Tufano, 1989) but also through higher underwriting spreads during the early stages of security development.

This reduction in underwriting spreads (also called *early-mover advantages*) may be due to the clientele hypothesis (Shapiro, 1990), the learning curve hypothesis (Spence, 1981), the marketing cost hypothesis (Ross, 1989), or the liquidity hypothesis (Amihud and Mendelson, 1988). The clientele effect implies the underwriters are reaping greater profits from the early issuance of these securities. The learning curve and the marketing cost hypotheses imply that underwriters are charging higher spreads during a security's developmental stage as compensation for increased costs in issuing the security. Based on the learning curve hypothesis, as firms learn more about a new product, the cost of issuing the security decreases, driving down underwriting costs. The marketing cost hypothesis implies a reduction in underwriting spreads related to the costs of informing issuers, the SEC, and investors about the new product. The liquidity hypothesis posits a risk reduction for underwriters, where a new security has greater volatility than a traditional security due to greater uncertainty. If the new security is unsuccessful (no further security issuances) because of inadequate demand, it will be traded infrequently, reducing its liquidity. However, if a security is successful, concerns about illiquidity will diminish. An underwriter, carrying an inventory of a new security is subject to the risk of an unsuccessful offering. While studying the security's price volatility as more securities are issued can test for a reduction in a security's price volatility, I leave this additional analysis for further research.[19]

This paper also documents that a security's features and the underwriter's reputation significantly influence the level of underwriting spreads. In general, features that increase the security's volatility or are included for tax purposes have higher underwriting spreads, while features designed to reduce price volatility have lower spreads. Overall, this finding demonstrates that investment banks demand compensation for the increased underwriting risk of guaranteeing a more volatile offer price. This is the first study of bond and preferred stocks to document that more prestigious underwriters charge significantly lower underwriting spreads than less prestigious underwriters. Lower underwriting spreads for more prestigious underwriters are consistent with greater economies of scale for more prestigious underwriters and increasing industry concentration, as shown by Cornett, Davidson, and Rangan (1996).

Notes

1. Call options on a security increase underwriting risk. Until recently, bonds, which are not callable, seldom were issued (Crabbe and Helwege, 1994). Also inclusion or exclusion of the extendible has no impact on this paper's results. Extendible securities are categorized as puttable securities for the purposes of this paper.
2. See Tufano (1989), Finnerty (1988), Ross (1989), Van Horne (1985), Silber (1975, 1981, 1983), and Miller (1986) for a more complete review of the innovative process. This paper focuses on pricing underwriting spreads.
3. Alternatively, Carter and Manaster (1990) and Booth and Smith (1986) argue that more prestigious underwriters should consistently charge higher fees than less prestigious underwriters to earn quasi-rents on their reputational capital.
4. Becker and Long (1997) argue equity options reduce volatility through diversification, an equity-linked security is a portfolio of bonds and stock.
5. Unless the asset to which the security is linked is positively correlated to the market value of interest rates on the security, such as adjustable rate securities linked to interest rate indices, greater price volatility and higher underwriting spreads are expected. The diversification argument by Becker and Long (1997) also may apply to these securities
6. Tufano includes a group of security category variables, of which convertible securities, preferred securities, and bonds are three categories, but he does not include a series of indicator variables for security features or underwriter prestige.
7. An omitted variable has an impact on every variable in the model. Due to interest primarily with the hypothesis variables, the impact of the omitted variables with each of the control variables is not presented.
8. In the preceding discussion, I analyzed only the primary impact of an omitted variable. When more than one variable is omitted, the interaction between each of the omitted variables also must be considered. These secondary affects are less tractable.
9. The sample is adjusted so that multiple issues of the same security by one company on one day, such as multiple issues of preferred stock, are aggregated into one transaction. This occurs primarily in the zero coupon bond offerings and auction rate preferred stock securities, which may be offered in series. Given such a multiple issue, the cumulative amount of the offerings and the weighted average underwriting spread are used in the sample. The offering amount is the weight used for this case.
10. Traditional securities are selected without replacement from the pool of eligible traditional securities. Data is restricted to offerings with complete information on the ROS tapes. The ROS tapes have complete data listed only for securities from 1977 through the end of 1988. Because of that limitation, the sample is obtained from this period. All selected records are checked against alternate sources for accuracy. Any security without complete information is eliminated from the control sample. Also, each security in the traditional sample is checked to determine if the firm issued another convertible, preferred, or innovative security on the same offering date; if so, the security is removed from the database.
11. Further analysis of the prestige of the underwriter, shows that early movers are more likely to be prestigious underwriters. Correlation is significant at the 1% level.
12. The results are not sensitive to defining this variable to the choice of the maximum value greater than 10.
13. More recent literature by Allen, Lamy, and Thompson (1990) and Denis (1991) shows those firms choosing shelf registration may enjoy a cost advantage over other firms regardless of the registration procedure used. In model 2, the coefficients for BID and Less than Baa are significant at the 5% level; however, they are insignificant in model 3. The change in significance is due to the reduction in sample size.
14. Tufano finds a significant negative coefficient. My result may differ from Tufano's due to choosing the more homogenous grouping of bond and preferred stock securities, the longer sample period used in the present study, or the inclusion of a wider variety of bond and preferred stock securities (see table 1).
15. The coefficients for the puttable securities may be showing that firms with high agency costs, and therefore higher guarantee costs as measured by the underwriter's put option, have higher underwriting costs relative to companies without these agency costs. Becker and Long's (1997) three-feature model also shows a significant positive coefficient for the put option.
16. While not reported, the results for BRACKET are verified when traditional securities are analyzed separately.

17. The potential two-feature interactions may add as many as 66 ($12 \cdot [12 - 1]/2$) additional indicator variables and the potential interactions of the features with the control variables may add as many as 84 (12 features * 7 control variables, interactions with BID are not included since competitive offerings account for less than 2% of the sample offerings). Due to the lack of variation for all interaction terms, only 101 variables actually were added to the original variables in model 3. The inclusion of so many variables may bias the model toward including many irrelevant variables. However, as shown in Judge et al. (1985, pp. 854–862) the primary penalty for including a superfluous variable is that the estimated variances of the coefficients are larger, and as a result our probability inferences about the parameters are biased toward rejecting an otherwise significant variable. That there is significant support for the hypothesis further strengthens the findings of this paper.
18. Tufano (1989) also considers differentiating the sample by how quickly a security is imitated. I also tested to determine if underwriting spreads decrease faster for imitated securities than nonimitated securities. While the RIVALS coefficient for imitated securities is less than the RIVALS coefficient for nonimitated securities, an F-test reveals that the coefficients are not significantly different from each other.
19. Trading infrequency and lack of available pricing information on publicly issued bond and preferred stock securities substantially increases the difficulty of such a project.

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