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Author(s): Chitru S. Fernando, Vladimir A. Gatchev, Paul A. Spindt
Source: *The Journal of Finance*, Vol. 60, No. 5 (Oct., 2005), pp. 2437-2469
Published by: Blackwell Publishing for the American Finance Association
Stable URL: http://www.jstor.org/stable/3694754
Accessed: 23/11/2009 12:17

THE JOURNAL OF FINANCE • VOL. LX, NO. 5 • OCTOBER 2005

Wanna Dance? How Firms and Underwriters Choose Each Other

CHITRU S. FERNANDO, VLADIMIR A. GATCHEV, and PAUL A. SPINDT*

ABSTRACT

We develop and test a theory explaining the equilibrium matching of issuers and underwriters. We assume that issuers and underwriters associate by mutual choice, and that underwriter ability and issuer quality are complementary. Our model implies that matching is positive assortative, and that matches are based on firms' and underwriters' relative characteristics at the time of issuance. The model predicts that the market share of top underwriters and their average issue quality varies inversely with issuance volume. Various cross-sectional patterns in underwriting spreads are consistent with equilibrium matching. We find strong empirical confirmation of our theory.

ONCE A FIRM DECIDES to issue equity in the public market, it must next decide which underwriter to employ for the offering. And underwriters, faced with a variety of opportunities to provide their services, must decide which issuers to serve. In this paper, we develop a theory that explains the equilibrium association of issuing firms and underwriters and produces a rich set of testable empirical implications. Examining the empirical evidence, we find strong support for our theory.

Our theoretical setup is based on the idea that issuing firms and underwriters associate by mutual choice. This approach is new to the literature. Existing theoretical literature has focused on the issuer's choice of underwriter (e.g., Titman and Trueman (1986), Habib and Ljungqvist (2001)), and has provided the basis for empirical studies by Benveniste et al. (2003) and Ljungqvist, Marston, and Wilhelm (2005), for example. The approach in this literature has been to represent the association of issuers and underwriters as a one-sided

*Chitru S. Fernando is at the Michael F. Price College of Business, University of Oklahoma. Vladimir A. Gatchev and Paul A. Spindt are at the A. B. Freeman School of Business, Tulane University. We thank Tim Adam, Rajesh Aggarwal, Vladimir Atanasov, Suman Banerjee, Sugato Bhattacharyya, Tom Chemmanur, Francesca Cornelli, Louis Ederington, Gary Emery, Rick Green, Rob Hansen, Thomas Hellmann, Ravi Jagannathan, Steve Kaplan, Laurie Krigman, Srini Krishnamurthy, Scott Linn, Alexander Ljungqvist, Dennis Logue, Bill Megginson, Tom Noe, Nagpurnanand Prabhala, Jay Ritter, Arturo Rodriguez, Donghang Zhang, two anonymous referees, and seminar participants at the University of Michigan, Tulane University, Texas A&M University, Baruch College, Hong Kong University of Science and Technology, University of New Orleans, Southern Methodist University, Vanderbilt University, the 2002 WFA meetings, the 2002 FMA meetings, the 2004 FIRS Conference on Banking, Insurance and Intermediation, the 2004 EVI Conference, and the 2005 AFA meetings for helpful comments and suggestions. We thank Thompson Financial for providing us with the I/B/E/S analyst data. We are responsible for any remaining errors.

"beauty pageant" mechanism in which an issuer chooses from a collection of possible underwriters whose characteristics are predetermined and fixed with respect to the choice.[1]

Mutual choice is a more natural model for the association of issuers and underwriters than a one-sided mechanism because it more accurately reflects the actual institutional situation. Underwriting contracts are mutual agreements. In the "bake-off" meetings leading up to a contract, issuers look to the abilities of prospective underwriters to certify, promote, place, and support the offering.[2] Similarly, underwriters look to the issuer's characteristics (relative to other possible issuers), such as the issue size, the likelihood that the offer will be completed, and the probability that the issuer will remain in business and issue again in the future (generically, we call these characteristics firm "quality") that will affect underwriters' short- and long-term profits.[3] Underwriting contracts are executed between those issuers and underwriters who mutually agree that their interests coincide.[4]

In the standard economic model, pricing solves the association problem; that is, issuing firms compete for underwriting services, underwriters compete for deals, and firms associate with underwriters on the basis of value/price of services delivered. But economic theory also indicates that when agent characteristics—in this case, firm quality and underwriter ability—are indivisible, the allocation problem can be solved efficiently as a matching problem of who transacts with whom, with the pricing issue left to bargaining between the matched parties.[5] The model we develop in this paper builds on this foundation. Moreover, if, as we assume, agents' characteristics are complementary, then matching is positive assortative; that is, higher quality firms associate with higher ability underwriters and lower quality firms associate with lower ability underwriters. Positive assortative matching of issuers and underwriters is also

[1] An exception is the model developed by Chemmanur and Fulghieri (1994a) in which underwriters exercise choice over the firms that they select, with more reputed underwriters having priority in the selection process.

[2] For a more detailed analysis of the different functions performed by the lead underwriter see, for example, Hayes, Spence, and Marks (1983), Booth and Smith (1986), Benveniste and Spindt (1989), Carter and Manaster (1990), Hansen and Torregrosa (1992), Chemmanur and Fulghieri (1994a), Galant (1995), Carter, Dark, and Singh (1998), Stoughton and Zechner (1998), McGough (1999), Ellis, Michaely, and O'Hara (2000), Krigman, Shaw, and Womack (2001), Ljungqvist and Wilhelm (2002), Logue et al. (2002), Ritter and Welch (2002), Benveniste et al. (2003), and Drucker and Puri (2005).

[3] Our idea of quality has nothing to do with conventional notions of "good" and "bad". In our definition, a high quality firm displays characteristics that positively affect an underwriter's short- or long-term expected profits and complement the underwriter's "ability", or reputation, characteristic.

[4] An exception is when issuers award their underwriting business to the highest bidder in a competitive auction among underwriting syndicates. Hansen and Khanna (1994) report that, unless prohibited from doing so by law, issuers virtually always prefer to mutually agree with an underwriter through negotiation and that negotiated offerings are more valuable to issuers than competitive bid offerings.

[5] See, for example, Gale and Shapley (1962), Roth (1984), Roth and Sotomayor (1989), Sattinger (1993), and Legros and Newman (2002).

a prediction of some one-sided choice models such as Titman and Trueman's (1986) signaling model.[6] However, in our model, issuers cannot choose their underwriter to signal quality.

Beyond positive assortative matching, our model generates a rich set of empirically testable propositions that are not predicted by one-sided choice models. First, in our model, we represent the market for underwriting services as a sequence of spot markets so that on any occasion, the association of issuers and underwriters is transaction rather than relationship based. Together with the rest of our assumptions, this implies, for example, that if an issuer improves (declines) sufficiently in quality from its initial public offering (IPO) to a later seasoned equity offering (SEO), then it will switch to a higher (lower) ability underwriter for its SEO. Since SEO issuers are, on average, of better quality (due to survivorship and seasoning) than IPO firms, the average tendency is for issuers to "graduate" to higher reputation underwriters as in Krigman et al. (2001). But our model implies that some "down-switching" (a firm rematching for its SEO with a lower reputation underwriter than the bank that underwrote its IPO) will also occur since some firms deteriorate in quality between their IPO and SEO. Moreover, if firm characteristics and underwriter abilities are relatively stable over time, then many issuer/underwriter associations formed for IPOs will rematch for SEOs. In our model, this is not because issuers become loyal to underwriters (or vice versa), or that issuers and underwriters invest in relationship-specific capital; rather it is because high quality issuers (who tend to remain high quality) associate with high ability underwriters (who tend to remain high ability) in each transaction.

Second, our model generates interesting new implications about underwriter market share that are not predicted by existing models. For example, it implies that more able underwriters underwrite more issues, by both initial and seasoned issuers, which gives them a larger market share than less able underwriters. But the model also predicts that as the number of issuers in the market increases, the market share of less able underwriters will increase. Moreover, while more able underwriters gain market share in shrinking markets, the average quality of the issuers they underwrite declines. Still, in our model, more able underwriters have less volatile underwriting business per unit of expected underwritten proceeds than their less able counterparts. These findings complement the results of Beatty and Ritter (1986), Beatty, Bunsis, and Hand (1998), and Dunbar (2000) by providing factors that, independent of underwriter historic performance, have a differential impact on the market share of underwriters.

Third, unlike existing models in which issuers choose underwriters, our mutual choice model implies that the underwriting spread is the result of bargaining between matched issuers and underwriters and does not determine the association of issuers and underwriters.[7] In our model, many cross-sectional

[6] Chemmanur and Fulghieri's (1994a) model also implies positive assortative matching.

[7] Krigman et al. (2001) observe that the underwriter fee is of less importance to issuers than the reputation of the underwriter and its analysts, which is supported by the evidence provided

spread patterns are consistent with equilibrium, including a uniform flat percentage fee charged by all underwriters. However, the model does predict that, for SEOs, the percentage spread is likely to be negatively related to the reputation of the underwriter. It also predicts that high reputation underwriters will earn higher dollar revenues from their client firms both at the IPO stage (by underwriting larger issues) and in the longer term (by underwriting a larger volume of secondary issues).

We test these predictions on a sample of 13,059 IPOs and SEOs between 1970 and 2000. To index underwriter ability, we use the relative market share of an underwriter (Megginson and Weiss (1991), Aggarwal, Krigman, and Womack (2002)) and the relative position of an underwriter on tombstone announcements (Carter and Manaster (1990), Carter et al. (1998), Loughran and Ritter (2004)). Because the notion of issuer quality is multidimensional, we use a variety of empirical proxies to measure quality, including the probability that the issuer is delisted due to financial distress in the 5 years subsequent to the offer, the issuer's age since founding (IPOs)/exchange listing (SEOs), whether or not the IPO issuer is venture-backed, whether or not the issuer has positive earnings in the year of the offer, analyst coverage, and the variability of issuer stock returns. We find strong empirical support for our theory's predictions.

The rest of the paper is organized as follows. Section I develops the analytical framework that we use in examining the matching market of firms and underwriters, and extracts the empirical implications. Section II describes the data. Section III reports the results from the empirical tests. Section IV concludes.

I. Firm–Underwriter Choice

A. Model Setup

We consider an economy in which firms sell their equity to public investors in offerings underwritten by investment banks. We examine the selection problem between I firms and J potential underwriters. We assume that each issuing firm could hire a single underwriter while each investment bank could simultaneously underwrite multiple issues subject to exogenously fixed capacity constraints. Throughout our analysis we take the decision of the firm to issue equity to the public as given and we assume that the available underwriting capacity in the market is predetermined at a level sufficient to accommodate all the issues entering the market.

Each individual issue $i = 1, \ldots, I$ is characterized by a quality parameter, q_i. Similarly, each underwriter $j = 1, \ldots, J$ is characterized by an ability parameter, a_j.[8] Firm quality is indivisible in the sense that it cannot be traded in

by Chen and Ritter (2000). Also, as noted by Uttal (1986) in his description of the Microsoft IPO, Microsoft and its underwriter, Goldman Sachs, agreed to work together well before Goldman's fee was set. In fact, the underwriting spread was the *last* aspect to be negotiated before the deal was signed.

