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Underwriter Reputation, Issuer–Underwriter Matching, and SEO Performance

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Abstract

The role of underwriters is altered in new seasoned equity offering deal types in which the offering follows quickly after its announcement. Controlling for the endogenous matching between issuing firms and underwriters, we find increased underwriter reputation mitigates the immediate price impact of announcing an accelerated bookbuilt offering, exacerbates the price impact of announcing a bought offering, and has no immediate price impact for fully marketed deals. In contrast, underwriter reputation positively affects price outcomes for fully marketed deals around the offer date. Reputation effects are not apparent in the absence of controlling for the endogenous matching.

I. Introduction

The potential for asymmetric information between parties to a transaction represents a fundamental friction in financial markets. A specific transaction for which this friction is a primary concern is a firm's sale of equity to external investors. The potential for informational asymmetry between the firm and arms-length investors is profound, and the informational sensitivity of equity value (Myers and Majluf (1984)) exacerbates this concern. Identifying ways in which the market mechanism or the design of specific transactions address this friction

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is a central issue in financial economics. Here, we examine the underwriters' differential role in seasoned equity offerings (SEOs) across the various mechanisms employed for selling seasoned equity to external investors.

Currently, there are 3 mechanisms (deal types) for performing a follow-on (or seasoned) offering. *Fully marketed* deals follow the format of U.S. initial public offerings (IPOs), including the use of a "roadshow" and the gathering of indications of interest from investors. This was the dominant type of deal in the U.S. until about 2009, when accelerated mechanisms for follow-on offerings became more common. In *accelerated bookbuilt* offerings and *bought* offerings, the offer follows very quickly (often within 24 hours) after the announcement of the issue.[1] The increased utilization of these methods followed the increased use of shelf registration (e.g., Denis (1991), Bortolotti, Megginson, and Smart (2008)).

Fully marketed deals involve significant time and expense. The "roadshow" and "bookbuilding," which characterize this mechanism, suggest that the primary role of the underwriter in this mechanism is information production and exchange. This aspect of the mechanism serves to control the potential adverse selection problem associated with offering new equity. Costly information production of the extent represented by the fully marketed deal structure is not likely to be efficient for all *public* firms seeking external capital. For firms for which the cost of such a process is inefficient, the cost savings and the ability to sell shares quickly are valuable. However, the dramatically compressed timeline of the accelerated mechanisms not only limits information production and exchange but also constrains investors' due diligence, and as such, the use of an accelerated mechanism will accentuate adverse selection.[2]

The potential adverse selection in an accelerated deal suggests that some method to control this friction must be embedded in these mechanisms. An important question regarding these new mechanisms is: What replaces information production as a check on adverse selection? A natural answer is underwriter certification (Beatty and Ritter (1986), Booth and Smith II (1986), and Carter and Manaster (1990)). A high-quality underwriter's reputational capital can be used to certify the value of new issues despite a compressed timeline. However, it is also possible that other mechanisms may be effective in the limited time. This article aims to examine how the change in SEO issuance methodologies has affected the importance of underwriter reputation in follow-on offerings.[3]

Inference regarding this question, however, may be impeded by the endogenous matching that occurs between issuing firms and underwriters in the market for underwriting services. Endogenous matching can create problems for causal

[1] Accelerated bookbuilt deals are sold directly to external investors, while bought deals are purchased by the underwriter.

[2] Blackwell, Marr, and Spivey (1990), Denis (1991), and Sherman (1999) have argued that shelf registrations limit due diligence.

[3] Bortolotti et al. (2008) suggest that, globally, IPOs are clustering on fully marketed deal structures, while SEOs are moving toward an auction-like format (accelerated deals). Our results suggest a refinement of their argument: the most informationally problematic SEOs continue to use fully marketed deals, while less problematic offerings utilize an accelerated deal type avoiding costly information production of the traditional approach.

inference regarding outcomes of the issuance process.[4] Consider the "discount" of the offer price relative to the closing price observed the day before the offer, an important measure of performance of the offer. Suppose that the issuing firm's quality is observed by the underwriter, but imperfectly observed by the econometrician. Further, suppose that firm quality is related to both the underwriter's decision to match with the firm and to its pricing of the offer. In this case, an estimation of the relation between the discount and the issuing firm's characteristics will suffer from an endogeneity problem