[8] In general, q_i and a_j could represent aggregate measures of quality and ability vectors, $\{q_{i,1}, q_{i,2}, \ldots, q_{i,N}\}$ and $\{a_{j,1}, a_{j,2}, \ldots, a_{j,M}\}$, respectively. Underwriter reputation is an example of such a measure.

partial units or parceled off. Underwriter ability is indivisible in the sense that it may not be parceled out differentially across the underwriter's clients. We let $q_1 > q_2 > \cdots > q_I$ and $a_1 > a_2 > \cdots > a_J$.[9]

If firm i is matched with underwriter j then a joint surplus of $H_{i,j} = H(q_i, a_j)$ is produced. This surplus is equal to the value created in the issue process net of all direct and indirect costs incurred by the issuer and the investment bank.[10] As noted before, we take the decision of the firm to issue equity as given. Therefore, $H_{i,j} > 0$ for any $\{i, j\}$ pair. If a firm or an underwriter is unmatched then no surplus is produced ($H_{i,0} = H_{0,j} = 0$). The above definition of the joint surplus necessarily assumes that the surplus produced by any issuer–underwriter pair is independent of the rest of the matching arrangements.

We assume that firm quality and underwriter ability are complementary in the sense that the returns (measured in terms of joint surplus) to firm quality are increasing in underwriter ability, and the returns to underwriter ability are increasing in firm quality. This notion fits the firm–underwriter matching market particularly well since it is reasonable to expect that high quality firms will be able to make better use of the numerous services provided by high ability underwriters than low quality firms, while high ability underwriters will be able to better identify, capitalize on, and promote the superior characteristics of high quality firms than their less able competitors. We can state the above notion more formally in terms of our notation as $H_{i,j} - H_{i,j+l} > H_{i+k,j} - H_{i+k,j+l}$ for any i, j and for any $k > 0$, $l > 0$, or equivalently, as $H_{i,j} - H_{i+k,j} > H_{i,j+l} - H_{i+k,j+l}$.[11]

Issuers and underwriters are perfectly informed about each other's characteristics and about the properties of the surplus function. The two sides maximize the joint surplus arising from a match. We allow for the possibility of transfer payments between any firm and any underwriter.[12] We assume that there are no prior contractual obligations that would prevent any firm from matching with any underwriter, should the two sides find it optimal to do so.[13]

B. Matching Firms and Underwriters: Theoretical and Empirical Implications

In this section, we examine the equilibrium matching of issuers and underwriters given our setup. In our first proposition, we establish the conditions

[9] Allowing for the existence of firms and underwriters with identical characteristics does not change the results qualitatively.

[10] In this setting, the gross spread that the firm pays to the underwriter for the services provided does not have an impact on the surplus. Underpricing, on the other hand, could affect the surplus produced by the match while also constituting a transfer to the underwriter. We thank a referee for drawing our attention to this point.

[11] When the surplus is monotonically increasing in both arguments, this condition is also known as the "supermodularity condition." In such cases, the inequality is also equivalent to a positive cross-partial derivative for a differentiable surplus function. See, for example, Legros and Newman (2002). We thank Tom Noe for his insights on this point.

[12] In equilibrium, no transfer payments need to be made between parties that are not matched with each other. However, this fact emerges endogenously from the matching framework. See, for example, Roth and Sotomayor (1989) for further exposition on this point.

[13] Roth and Sotomayor (1989) prove the existence of a stable outcome for such a matching market using the Duality Theorem.

under which matching is positive assortative, that is, the quality of issuing firms is positively correlated with the ability of their underwriters in equilibrium. All proofs are provided in the Appendix.

PROPOSITION 1 (Positive Assortative Matching): *If $H_{i,j} - H_{i,j+l} > H_{i+k,j} - H_{i+k,j+l}$ for any i, j and for any $k > 0$, $l > 0$, then the competitive equilibrium outcome is characterized by positive assortative matching, that is issuers and underwriters will match such that firm quality and underwriter ability are positively correlated.*

Proposition 1 provides the basic matching result underlying our theoretical framework. It supports the notion that issuing firms and underwriters associate by mutual choice, in contrast to the traditional notions of unidirectional choice.

Proposition 1 gives rise to several empirical hypotheses. First, it implies that firms of higher quality will match with more reputable underwriters.[14] Second, if a firm chooses the most reputable lead underwriter from the set of available underwriters, our theory also suggests that co-managers (i.e., investment banks that have demonstrated their desire to associate with the issuer) will be of lower reputation than lead managers.[15] Third, to the extent that higher quality firms are more likely to issue public securities, as argued by Chemmanur and Fulghieri (1994b) and Krishnaswami, Spindt, and Subramaniam (1999), Proposition 1 also suggests that more reputable underwriters would match with IPO firms that are more likely to have subsequent issues of public securities.

We next examine several additional implications of our matching framework. We first study how differences in ability across underwriters can give rise to differences in their market shares. When underwriter ability is valuable (i.e., underwriters of higher ability give rise to a larger joint surplus), more able underwriters would always find a match as long as their less able counterparts are also matched, suggesting that more able underwriters will command a larger market share. This notion is formalized in our second proposition.

PROPOSITION 2 (Underwriter Market Share): *If the surplus is increasing in the ability of the underwriter and if in equilibrium an underwriter with a given ability is matched, then it must be the case that any underwriter with a higher ability is also matched.*

From an empirical standpoint, Proposition 2 suggests that in more active markets, less reputable underwriters will have a higher probability of matching with an issuer, providing a link between underwriter market share and the level of issue activity in the market. Specifically, the market share of more reputable

[14] Since underwriter reputation is the standard empirical measure of underwriter ability, we will refer to "underwriter ability" directly as "underwriter reputation" in the empirical part of the paper.

[15] We thank a referee for providing this insight.

underwriters will be negatively related to the level of activity in the equity issue market.

Given mutual association, differences in underwriter ability also create differences in the quality of issuers that different underwriters are able to pair with. As stipulated in Proposition 3, if underwriter ability is positively related to the joint surplus and positive assortative matching occurs, then the most able underwriter will always match with the highest quality firm, regardless of what this firm's characteristics might be in absolute terms.

PROPOSITION 3 (Relative Matching): *If the surplus is increasing in the ability of the underwriter and if* $H_{i,j} - H_{i,j+l} > H_{i+k,j} - H_{i+k,j+l}$ *for any i, j and for any* $k > 0$, $l > 0$, *then in equilibrium the highest quality firm is matched with the most able underwriter, the second highest quality firm is matched with the most able underwriter if it still has underwriting capacity available and if not, with the second most able underwriter, and so on.*

Proposition 3 suggests that underwriters match with issuers based on their relative quality, and gives rise to the joint empirical hypotheses that the average quality of issues underwritten by more reputable underwriters is positively related to the average quality of all issuing firms in the market, positively related to the market-wide variation in issue quality, and positively related to the number of issues in the market.

The existing literature widely recognizes that many firms go public with the intent to revisit the public equity markets in the near future. Such firms use the IPO stage, in part, as an introductory step for a larger secondary equity offering. While the empirical implications derived hitherto apply to both IPOs and SEOs, our theoretical framework also permits us to derive additional empirical implications that link the IPO and SEO stages. The first of these is based on the insight that a change in the quality of the firm between the IPO and SEO would lead to a change in the reputation of the underwriter it matches with and that a change in the reputation of an underwriter would lead to a change in the quality of firms it matches with. Thus, a change in underwriter reputation between a firm's IPO and SEO is positively related to a change in the firm's quality between the IPO and the SEO.

Furthermore, a change in the firm's quality from the IPO to the SEO that is not offset by a corresponding change in the reputation of its IPO underwriter could lead to a switch of underwriter. Since secondary issues are in general of higher quality than initial issues, the argument in the previous paragraph would imply that on average firms would switch to more reputable underwriters from IPO to SEO, that is manifest a "graduation" effect between the two stages.

However, clients of more reputable underwriters would find fewer opportunities to improve underwriter reputation and therefore, they would be less likely to switch underwriters. Additionally, more reputable underwriters would match with higher quality firms that are less likely to experience significant changes in quality and thus would be less likely to switch them if and when such firms have subsequent issues.

Finally, since it is more likely that clients of more reputable underwriters will undertake secondary offerings, and less likely that they will switch to a new underwriter when they do so, more reputable underwriters should generate significantly more future underwriting business from the firms they bring public. Thus, we would expect the amount of future business that underwriters receive from their IPO clients to be positively related to the reputation of the underwriter.

The mutual association through optimal matching also has implications for the pricing of underwriter services. Given a specific level of joint surplus created by the match, underwriter fees are determined by the distribution of this surplus between firms and underwriters. This distribution is determined in a bargaining framework and depends on the relative bargaining power of the parties involved. It is especially significant that the equilibrium allocation of the surplus need not be unique. In Proposition 4, we identify both the firm-optimal and underwriter-optimal surplus allocations that would occur in equilibrium. We present Proposition 4 under two additional assumptions: (a) each underwriter underwrites only one firm, and (b) firm quality and surplus are positively related. Although these assumptions are not necessary to obtain our results, they greatly simplify the exposition.

PROPOSITION 4 (Surplus Allocation): *Suppose that the surplus is increasing in the ability of the underwriter and in the quality of the firm and that $H_{i,j} - H_{i,j+l} > H_{i+k,j} - H_{i+k,j+l}$ for any firm i, any underwriter j, and any $k > 0$, $l > 0$. Positive assortative matching implies that in equilibrium underwriter j will match with firm $i = j$. The firm-optimal (lower) and underwriter-optimal (upper) allocations to the j^{th} underwriter ($j < J$) are equal to*

$$U_{j,j}^{\text{lower}} = \sum_{n=j}^{J-1} \left(H_{n+1,n} - H_{n+1,n+1}\right),$$

and

$$U_{j,j}^{\text{upper}} = H_{j,j} - \sum_{n=j}^{J-1} \left(H_{n,n+1} - H_{n+1,n+1}\right).$$

When $j = J$, then $U_{J,J}^{\text{lower}} = 0$ and $U_{J,J}^{\text{upper}} = H_{J,J}$.

The dollar bounds in Proposition 4 are nonnegative numbers less than or equal to $H_{j,j}$.[16] Additionally, both bounds are increasing in the ability rank of the underwriter. Moreover, it can be easily shown that any equilibrium dollar allocation to the underwriter will be nondecreasing in the ability of the underwriter. The interpretation of the two bounds is straightforward. Note that

[16] For simplicity, we disregard moral hazard problems of the type discussed by Pichler and Wilhelm (2001), who argue that in order to ensure high underwriter effort, it might be rational for issuers to share surplus with syndicate members. However, it is not possible to rule out such behavior in our framework.

the lower bound for underwriter j is equal to the lower bound for underwriter $j+1$ plus the increase in surplus achieved if underwriter j matches with firm $j+1$, that is $U_{j,j}^{\text{lower}} = U_{j+1,j+1}^{\text{lower}} + (H_{j+1,j} - H_{j+1,j+1})$. In other words, if underwriter j replaces underwriter $j+1$ in the match with firm $j+1$, then it can expect to get at least what underwriter $j+1$ gets plus the additional surplus being created due to underwriter j. The upper bound for underwriter j can be viewed as the surplus produced by its match with firm j minus the lower bound that firm j should get from that surplus.

Using the dollar bounds derived above, we can also analyze the allocation received by the j^{th} underwriter in proportion to the created surplus. The proportionate allocation that is obtained at the firm-optimal distribution of the surplus is equal to $\alpha_{j,j}^{\text{lower}} = \sum_{n=j}^{J-1} (H_{n+1,n} - H_{n+1,n+1})/H_{j,j}$, while the proportionate allocation obtained at the underwriter-optimal surplus distribution is $\alpha_{j,j}^{\text{upper}} = [H_{j,j} - \sum_{n=j}^{J-1} (H_{n,n+1} - H_{n+1,n+1})]/H_{j,j}$. These proportionate bounds are not necessarily a monotone function of the ability of the underwriter. However, if the marginal contribution of underwriter ability to the joint surplus is declining, and is sufficiently small relative to the marginal contribution of firm quality, then the numerator in $\alpha_{j,j}^{\text{lower}}$ will increase at lower rates than the denominator and the proportion received by underwriters in the firm-optimal allocation of the surplus would decline as underwriter ability rises. Finally, for an underwriter of given ability rank j, as the number of underwriters, J, increases, $\alpha_{j,j}^{\text{lower}}$ would increase while $\alpha_{j,j}^{\text{upper}}$ would decrease so that the two proportionate bounds would converge.

The allocations identified above are not necessarily the only equilibrium ones. For example, any flat proportional allocation that lies within the identified bounds and any fixed linear combination of the two bounds would also support the equilibrium matching. One important fact should be emphasized, however: the exact surplus allocation results from the bargaining stage are independent of the firm–underwriter pairing that occurs at the matching stage.

Proposition 4 yields our final empirical hypothesis. We argue above that when the marginal contribution of underwriter reputation to the joint surplus is small relative to the marginal contribution of firm quality, the percentage allocation of the surplus to the underwriter should be a declining function of the reputation of the underwriter. These conditions are more likely to hold in SEOs than in IPOs since the ability of the underwriter is likely to be less critical for seasoned offerings. Additionally, the underwriter's relative bargaining power is likely to be lower as the quality of the firm increases. Thus, we would expect to find that in SEOs, the percentage spread declines with the reputation of the underwriter.

II. Data

We collect our data from the New Issues Database of the Securities Data Company (SDC), the Center for Research in Security Prices (CRSP) monthly and daily files, the COMPUSTAT annual files, and the Institutional Brokers Estimate System (I/B/E/S) database. Additionally, I/B/E/S kindly provided us with the analyst and broker data necessary to identify the brokerage houses associated with analysts providing earnings forecasts.[17]

A. General Sample

From the SDC we include only issues marketed in the U.S. by U.S. firms between 1970 and 2000. Similar to Chen and Ritter (2000), we exclude all offerings of closed-end funds, American Depositary Receipts (ADRs), real estate investment trusts (REITs), and unit offerings. However, we do not exclude penny stocks from our analysis since both high and low reputation underwriters are allowed to compete for such offerings.[18] As in Hansen (2001) and Altinkiliç and Hansen (2000), among others, we use only industrial firms in our tests, where we classify a firm as industrial if its Standard Industrial Classification (SIC) code is not between 4000 and 4999 (utilities) or 6000 and 6999 (financials). The actual sample size used in the different analyses is dictated by data availability and is indicated in the relevant tables.

For part of the analysis we require only available information on the proceeds from the offering so that we use all available public issues of common equity without further restrictions on data availability. All proceeds used in the tests exclude overallotment options. We express all dollar amounts in 1996 U.S. dollars using the GDP implicit price deflator. The total number of issues is 13,059 with 5,764 issues classified as IPOs and 7,295 issues as SEOs. On average there are 421 issues per year. This sample is used to compute the main underwriter reputation measure, which is based on Megginson and Weiss (1991) and is calculated as in Aggarwal et al. (2002).[19] This measure of underwriter quality is market-share based and is a continuous variable on [0,100]. When more than one lead underwriter underwrites an issue, we split the proceeds equally among all lead banks. We also use the reputation measure developed by Carter and Manaster (1990) and extended by Carter et al. (1998) and Loughran and Ritter (2004) that is based on underwriter rankings in tombstone announcements. This measure is equal to zero for the lowest reputation underwriters and nine for the highest.[20] We also perform some of our analysis using the lead

[17] I/B/E/S is a service of Thompson Financial. This data has been provided as part of a broad academic program to encourage earnings expectations research.

[18] Nonetheless, we have verified that our results are not driven by penny stocks. We replicate our tests excluding stocks with IPO/SEO offer price below \$5 per share, and do not observe any significant change in the results.

[19] For a set of underwriters I and for every year t, we define the 3-year moving average $(t-2, t-1, t)$ of IPO and SEO proceeds lead underwritten by underwriter j as x_{jt}. Then the lead underwriter rank (LUR) for underwriter j is

$$LUR_{jt} = \frac{\ln x_{jt}}{\max_{i \in I}\left[\ln x_{it}\right]} \times 100.$$

Under this measure, the underwriter with the highest 3-year moving average of IPO and SEO proceeds for year t would have a lead underwriter rank of 100.

[20] The Carter–Manaster rankings are obtained from the website of Jay Ritter (http://bear.cba.ufl.edu/ritter/Rank.HTM).

underwriter's percentile rank based on the Megginson–Weiss lead underwriter reputation measure.

B. IPO Data

For the IPO sample we select only public offerings of common stock that the SDC defines as "Original IPOs", that is common stock that has never traded publicly in any market and the firm offers it for the first time in the U.S. public market. The SDC database contains only firm-commitment IPOs, and therefore our sample has only such IPOs. Also, the sample of IPOs contains only negotiated offers. We further require that firms have a single lead underwriter for the issue, unless noted otherwise.[21] Additional data requirements dictate the actual sample size in the analysis.

Data on firm earnings is obtained from the COMPUSTAT annual files. We create a dummy variable to indicate whether a firm has positive earnings for the fiscal year that ends closest to the IPO date. Data on earnings forecasts is obtained from the I/B/E/S database. We obtain the number of analysts that made annual forecasts 3 months before the end of the fiscal year that ends at most 1 year after the IPO. As in Seguin and Smoller (1997) and Fernando, Krishnamurthy, and Spindt (2004), we use the likelihood of delisting due to financial distress in the 5-year period following the IPO as a proxy for a firm's risk. A firm is considered to be viable if in 5 years after the IPO the firm still trades on the New York Stock Exchange (NYSE), on the American Stock Exchange (AMEX), or on Nasdaq, or has been delisted due to a merger or an exchange offer.[22] Otherwise, it is nonviable. To measure the likelihood of financial distress, we use a dummy variable that equals "1" if the firm is viable after 5 years and "0" if it is not. Firm delisting data is obtained from the CRSP monthly files. We also use a dummy that measures whether the issue is venture-backed or not. The market capitalization of the firm after the IPO is computed using the first available CRSP data for shares outstanding and share price.

C. SEO Data

For the SEO sample we select all issues of seasoned equity offerings of common stock between 1970 and 2000. We again require that the issue has a single lead underwriter, unless noted otherwise.

Data on firm earnings and dividends is obtained from the COMPUSTAT annual files while data on earnings forecasts is obtained from the I/B/E/S database. We define and measure viability in a manner similar to the IPO sample, with the 5-year measurement period commencing on the SEO date.

[21] During our sample period, only 52 issues (less than 2% of all equity issues included in the SDC database) had more than one lead underwriter.

[22] It is possible that by including firms delisted due to a merger or an exchange offer in our count of viable firms, this measure would include as viable those distressed firms that would eventually have been delisted if not for a prior acquisition. We thank Jay Ritter for this observation.

Standard deviation (*SD*) of daily returns is computed using data from the CRSP daily files. We compute the market capitalization of the firm in the month prior to the SEO using data for shares outstanding and share price from the CRSP monthly files.

D. IPOs and Subsequent Issues Data

We classify a firm as making a subsequent offering if it has at least one subsequent issue in the 5-year period after the IPO, and that data is available as necessary. A part of the analysis uses any type of security that the firm has issued during the period, while the rest of the analysis uses only subsequent issues of equity.

We measure the subsequent spreads as the sum of all spreads that the IPO underwriter collects from the firm that it brought public, excluding the IPO. We also employ an alternative measure of subsequent spreads. We discount the future spreads using the average market rate of return to bring them back to the IPO date. After summing these values, we use the 1996 GDP implicit price deflator to represent the sum in 1996 dollars.

III. Empirical Results

A. Firm–Underwriter Matching at the IPO and SEO Stages

We divide our sample into IPOs and SEOs to avoid misspecifications that may result from omitted variables related to the differences between firms performing IPOs and firms performing SEOs. We first test for positive assortative matching in the IPO market and then we repeat the analysis for the SEO market.

Table I examines the relation between firm quality and underwriter reputation while controlling for the market capitalization of the firm and the amount of the IPO proceeds. Panel A uses the Megginson–Weiss reputation measure while Panel B uses the Carter–Manaster measure of reputation. We find that more reputable underwriters associate with larger firms and firms with larger IPO proceeds than their less reputable counterparts.[23] The positive link between underwriter reputation and issue size is consistent with the better ability of more reputable underwriters to market the issue to public investors. We find that more reputable underwriters associate with firms that have a lower risk of distress delisting. Furthermore, clients of more reputable underwriters are more likely to have a follow-on security offering in the 5 years after the IPO, in line with the evidence presented by Carter (1992). As in Brav and Gompers (1997) and Megginson and Weiss (1991), we employ the venture-backed dummy as another proxy for the firm's risk. Barry et al. (1990) find evidence that venture capitalists provide intensive monitoring services. Therefore, venture-backed IPOs would result in lower monitoring costs for the lead

[23] Benveniste et al. (2003) also find a positive link between IPO proceeds and underwriter reputation.

Table I

Firm Quality and Underwriter Reputation at the IPO Stage

The sample of common stock IPOs of industrial firms (SIC codes not in the 4000's and 6000's) between 1970 and 2000 is obtained from the SDC New Issues database. The table reports the results from OLS regressions of the Megginson–Weiss (Panel A) and the Carter–Manaster (Panel B) reputation of the IPO lead underwriter on IPO proceeds (excluding the overallotment option), the market capitalization of the equity of the firm at most 60 days after the IPO, and additional proxies of firm quality. Carter–Manaster reputations are available after 1980. Dollar amounts are expressed in 1996 U.S. dollars using the GDP implicit price deflator. The title of each regression gives the firm quality measure used in that regression. We use the founding date of the firm from SDC to calculate the number of years from foundation to IPO. A firm is considered to be viable if in 5 years after the IPO it is still traded on NYSE/AMEX/Nasdaq or if it is delisted due to a merger or an exchange offer. Delisting data is obtained from CRSP. Using data from SDC, we construct a dummy indicating whether the firm has a subsequent issue in the 5 post-IPO years. The venture-backed dummy is constructed using venture-backing data from SDC. The earnings dummy indicates whether the firm has positive earnings for the fiscal year that ends closest to the IPO date, before or after. Data on earnings is obtained from the Compustat annual files. We use the I/B/E/S database to get the number of analysts that make annual forecasts 3 months before the end of the fiscal year ending within 1 year after the IPO. Asymptotically efficient two-tailed p-values of the respective coefficients are reported in parentheses.

Panel A: Dependent Variable Is the Megginson–Weiss Reputation of the Lead IPO Underwriter

	Log of Years Since Founded	Viability Dummy	Subsequent Issue Dummy	Venture-Backed Dummy	Earnings Dummy	Log Number of Forecasts
Intercept	−27.50*	−27.07*	−27.44*	−21.96*	−25.08*	−1.99
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.4557)
Log of IPO proceeds	4.87*	4.53*	4.57*	5.02*	4.43*	2.89*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Log of market capitalization	1.67*	1.96*	2.02*	1.23*	1.96*	2.21*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Firm quality measure	0.35**	1.84*	0.61*	2.60*	1.38*	0.14**
	(0.0188)	(<0.0001)	(0.0044)	(<0.0001)	(<0.0001)	(0.0291)
Number of observations	1,399	4,030	4,030	5,759	4,567	3,027
Adjusted R^2	49.57%	55.13%	54.82%	56.72%	53.19%	36.93%

(*continued*)

Table I—*Continued*

Panel B: Dependent Variable Is the Carter–Manaster Reputation of the Lead IPO Underwriter

	Log of Years Since Founded	Viability Dummy	Subsequent Issue Dummy	Venture-Backed Dummy	Earnings Dummy	Log Number of Forecasts
Intercept	−21.38*	−22.07*	−22.22*	−20.75*	−21.34*	−11.15*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Log of IPO proceeds	1.22*	1.18*	1.21*	1.32*	1.13*	0.61*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Log of market capitalization	0.38*	0.44*	0.46*	0.25*	0.46*	0.43*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Firm quality measure	0.17*	0.78*	0.30*	0.75*	0.51*	0.03**
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0240)
Number of observations	1,376	3,691	3,691	5,416	4,456	2,987
Adjusted R^2	49.09%	55.22%	54.49%	56.25%	52.55%	33.34%

*, **, ***denote significance at the 1%, 5%, and 10% levels, respectively, from a two-tailed t-test.

underwriter. We document that venture-backed IPOs match with underwriters of a higher reputation than do IPOs with no venture-backing.[24] We use an earnings dummy as another proxy for a firm's quality. Consistent with Kim and Ritter (1999) and Benveniste et al. (2003), firms with positive earnings may be easier to value since one can use earnings multiples. We can also view firms with negative earnings and short records as being subject to greater uncertainty about their future performance and profitability. We also expect the age of the firm to be negatively related to the uncertainty and asymmetric information that accompany an issue (see also Loughran and Ritter (2004)). We find that lead underwriter reputation is significantly and positively related to both the earnings dummy and the age of the firm. The results in the last column of Table I show that firms brought public by more reputable underwriters have more analysts making 3-month earnings forecasts in the first year after the IPO.[25]

We also separately examine the association of firms and underwriters for the 1999 to 2000 subperiod.[26] While the results for size, proceeds, venture-backing, and number of forecasts are consistent with the results for the full sample period, the results for the age of the firm and the profitability dummy are not significant in our regressions. The weaker results for this subperiod could be due, in part, to the bundling phenomenon hypothesized by Benveniste, Busaba, and Wilhelm (2002) and empirically verified by Benveniste et al. (2003).

Next we examine the relation between underwriter reputation and different proxies of firm quality at the SEO stage while controlling for the size of the firm and the issue. We again use both Megginson–Weiss and Carter–Manaster reputation measures. The results presented in Table II, Panels A and B respectively, are consistent with the notion that more reputable underwriters underwrite seasoned issues of higher quality firms. More reputable underwriters underwrite SEOs of firms with a longer record on the CRSP files. The viability dummy is also significantly and positively related to the reputation of the underwriter. Additionally, firms with positive earnings immediately after the SEO and firms that pay dividends hire more reputable underwriters. Finally, firms that have a greater analyst following and a lower *SD* of returns before the SEO are matched with underwriters of higher reputation. The number of years on CRSP is significant at the 5% level while all other variables are significant at the 1% level.

In summary, the results presented in this section strongly support positive assortative matching at the IPO and the SEO stages.

[24] However, it is possible that a pre-existing relationship between a venture capitalist and an investment bank may influence this result. We thank Donghang Zhang for this observation. Benveniste et al. (2003) also find a positive link between IPO venture-backing and underwriter reputation.

[25] We also used the number of 1- and 6-month analyst forecasts with similar results. Additionally, in unreported tests we find evidence that firms that are brought public by more reputable underwriters have more precise analyst earnings forecasts after the IPO. These results, however, are likely to suffer from endogeneity problems and we do not report them in the paper.

[26] The results are available on request.

Table II

Firm Quality and Underwriter Reputation at the SEO Stage

The sample of common stock SEOs of industrial firms (SIC codes not in the 4000's and 6000's) between 1970 and 2000 is obtained from the SDC New Issues database. The table reports the results from OLS regressions of the Megginson–Weiss (Panel A) and the Carter–Manaster (Panel B) reputation of the SEO lead underwriter on SEO proceeds (excluding the overallotment option), the market capitalization of the firm's equity in the month prior to the SEO, and additional proxies of firm quality. Carter–Manaster reputations are available after 1980. Dollar amounts are expressed in 1996 U.S. dollars using the GDP implicit price deflator. The title of each regression gives the firm quality measure used in that regression. A firm is considered to be viable if in 5 years after the SEO it is still traded on NYSE/AMEX/Nasdaq or if it is delisted due to a merger or an exchange offer. Delisting data is obtained from CRSP. The earnings dummy indicates whether the firm has positive earnings in the fiscal year ending after the offering. The dividend dummy indicates whether the firm pays a dividend in the fiscal year ending just before the offering. Earnings and dividend data are obtained from the Compustat annual files. We use the I/B/E/S database to get the number of analysts that made annual forecasts 3 months before the end of the fiscal year ending prior to the SEO. We use daily returns from CRSP for the period that starts 365 days before and ends 40 days before the SEO to calculate the standard error of daily returns. Asymptotically efficient two-tailed p-values of the respective coefficients are reported in parentheses.

Panel A: Dependent Variable Is the Megginson–Weiss Reputation of the Lead SEO Underwriter

	Log of Years on CRSP	Viability Dummy	Earnings Dummy	Dividend Dummy	Log Number of Forecasts	Standard Error of Daily Returns
Intercept	19.42*	18.68*	20.19*	21.14*	44.98*	23.58*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Log of SEO proceeds	1.63*	1.81*	1.66*	1.80*	0.96*	1.84*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Log of market capitalization	2.21*	2.00*	2.11*	1.96*	1.48*	1.90*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Firm quality measure	0.12**	2.16*	0.94*	0.73*	0.92*	−49.69*
	(0.0490)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Number of observations	5,756	4,514	5,438	5,508	2,533	5,883
Adjusted R^2	35.94%	35.83%	36.26%	35.97%	25.44%	36.92%

(continued)

Table II—*Continued*

Panel B: Dependent Variable Is the Carter–Manaster Reputation of the Lead SEO Underwriter						
	Log of Years on CRSP	Viability Dummy	Earnings Dummy	Dividend Dummy	Log Number of Forecasts	Standard Error of Daily Returns
Intercept	−7.08*	7.45*	−6.73*	−6.42*	0.45	−6.01*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.3910)	(<0.0001)
Log of SEO proceeds	0.31*	0.36*	0.31*	0.34*	0.16*	0.36*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Log of market capitalization	0.49*	0.43*	0.45*	0.42*	0.23*	0.41*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Firm quality measure	0.04*	0.85*	0.35*	0.21*	0.18*	−13.38*
	(0.0067)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Number of observations	4,769	3,507	4,561	4,617	2,411	4,868
Adjusted R^2	32.56%	33.84%	32.67%	32.16%	20.90%	34.10%

*, **, *** denote significance at the 1%, 5%, and 10% levels, respectively, from a two-tailed t-test.

Table III

Issue Activity and the Market Share of High Reputation Underwriters

The sample of industrial (SIC codes not in the 4000's and 6000's) public offerings of common stock is obtained from the SDC New Issues database. The sample includes 13,059 issues between 1970 and 2000. We perform separate analyses using annual and quarterly data. As dependent variables, we use the average market share (%) of the top seven and the top nine underwriters in the equity issue market for a given period, using the Megginson–Weiss reputation measure. As an additional dependent variable between 1980 and 2000 we also use the average market share (%) of all underwriters with the highest Carter–Manaster reputation of nine. As an explanatory variable we use the total number of issues in a given period. Two-tailed p-values of the respective coefficients are reported in parentheses.

Dependent Variable: Market Share of Top Reputation Underwriters						
	Top Seven Underwriters Using Megginson–Weiss Reputation		Top Nine Underwriters Using Megginson–Weiss Reputation		Underwriters with Carter–Manaster Reputation of Nine	
	Annual	Quarterly	Annual	Quarterly	Annual	Quarterly
Intercept	12.18*	11.11*	10.55*	9.14*	19.15*	30.28*
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Log of total number of issues in a period	−0.78**	−0.81*	−0.65**	−0.56*	−1.99*	−4.60*
	(0.0413)	(0.0006)	(0.0310)	(0.0020)	(<0.0001)	(<0.0001)
Number of periods	31	124	31	124	21	84
Adjusted R^2	9.74%	9.06%	10.94%	6.83%	32.56%	39.99%

*, **, *** denote significance at the 1%, 5%, and 10% levels, respectively, from a two-tailed t-test.

B. Issue Activity versus Market Share and Client Quality of Reputable Underwriters

In this section, we first analyze the relation between the average market share of top reputation underwriters in a given year and in a given quarter and the level of activity in the equity issue market in that year or quarter. We use three broadly consistent approaches to define the set of top underwriters. The first two approaches are based on the Megginson–Weiss reputation of the underwriters, and use the seven and nine underwriters with the highest reputation. The third approach uses all underwriters with a Carter–Manaster reputation equal to nine as the set of top reputation underwriters. There are approximately eight underwriters per year with a Carter–Manaster reputation of nine. Proposition 2 implies that the market share of the high reputation underwriters should decline as the number of issues rises, and vice versa. The results in Table III are consistent with this implication. The coefficient on issue activity is significantly negative, mostly at the 1% level.

In Table IV, we report the results of our test of several hypotheses based on Proposition 3. We use the proceeds of an issue as a measure of the firm's quality, under the assumption that larger issues are of higher quality. We find that the average firm quality for the top seven and top nine underwriters using Megginson–Weiss reputation[27] in a given year is positively related to the

[27] The number of underwriters with Carter–Manaster reputation of nine varies over time and this impedes the use of Carter–Manaster ranks in these tests.

Table IV

Quality of Firms Underwritten by High Reputation Underwriters

The sample of industrial (SIC codes not in the 4000's and 6000's) public offerings of common stock is obtained from the SDC New Issues database. The sample includes 13,059 issues between 1970 and 2000. All dollar values are expressed in millions of 1996 U.S. dollars using the GDP implicit price deflator. The dependent variable is the average log proceeds underwritten by the top seven and the top nine underwriters in year t. For every year t, as independent variables we use the average and the *SD* of log proceeds and the natural log of total number of issues for that year. Two-tailed p-values of the respective coefficients are reported in parentheses.

	Dependent Variable: Average Log Proceeds Underwritten by Top Reputation Underwriters in Year t	
	Top Seven Underwriters Based on Megginson–Weiss Reputation	Top Nine Underwriters Based on Megginson–Weiss Reputation
Intercept	1.21	2.31
	(0.4138)	(0.1020)
Average of log proceeds for year t	0.83*	0.76*
	(<0.0001)	(<0.0001)
SD of log proceeds for year t	1.35*	1.24*
	(<0.0001)	(<0.0001)
Log of total number of issues in year t	0.15*	0.18*
	(< 0.0001)	(<0.0001)
Number of years	31	31
Adjusted R^2	87.05%	87.13%

*, **, *** denote significance at the 1%, 5%, and 10% levels, respectively, from a two-tailed t-test.

average quality of all the issues for that year. Furthermore, as the dispersion of firm quality rises, so does the average quality of firms underwritten by top underwriters. Finally, the number of issues is positively related to the average quality of the firms underwritten by top underwriters. All three relations are significant at the 1% level in both specifications.

C. Lead Underwriter Reputation and the Reputation of Co-Managing Banks

In this section, we focus our attention on the choice that a firm exercises over underwriters willing to underwrite it. If a firm chooses the most reputable lead underwriter from the set of available underwriters, Proposition 1 also suggests that co-managers will be of lower reputation than lead managers. We compare the reputation of the lead underwriter to the reputation of co-managers.[28] The results are presented in Panel A of Table V. Consistent with our hypothesis, we find that on average lead underwriters have significantly higher reputation than co-managers. The results hold for the whole sample as well as for the IPO and SEO subsamples. In addition, when we bifurcate our sample into two subsamples—issues in which the lead underwriter has above-median reputation and issues in which the lead underwriter has below-median reputation—we find that the results hold for both subsamples.

[28] We thank a referee for suggesting this analysis.

Table V

Reputation of Lead Underwriters, Co-Managers, and Analysts Providing Earnings Forecasts

From SDC we collect issues of common stock by industrial firms (SIC codes not in the 4000's and 6000's). The table compares the reputation of the lead underwriter to the reputation of co-managers (Panel A) and the reputation of analysts providing post-issue earnings forecasts (Panel B). The lead reputation, when there is more than one lead underwriter, is equal to the maximum reputation of all lead underwriters. For Panel A we identify 7,099 issues—3,389 IPOs and 3,710 SEOs—between 1970 and 2000 that have at least one co-manager with available Megginson–Weiss reputation. The co-manager reputation, when there is more than one co-manager, is equal to the maximum Megginson–Weiss reputation of all co-managers. For Panel B we identify 3,966 issues—820 IPOs and 3,146 SEOs—between 1982 and 2000 that have at least one analyst associated with a broker different from the firm's lead underwriter(s) and for which the Megginson–Weiss reputation measure is available. We identify the analysts that provide earnings forecasts in the year following the issue, and their broker houses, from the I/B/E/S database. The reputation of the analyst is equal to the Megginson–Weiss reputation of the investment bank that the analyst is associated with, as long as this bank is not the lead underwriter(s). When there is more than one investment bank providing analyst coverage, analyst reputation is equal to the maximum reputation of all analysts providing coverage. Co-managers and analysts with missing reputation are not included in the analysis. The table reports the average difference in reputation between lead underwriters and co-managers (Panel A) and the average difference in reputation between lead underwriters and analysts (Panel B). We perform the same analysis for the whole sample and for two equally sized subsamples formed on the reputation of the lead underwriter. The respective p-values are presented in parentheses.

	Whole Sample	IPOs	SEOs
Panel A: Average Difference in Reputation between Lead Underwriters and Co-Managers			
Whole sample	2.95*	3.04*	2.86*
	(<0.0001)	(<0.0001)	(<0.0001)
Lead below-median reputation	0.51*	0.66*	0.35***
	(<0.0001)	(0.0002)	(0.0545)
Lead above-median reputation	5.39*	5.43*	5.38*
	(<0.0001)	(<0.0001)	(<0.0001)
Panel B: Average Difference in Reputation between Lead Underwriters and Analysts			
Whole sample	4.63*	5.66*	4.36*
	(<0.0001)	(<0.0001)	(<0.0001)
Lead below-median reputation	2.27*	3.27*	2.01*
	(<0.0001)	(<0.0001)	(<0.0001)
Lead above-median reputation	6.98*	8.01*	6.75*
	(<0.0001)	(<0.0001)	(<0.0001)

*, **, *** denote significance at the 1%, 5%, and 10% levels, respectively, from a two-tailed t-test.

It is possible that lead underwriters, rather than firms, are actively involved in the selection of co-managers of an issue, in which case our results in Panel A may be mostly driven by the preferences of the lead underwriters. To verify the robustness of our results, we compare the reputation of the lead underwriter with the reputation of the investment banks whose analysts provide earnings forecasts for the firm after the issue. The results are presented in Panel B of Table V. We again find that on average lead underwriters have higher reputation than the investment banks whose analysts provide forecasts for the firm. As before, our results hold for the whole sample, for the IPO and SEO subsamples, and for the above-median and below-median underwriter reputation subsamples. Since the lead underwriter is unlikely to exert significant direct influence on third-party analyst coverage subsequent to the issue, these results provide further support to our previous findings.

D. The Transactional Nature of Firm–Underwriter Matching

Our next objective is to examine whether a switch in underwriters from IPO to SEO is related to a change in a firm's quality relative to the current reputation of its IPO underwriter, which is also suggested by Proposition 3. A relationship between the probability of switching and the relative change in firm quality would lend support to the notion that firm–underwriter choice is transactional rather than the outcome of a prior relationship. Our theory predicts that the probability of a switch would increase as the divergence between firm quality and underwriter reputation increases relative to the association predicted by positive assortative matching. We use the absolute difference between the percentile rank of an issue's proceeds and the percentile rank of the underwriter's reputation as our measure of the divergence between firm quality and underwriter reputation. Percentile ranks of proceeds are constructed on an annual basis using all IPO and SEO issues for a given year. Similarly, underwriter percentile ranks are constructed annually using the Megginson–Weiss reputation measure discussed above. To exclude the possibility of switching because a firm's IPO underwriter may not exist at the time of the SEO due to a merger or other reason, we confine our analysis to the subset of firms in our sample in which the firm's IPO underwriter exists at its SEO.

Table VI reports the results from a logistic regression that relates the probability of switching to the absolute difference between the firm's quality rank and its IPO underwriter's reputation rank. Consistent with our theory, we find that firms and underwriters with higher differences in relative ranking are more likely to switch each other than firms and underwriters that have similar ranks. These results are new to the literature and are not predicted by a relationship theory of firm–underwriter association. We provide our estimates for the entire 1970 to 2000 sample period as well as for the 1970 to 1990 and the 1991 to 2000 subperiods to check for any differences in the 1990s. For the full sample period, firms are more likely to switch, the higher the change of IPO underwriter reputation percentile rank from IPO to SEO, the higher the absolute difference between the IPO underwriter reputation percentile rank and the firm's SEO proceeds percentile, and the higher the time elapsed since the IPO; firms are less likely to switch, the higher the IPO underwriter's reputation percentile rank at the SEO. While Krigman et al. (2001) also examine switching and document a graduation to higher reputation underwriters at the SEO stage, their findings suggest that firms switch in order to graduate to better underwriters. However, even after we control for the change in underwriter reputation between IPO and SEO, and the elapsed time between IPO

Table VI

Changes in Firm and Underwriter Relative Qualities and SEO Switching

From SDC we collect SEOs of common stock by industrial firms (SIC codes not in the 4000's and 6000's) between 1970 and 2000 so that the IPO of the firm is at most 5 years before the SEO date. We keep only the first SEO after the IPO. In this table, we estimate a logistic regression to predict the probability of a switch. For each year, we construct issue percentile ranks based on the proceeds of the issue from SDC using all industrial equity issues (IPOs and SEOs) for that year. For each year, we also create percentile ranks of underwriters based on their 3-year total proceeds. In this ranking, each underwriter appears as many times as it is a lead of any IPO or SEO during the year. We use these percentile ranks to create the absolute difference between the firm-proceeds rank and the IPO-underwriter reputation rank in the SEO year and we use this variable to explain the probability of a switch. As additional explanatory variables, we use the percentile rank of the IPO underwriter calculated above, the change in underwriter reputation that the firm experiences from IPO to SEO, and the number of days from IPO to SEO. For 271 issues we do not have information on the reputation of the IPO lead underwriter in the year of the SEO so we exclude these observations from our analysis. The regression also includes several time dummies as explanatory variables. p-Values from a two-tailed t-test are given in parentheses under the respective coefficients.

Dependent Variable: Probability of Switch			
	All SEOs	1970–1990	1991–2000
Intercept	−6.22*	−4.26*	−6.65*
	(<0.0001)	(0.0002)	(<0.0001)
IPO underwriter reputation percentile rank at SEO	−1.86*	−1.87*	−1.92*
	(<0.0001)	(<0.0001)	(<0.0001)
Change of underwriter reputation percentile rank from IPO to SEO	1.25*	3.05*	0.42
	(<0.0001)	(<0.0001)	(0.2627)
Log of days from IPO to SEO	0.96*	0.62*	1.09*
	(<0.0001)	(0.0004)	(<0.0001)
Absolute difference in IPO lead reputation percentile at SEO and proceeds percentile of SEO	1.49*	1.46**	1.54*
	(<0.0001)	(0.0405)	(0.0005)
1986–1990 Dummy	0.57*	0.67*	
	(0.0081)	(0.0024)	
1991–1995 Dummy	0.30**		
	(0.0905)		
1996–1998 Dummy	0.35**		0.07
	(0.0655)		(0.6874)
1999–2000 Dummy	0.86*		0.60*
	(0.0005)		(0.0090)
Switch	473	159	314
Do not switch	991	305	686

*, **, *** denote significance at the 1%, 5%, and 10% levels, respectively, from a two-tailed t-test.

and SEO, we find that the change in the firm's relative quality is highly significant in explaining the switch. Thus, we attribute switching to a change in relative ranking between the IPO and SEO, suggesting that the graduation effect will occur only if the firm's relative quality also improves. Indeed, for the 1991 to 2000 period, our results show that after controlling for the change in the firm's quality and the time elapsed since the IPO, the change in underwriter reputation from IPO to SEO is no longer statistically significant in explaining the switch.

Additionally, in contrast to Krigman et al. (2001), our findings also suggest the possibility (examined in detail below) of downward switching. Nonetheless, we do find that switchers usually switch to higher reputation underwriters (at least in the early part of our sample period) and that the length of the period between the IPO and the SEO is positively related to the probability of a switch. A one standard deviation (0.72) increase in the log number of days from IPO to SEO leads to an increase in the probability of a switch from around 32% to around 49%. While the previous literature (e.g., James (1992)) has attributed the significance of the IPO–SEO period length to the declining value of the relationship-specific asset over time, our theory provides an alternative explanation for this result since firm quality is more likely to change as the elapsed time increases, thus increasing the likelihood of a switch. We also find that underwriters with higher reputation are less likely to be switched, possibly because switching in the case of high reputation underwriters would occur only if their clients exhibit significant decreases in their relative qualities. A one standard deviation (0.27) increase in the percentile rank of the IPO lead underwriter reduces the probability of a switch from 32% to 22%.

Authors such as Hayes (1979), Hayes et al. (1983), and Eccles and Crane (1988) argue that the investment banking industry has experienced a change from a relationship orientation towards a transactional orientation. To control for this possibility we bifurcate our sample into two subperiods of equal length (1970 to 1985 and 1986 to 2000) and include time dummies in our regression to encompass several subperiods that span the 1986 to 2000 period. All of these dummies are significantly positive, suggesting that the firm–underwriter switching rates have indeed been higher in the second half of the 1970 to 2000 period. In particular, the results show that the probability of a switch during 1986 to 1990 is significantly higher (at the 1% level) relative to the pre-1986 period. Similarly, the switching rates are significantly higher (at the 1% level) for 1999 to 2000. For the 1991 to 1995 and 1996 to 1998 subperiods, however, the probability of a switch is only marginally higher (at the 10% level) relative to the pre-1986 period.

Our finding of a higher propensity to switch in the later years, especially in the 1986 to 1990 and 1999 to 2000 subperiods, lends support to the notion that the investment banking industry has become more transactional in recent times. Nonetheless, our analysis clearly shows that the overriding determinant of an underwriter switch from an IPO to an SEO is the difference in relative ranks of issuer quality and underwriter reputation, a result that persists throughout our sample period and during each of the subperiods.

Our theory also suggests that firms experiencing a relative increase in their quality would be more likely to switch up while firms experiencing a relative decline in quality are more likely to switch down. We test this implication in Table VII using an ordered logistic regression, where issuers are categorized into three groups: down-switchers, nonswitchers, and up-switchers. As a control variable, we include the reputation percentile rank of the IPO underwriter. The

Table VII

Ordered Logistic Regression of How Firms Switch

From SDC we collect SEOs of common stock by industrial firms (SIC codes not in the 4000's and 6000's) between 1970 and 2000 so that the IPO of the firm is at most 5 years before the SEO date. We keep only the first SEO after the IPO. In this table, we estimate an ordered logistic regression to predict the probability of a firm switching up. We construct the dependent variable as an ordered variable indicating whether the firm switches to a lower reputation underwriter, does not switch, or switches to a higher reputation underwriter for the SEO. For each year, we construct issue percentile ranks based on the proceeds of the issue from SDC using all industrial equity issues (IPOs and SEOs) for that year. For each year, we also create percentile ranks of underwriters based on their 3-year total proceeds. In this ranking, each underwriter appears as many times as it is a lead of any IPO or SEO during the year. As explanatory variables, we use the reputation rank of the IPO underwriter at the SEO discussed above and the change in the percentile rank of proceeds from IPO to SEO. p-Values from a two-tailed t-test are given in parentheses under the respective coefficients.

Dependent Variable: Probability of Switching Up	
Intercept 1	0.16
	(0.2341)
Intercept 2	4.07*
	(<0.0001)
Reputation percentile rank of IPO underwriter at SEO	−3.23*
	(<0.0001)
Change in firm proceeds percentile rank from IPO to SEO	1.32*
	(<0.0001)
Number of firms switching up	302
Number of firms not switching	991
Number of firms switching down	171

*, **, *** denote significance at the 1%, 5%, and 10% levels, respectively, from a two-tailed t-test.

results show that issuers with high reputation IPO underwriters are less likely to improve the reputation of their underwriter for the SEO while the opposite is true for issuers with less reputable IPO underwriters. As our measure of issue quality we use the percentile rank of proceeds. We then compute the difference between the proceeds percentile rank of the issuer at the SEO and at the IPO. Issuers that have increased their relative proceeds rank from IPO to SEO are viewed as having improved their relative quality. As hypothesized, we find that issuers that experience a relative increase in quality are more likely to switch up while issuers that experience a relative decline in quality are more likely to switch down. The coefficient for the change in issue proceeds rank is highly significant at the 1% level. These results complement the findings presented in Table VI by providing further evidence consistent with our hypotheses of positive assortative matching and of the transactional nature of firm–underwriter association.

The final part of our analysis in this section focuses on the subsample of firms that experience a downward switch in underwriter reputation.[29] These firms constitute an interesting sample for special attention since they go against

[29] We thank a referee for suggesting this analysis.

the common trend of switching to higher reputation underwriters at the SEO stage. Indeed, it seems unintuitive that firms would voluntarily switch to lower reputation underwriters. We first compare the down-switchers to all other issuers that either do not switch or that switch up. The results are provided in Table VIII. The results suggest that firms that switch down have an IPO underwriter reputation that is similar to firms that do not switch down. We use underpricing at the IPO to measure the level of positive new information provided by the market about the quality of the issue. We find that down-switchers are significantly less underpriced at their IPO. Down-switchers also have lower market capitalization and issue lower amounts at the IPO stage. Furthermore, firms switching down have a significantly smaller increase in the issue size from IPO to SEO, have lower average returns from IPO to SEO, have smaller SEO issues, and pay higher percentage SEO spreads.

To establish the robustness of these findings, we also use the matched sample approach to compare issuers that switch down to issuers that do not switch down. These results are also reported in Table VIII. For each firm that switches down we find a matching firm that does not switch down, performs the SEO in the same year, has the closest SEO proceeds, and has an IPO lead underwriter in the same reputation quartile as the down-switching firm. In keeping with our previous results, the difference between the IPO proceeds of the two samples is insignificant but the underpricing at the IPO stage and the subsequent market capitalization are significantly lower for the down-switchers. The sample of firms switching down also has a significantly lower change in the proportion of firms with positive earnings, lower average daily returns between the IPO and the SEO, and lower SEO proceeds. In the matched sample approach we do not find a significant difference in the percentage spreads that firms pay to the SEO underwriter.

Our overall conclusion from the separate analysis of down-switchers is that firms that experience a decline in relative quality at the SEO stage switch to lower reputation investment banks to underwrite their SEOs. It is difficult to justify why firms would voluntarily switch to lower reputation underwriters, especially given our finding later in the paper that higher reputation underwriters charge lower spreads on SEOs. Down-switching is consistent with the notion that lower quality firms are "forced" to switch to lower reputation underwriters because their higher reputation IPO underwriters decline the opportunity to underwrite their secondary issues. Underwriters do indeed seem to exercise choice over the firms they underwrite in the same way that firms do over underwriters, further reinforcing the concept of mutual choice that we advance in this paper.

E. Subsequent Security Issues, Underwriter Reputation, and Long-Term Underwriter Revenue

In this section, we turn to the insights provided by our theory concerning the relation between underwriter reputation, and both subsequent security issues and long-term underwriting revenue.

Table VIII

Separate Analysis for Firms Switching Down

From SDC we collect SEOs of common stock by industrial firms (SIC codes not in the 4000's and 6000's) between 1970 and 2000 so that the IPO of the firm is at most 5 years before the SEO date. Offer prices, issued dates, issue proceeds, and SEO gross spreads are obtained from SDC. Firm market capitalization, post-IPO market price used to calculate underpricing, and daily returns are obtained from CRSP. Information of earnings is obtained from COMPUSTAT. We calculate the Megginson–Weiss reputation of the lead underwriter as in Aggarwal et al. (2002). All underwriters are allocated in four portfolios, for IPOs and for SEOs, based on their Megginson–Weiss reputation. The cut-off points for the IPO reputation quartiles are 80.7, 90.4, and 95.2. The cut-off points for the SEO reputation quartiles are 85.6, 91.6, and 95.8. The sample for the first column contains all firms whose IPO underwriter is in the top two quartiles. Firms switching to an SEO reputation quartile lower than their IPO quartile are classified as switching down (129 firms). The rest of the firms are classified as not switching down (556 firms). The table reports the difference in the average variables for the two subsamples (not switching down minus switching down) and their p-values in parentheses. The results in the second column use a matching sample. For each firm that starts with a given IPO underwriter reputation quartile and switches to an underwriter in a lower SEO reputation quartile (174 firms), we find a matching firm that performs the SEO in the same year, has the closest SEO proceeds, starts in the same IPO underwriter reputation quartile, but does not switch to a lower SEO reputation quartile. The table reports the average differences in the variables under interest for the two subsamples (not switching down minus switching down) and their p-values in parentheses. Using z-scores provides us with similar results in both columns.

	Difference in Averages between Firms That Do Not Switch Down and Firms That Switch Down	Average Difference between a Matched Sample of Firms That Do Not Switch Down and Firms That Switch Down
Log of SEO proceeds	0.36*	0.05**
	(<0.0001)	(0.0332)
Number of days from IPO to SEO	−307*	−258*
	(<0.0001)	(<0.0001)
IPO reputation	−0.33	−0.08
	(0.2598)	(0.5984)
Log of IPO market capitalization	0.27*	0.15**
	(0.0006)	(0.0226)
Change in log of market capitalization from IPO to SEO	0.07	−0.06
	(0.1729)	(0.2572)
Log of IPO proceeds	0.20*	0.05
	(0.0047)	(0.3974)
Change in log of proceeds from IPO to SEO	0.16**	0.01
	(0.0322)	(0.8864)
IPO underpricing	0.08*	0.09*
	(0.0004)	(0.0003)
Change in earnings dummy from IPO to SEO	0.05	0.09***
	(0.2535)	(0.0864)
Average daily return minus equally weighted CRSP between IPO and SEO (%)	0.08*	0.05**
	(<0.0001)	(0.0151)
SEO gross spread	−0.24*	−0.05
	(0.0037)	(0.5412)

*, **, *** denote significance at the 1%, 5%, and 10% levels, respectively, from a two-tailed t-test.

Table IX

Underwriter Reputation and Subsequent Underwriting Revenues

The sample consists of 3,970 industrial IPOs (SIC codes not in the 4000's and 6000's) between 1970 and 1995 with available data. As dependent variables we use the total amount of subsequent spreads and the number of subsequent issues that the IPO lead underwriter has with the firm at most 5 years after the IPO. There are 848 IPO firms with at least one subsequent issue underwritten by the IPO lead bank and 3,122 firms that either did not have a subsequent issue or employed the services of different lead underwriter(s). When the dependent variable is total subsequent spreads, we estimate a Tobit regression. When the dependent variable is the number of subsequent issues, we estimate a Poisson regression. We compute the market capitalization using the first available CRSP data on share price and shares outstanding as long as this information is available within 60 days of the IPO. We calculate the Megginson–Weiss reputation of the lead underwriter as in Aggarwal et al. (2002). The total amount of subsequent spreads is calculated as the sum of all spreads that the firm paid for issues that the firm made at most 5 years after the IPO and that were underwritten by the IPO lead underwriter. We also discount the subsequent spreads to the IPO date using the average market return for the period of 1970 to 2000. We present all dollar values in millions of 1996 U.S. dollars using the GDP implicit price deflator. p-Values from a two-tailed t-test are given in parentheses under the respective coefficients.

	Dependent Variable					
	Total Amount of Subsequent Spreads in 1996 U.S. Dollars (million)		Total Amount of Subsequent Spreads Discounted to the Day of the IPO in 1996 U.S. Dollars (million)		Number of Subsequent Issues	
Intercept	−41.86*	−35.66*	−35.04*	−29.81*	−7.47*	−7.00*
	(< 0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Megginson–Weiss underwriter reputation	0.4017*	0.3257*	0.3365*	0.2726*	0.0712*	0.0650*
	(< 0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Market capitalization at IPO (million 1996$)		0.0048*		0.0041*		0.0004*
		(<0.0001)		(<0.0001)		(<0.0001)

*, **, *** denote significance at the 1%, 5%, and 10% levels, respectively, from a two-tailed t-test.

Of the 3,970 firms in our sample that go public between 1970 and 1995, 1,761 (44%) have subsequent issues of securities in the 5-year period after the IPO, while the rest do not. Of the firms that make subsequent offerings, 913 use a different lead underwriter in their subsequent security offering, while the remaining 848 firms use their IPO lead underwriter.

In Table IX, we use a Tobit regression to examine the relationship between underwriter reputation and subsequent fees. Our estimates suggest that a one standard deviation increase in underwriter reputation from the mean leads to an increase in the probability of a subsequent issue with the same underwriter from 19% to 35%. We also find that underwriters with higher reputation receive higher future dollar proceeds from the spreads that they charge on subsequent issues. Given that the IPO investment bank underwrites at least one subsequent issue, we find that a one standard deviation increase in IPO underwriter reputation leads to an increase of more than $3.9 million in the total amount of spreads that it receives for underwriting follow-on security offerings in the 5-year period after the IPO. The positive relation between subsequent revenues and underwriter reputation persists even after we control for the market capitalization of the firm after the IPO. The final Poisson regression in Table IX provides strong evidence that higher reputation underwriters underwrite a higher number of subsequent issues of their IPO clients. A one standard deviation increase in the reputation of the underwriter leads to an expected increase of 0.69 subsequent offerings. Overall, the results presented in this section are consistent with the notion that the amount of future business that underwriters receive from their IPO clients is positively related to the reputation of the underwriter.

Table X

Underwriter Reputation and Percentage Spreads of Follow-On SEOs

From SDC we collect SEOs of common stock by industrial firms (SIC codes not in the 4000's and 6000's) between 1970 and 2000 where the IPO of the firm is at most 5 years before the SEO. We perform separate analysis for SEOs lead underwritten by the IPO lead underwriter and for all SEOs. As a dependent variable we use the percentage spread of the subsequent issues. As explanatory variables, we use the Megginson–Weiss reputation of the lead underwriter, the market capitalization of the firm after the IPO, the proceeds of the SEO, and the number of calendar days from IPO to SEO. We compute market capitalization using the first available CRSP data on share price and shares outstanding as long as this information is available within 60 days of the IPO. We calculate the Megginson–Weiss reputation of the lead underwriter as in Aggarwal et al. (2002). We use the SDC New Issues database to obtain the proceeds amount of the issue. We present all dollar values in 1996 U.S. dollars using the GDP implicit price deflator. Underpricing is measured as the percentage difference of the first available CRSP price and the offer price. The estimated model is an OLS regression. p-Values from a two-tailed t-test are given in parentheses under the respective coefficients. We use an asymptotically efficient estimate of the variance–covariance matrix to calculate the t-statistics.

Dependent Variable: Percentage Spread of Follow-On SEOs		
	SEOs Using IPO Underwriter	All SEOs
Intercept	18.28*	18.70*
	(<0.0001)	(<0.0001)
Megginson—Weiss reputation of underwriter	−0.03*	−0.04*
	(<0.0001)	(<0.0001)
Log of market capitalization after the IPO in 1996 U.S. dollars	−0.47*	−0.44*
	(<0.0001)	(<0.0001)
Log of issue proceeds in 1996 U.S. dollars	−0.26*	−0.29*
	(0.0054)	(<0.0001)
Log of days from IPO to SEO	−0.10**	−0.10*
	(0.0474)	(0.0006)
IPO underpricing (%)	0.23	0.12
	(0.1092)	(0.1994)
Number of observations	964	1,902
Adjusted R^2	43.25%	47.55%

*, **, *** denote significance at the 1%, 5%, and 10% levels, respectively, from a two-tailed t-test.

It is possible that the larger dollar spreads on subsequent issues earned by higher-reputation underwriters may be due in part to higher percentage underwriting spreads. In contrast, our empirical hypothesis derived from Proposition 4 suggests that in SEOs, the percentage spread declines with underwriter reputation. We turn to this issue next, noting at the outset that there is no significant clustering of SEO spreads on a single number (as observed for IPOs by Chen and Ritter (2000)) to complicate our analysis. Table X examines the relation between the spreads charged on SEOs and the reputation of the lead underwriter. In the first model, we include only firms that issue equity at most 5 years after the IPO using the same lead underwriter. We control for the market capitalization of the issuer, the amount of the seasoned offering, the number of days from IPO to SEO, and the underpricing at the IPO. The results indicate that more reputable underwriters charge significantly lower fees for underwriting SEOs. An increase of one standard deviation in SEO lead underwriter reputation is associated with a decrease (significant at the 1% level) of approximately two basis points in the percentage spread. The other coefficients are consistent with Altinkiliç and Hansen (2000). As in Nanda and Warther (1998), firms that were more underpriced at the IPO stage are charged higher fees for their SEOs, even though the significance of the coefficient is marginal. This evidence shows that more reputable underwriters receive higher future revenues not because they charge higher percentage fees but because they pair with firms that raise larger amounts of capital through more frequent subsequent offerings. In the second model we expand our analysis to include all firms that issued SEOs within 5 years of their IPO, regardless of whether they used their IPO underwriter for the SEO. Our results are essentially unchanged. The evidence presented in Table X provides strong support for the notion that in seasoned equity offerings, underwriting spreads decline with underwriter reputation.

IV. Conclusion

In this paper, we develop and test a theory of firm–underwriter selection founded on the institutionally accurate premise that issuers and underwriters associate by mutual choice. Underwriters look to the quality of the issuers who wish to employ their services and issuers look to the abilities of the underwriters who offer their services. This contrasts both with the conventional representation of issuer/underwriter associations as one-sided choices (with either issuers or underwriters doing the choosing), and the classical economics representation of a market in which prices clear the market. Our approach has implications for empirical studies that examine the effect of underwriter reputation and/or issuer quality on IPO characteristics such as its level of underpricing, its probability of being withdrawn, and other variables that are important to either the issuer or the underwriter. Our findings suggest that issuers and underwriters will associate with different partners for subsequent offerings if changes in issuer quality and/or underwriter reputation are large enough. These findings support the view that the association of issuers and underwriters is transactional rather than relationship-based.

Our research also has implications for future work on underwriter market share and compensation. We provide fresh insights about how the level of market activity affects the market share of high ability underwriters as well as the quality of issues they underwrite. While more able underwriters enjoy a higher and less volatile market share, we show that they achieve this in cold markets by associating with lower quality issuers rather than in hot markets. While the flat IPO underwriting fees documented by Chen and Ritter (2000) are consistent with our model, we also argue that many other fee structures are possible. Indeed, we show that percentage fees for subsequent offerings decline with underwriter reputation. Significantly, our model implies that the underwriting spread is determined through bargaining between the matched issuers and underwriters and does not determine which underwriters associate with which issuers. Moreover, notwithstanding flat percentage IPO fees and declining SEO fees, we show that high reputation underwriters reap ample rewards for maintaining their reputation assets. It would be interesting to use the mutual choice model developed here to examine how and why the industry converged on flat underwriting fees.

Appendix

Proof of Proposition 1: $M(j)$ denotes the set of firms matched to underwriter j. If firm i is matched to underwriter j, we write $i \in M(j)$. The underwriter that is matched to firm i is denoted as $\mu(i)$. If firm i is matched to underwriter j, we write $j = \mu(i)$. We need to show that if $i < i + k$, then in equilibrium $\mu(i) < \mu(i + k)$. Any stable matching should maximize the aggregate surplus produced by the matched pairs. If this were not the case the outcome would be dominated by another matching with a higher aggregate surplus in which all participants receive the same amounts as in the original matching plus a nonnegative portion of the additional value created. Suppose that there exists an equilibrium matching, where $i + k \in M(j)$ and $\mu(i) = j + l$ for some $k > 0$ and for $l > 0$. Since we know that $H_{i,j} - H_{i,j+l} > H_{i+k,j} - H_{i+k,j+l}$, by re-matching firm i with underwriter j and firm $i + k$ with underwriter $j + l$, the sum of surpluses is increased and the hypothesized matching is not stable. Q.E.D.

Proof of Proposition 2: Suppose that there exists an equilibrium matching, where for some $l > 0$ we have $i \in M(j + l)$ and the capacity of underwriter j is not filled, which we denote as $0 \in M(j)$. Since we know that $H_{i,j} > H_{i,j+l}$ and $H_{0,j} = H_{0,j+l} = 0$, it is true that $H_{i,j} + H_{0,j+l} > H_{0,j} + H_{i,j+l}$. By re-matching firm i with underwriter j and leaving underwriter $j + l$ with one less match, the sum of surpluses can be increased and the hypothesized matching is not stable. Q.E.D.

Proof of Proposition 3: Suppose that $i' \in M(j = 1)$ so that $i' > 1$ and $\mu(i = 1) = j'$, $j' > 1$. Since we know that $H_{1,1} + H_{i',j'} > H_{1,j'} + H_{i',1}$, by matching firm $i = 1$ with underwriter $j = 1$ and firm i' with underwriter j', the sum of surpluses can be increased, and the hypothesized matching is not stable.

Situations in which underwriter $j = 1$ is not matched are ruled out by the fact that firm $i = 1$ is matched to $j' > 1$ and by Proposition 2. We apply the same reasoning to the new market created by eliminating firm $i = 1$ and decreasing the available capacity of underwriter $j = 1$ by one to get the desired result. Q.E.D.

Proof of Proposition 4: The allocations to underwriter j and firm i, when matched together, are respectively $U_{i,j}$ and $F_{i,j}$ so that $U_{i,j} + F_{i,j} = H_{i,j}$. We will prove the validity of the lower bound of underwriter allocations. The proof for the upper bound of underwriter allocation is a proof for the lower bound of firm allocation and as such is analogous. First, we prove that an underwriter allocation that is less than the identified lower bound is not supported in equilibrium. In equilibrium, underwriter j is matched with firm j. Similarly, underwriter $j-1$ is matched with firm $j-1$. We will prove that if underwriter j gets at least $U_{j,j}^{\text{lower}}$, then underwriter $j-1$ should get at least $U_{j-1,j-1}^{\text{lower}}$. Since $U_{j,j} \geq U_{j,j}^{\text{lower}}$, then $F_{j,j} \leq H_{j,j} - \sum_{n=j}^{J-1}(H_{n+1,n} - H_{n+1,n+1})$. Suppose that $U_{j-1,j-1} < \sum_{n=j-1}^{J-1}(H_{n+1,n} - H_{n+1,n+1})$ so that $F_{j,j} + U_{j-1,j-1} < H_{j,j} + H_{j,j-1} - H_{j,j}$. As a result, $F_{j,j} + U_{j-1,j-1} < H_{j,j-1}$, and underwriter $j-1$ and firm j will block the hypothesized matching. So, it must be the case that in equilibrium, $U_{j-1,j-1} \geq \sum_{n=j-1}^{J-1}(H_{n+1,n} - H_{n+1,n+1})$. Since the lowest ability underwriter, J, would not get less than its lower bound ($U_{J,J}^{\text{lower}} = 0$), this completes the first part of the proof. Second, we prove that the given lower bound of underwriter allocation is indeed an equilibrium allocation. For that purpose we need to show that, given this allocation, no firm–underwriter pair could do strictly better by blocking the equilibrium matching. In equilibrium, underwriter j is matched with firm j while underwriter j' is matched with firm j'. Without loss of generality, we need to show that firm j and underwriter j' cannot do better by matching with each other, or equivalently, that $(H_{j,j} - U_{j,j}^{\text{lower}}) + U_{j',j'}^{\text{lower}} \geq H_{j,j'}$. This translates to $H_{j,j} - \sum_{n=j}^{J-1}(H_{n+1,n} - H_{n+1,n+1}) + \sum_{n=j'}^{J-1}(H_{n+1,n} - H_{n+1,n+1}) \geq H_{j,j'}$. If $j' < j$, then the previous expression can be rewritten as $\sum_{n=j'}^{j-1}(H_{n+1,n} - H_{n+1,n+1}) \geq \sum_{n=j'}^{j-1}(H_{j,n} - H_{j,n+1})$, which is true since $H_{n+1,n} - H_{n+1,n+1} \geq H_{j,n} - H_{j,n+1}$ for any $n \in [j', j-1]$. If $j' > j$, then we need to show that $\sum_{n=j}^{j'-1}(H_{n+1,n} - H_{n+1,n+1}) \leq \sum_{n=j}^{j'-1}(H_{j,n} - H_{j,n+1})$, which is true since $H_{n+1,n} - H_{n+1,n+1} \leq H_{j,n} - H_{j,n+1}$ for any $n \in [j, j'-1]$. Q.E.D.

REFERENCES

Aggarwal, Rajesh K., Laurie Krigman, and Kent L. Womack, 2002, Strategic IPO underpricing, information momentum, and lockup expiration selling, *Journal of Financial Economics* 66, 105–137.

Altinkiliç, Oya, and Robert S. Hansen, 2000, Are there economies of scale in underwriting fees? Evidence of rising external financing costs, *Review of Financial Studies* 13, 191–218.

Barry, Christopher B., Chris J. Muscarella, John W. Peavy III, and Michael R. Vetsuypens, 1990, The role of venture capital in the creation of public companies, *Journal of Financial Economics* 27, 447–471.

Beatty, Randolph P., Howard Bunsis, and John R. M. Hand, 1998, The indirect economic penalties in SEC investigations of underwriters, *Journal of Financial Economics* 50, 151–186.

Beatty, Randolph P., and Jay R. Ritter, 1986, Investment banking, reputation, and the underpricing of initial public offerings, *Journal of Financial Economics* 15, 213–232.

Benveniste, Lawrence M., Walid Y. Busaba, and William J. Wilhelm Jr., 2002, Information externalities and the role of underwriters in primary equity markets, *Journal of Financial Intermediation* 11, 61–86.

Benveniste, Lawrence M., Alexander Ljungqvist, William J. Wilhelm Jr., and Xiaoyun Yu, 2003, Evidence of information spillovers in the production of investment banking services, *Journal of Finance* 58, 577–608.

Benveniste, Lawrence M., and Paul A. Spindt, 1989, How investment bankers determine the offer price and allocation of new issues, *Journal of Financial Economics* 24, 343–361.

Booth, James R., and Richard L. Smith II, 1986, Capital raising, underwriting, and the certification hypothesis, *Journal of Financial Economics* 15, 261–281.

Brav, Alon, and Paul A. Gompers, 1997, Myth or reality? The long-run underperformance of initial public offerings: Evidence from venture and nonventure capital-backed companies, *Journal of Finance* 52, 1791–1821.

Carter, Richard B., 1992, Underwriter reputation and repetitive public offerings, *Journal of Financial Research* 15, 341–354.

Carter, Richard B., Frederick H. Dark, and Ajai K. Singh, 1998, Underwriter reputation, initial returns, and the long-run performance of IPO stocks, *Journal of Finance* 53, 285–311.

Carter, Richard B., and Steven Manaster, 1990, Initial public offerings and underwriter reputation, *Journal of Finance* 45, 1045–1067.

Chemmanur, Thomas J., and Paolo Fulghieri, 1994a, Investment bank reputation, information production, and financial intermediation, *Journal of Finance* 49, 57–79.

Chemmanur, Thomas J., and Paolo Fulghieri, 1994b, Reputation, renegotiation, and the choice between bank loans and publicly traded debt, *Review of Financial Studies* 7, 475–506.

Chen, Hsuan-Chi, and Jay R. Ritter, 2000, The seven percent solution, *Journal of Finance* 55, 1105–1131.

Drucker, Steven, and Manju Puri, 2005, On the benefits of concurrent lending and underwriting, *Journal of Finance* (forthcoming).

Dunbar, Craig G., 2000, Factors affecting investment bank initial public offering market share, *Journal of Financial Economics* 55, 3–41.

Eccles, Robert G., and Dwight B. Crane, 1988, *Doing Deals* (Harvard Business School Press, Boston, MA).

Ellis, Katrina, Roni Michaely, and Maureen O'Hara, 2000, When the underwriter is the market maker: An examination of trading in the IPO aftermarket, *Journal of Finance* 55, 1039–1074.

Fernando, Chitru S., Srinivasan Krishnamurthy, and Paul A. Spindt, 2004, Are share price levels informative? Evidence from the ownership, pricing, turnover and performance of IPO firms, *Journal of Financial Markets* 7, 377–403.

Galant, Debbie, 1995, Money (still) talks, *Institutional Investor*, July, 167–168.

Gale, David, and Lloyd S. Shapley, 1962, College admissions and the stability of marriage, *American Mathematical Monthly* 69, 9–15.

Habib, Michel A., and Alexander Ljungqvist, 2001, Underpricing and entrepreneurial wealth losses in IPOs: Theory and evidence, *Review of Financial Studies* 14, 433–458.

Hansen, Robert S., 2001, Do investment banks compete in IPOs? The advent of the "7% plus contract", *Journal of Financial Economics* 59, 313–346.

Hansen, Robert S. and Naveen Khanna, 1994, Why negotiation with a single syndicate may be preferred to making syndicates compete: The problem of trapped bidders, *Journal of Business* 67, 423–457.

Hansen, Robert S., and Paul Torregrosa, 1992, Underwriter compensation and corporate monitoring, *Journal of Finance* 47, 1537–1555.

Hayes, Samuel L. III, 1979, The transformation of investment banking, *Harvard Business Review*, January–February, 153–170.

Hayes, Samuel L. III, A. Michael Spence, and David Marks, 1983, *Competition in the Investment Banking Industry* (Harvard University Press, Cambridge, MA).

James, Christopher M., 1992, Relationship-specific assets and the pricing of underwriter services, *Journal of Finance* 47, 1865–1885.

Kim, Moonchul, and Jay R. Ritter, 1999, Valuing IPOs, *Journal of Financial Economics* 53, 409–437.

Krigman, Laurie, Wayne H. Shaw, and Kent L. Womack, 2001, Why do firms switch underwriters? *Journal of Financial Economics* 60, 245–284.

Krishnaswami, Sudha, Paul A. Spindt, and Venkat Subramaniam, 1999, Information asymmetry, monitoring, and the placement structure of corporate debt, *Journal of Financial Economics* 51, 407–434.

Legros, Patrick, and Andrew F. Newman, 2002, Monotone matching in perfect and imperfect worlds, *Review of Economic Studies* 69, 925–942.

Ljungqvist, Alexander, Felicia C. Marston, and William J. Wilhelm Jr., 2005, Competing for securities underwriting mandates: Banking relationships and analyst recommendations, *Journal of Finance* (forthcoming).

Ljungqvist, Alexander, and William J. Wilhelm Jr., 2002, IPO allocations: Discriminatory or discretionary? *Journal of Financial Economics* 65, 167–201.

Logue, Dennis E., Richard J. Rogalski, James K. Seward, and Lynn Foster-Johnson, 2002, What is special about the role of underwriter reputation and market activities in IPOs? *Journal of Business* 75, 213–243.

Loughran, Tim, and Jay R. Ritter, 2004, Why has IPO underpricing changed over time? *Financial Management* 33, 5–37.

McGough, Robert, 1999, Amid dry spell in the health-care market, Wall Street has bidding wars for rainmakers, *Wall Street Journal* May 6, C2.

Megginson, William L., and Kathleen A. Weiss, 1991, Venture capitalist certification in initial public offerings, *Journal of Finance* 46, 879–903.

Nanda, Vikram, and Vincent A. Warther, 1998, The price of loyalty: An empirical analysis of underwriter relationships and fees, Working paper, University of Michigan.

Pichler, Pegaret, and William J. Wilhelm Jr., 2001, A theory of the syndicate: Form follows function, *Journal of Finance* 56, 2237–2264.

Ritter, Jay R., and Ivo Welch, 2002, A review of IPO activity, pricing, and allocations, *Journal of Finance* 57, 1795–1828.

Roth, Alvin E., 1984, The evolution of the labor market for medical interns and residents: A case study in game theory, *Journal of Political Economy* 92, 991–1016.

Roth, Alvin E., and Marilda Sotomayor, 1989, *Two-Sided Matching* (Cambridge University Press, Cambridge, UK).

Sattinger, Michael, 1993, Assignment models and the distribution of earnings, *Journal of Economic Literature* 31, 831–880.

Seguin, Paul J., and Margaret A. Smoller, 1997, Share price and mortality: An empirical evaluation of newly listed Nasdaq stocks, *Journal of Financial Economics* 45, 333–364.

Stoughton, Neal M., and Josef Zechner, 1998, IPO-mechanisms, monitoring, and ownership structure, *Journal of Financial Economics* 49, 45–77.

Titman, Sheridan, and Brett Trueman, 1986, Information quality and the valuation of new issues, *Journal of Accounting and Economics* 8, 159–172.

Uttal, Bro, 1986, Inside the deal that made Bill Gates $350,000,000, *Fortune* 24 (July 21), 343–361.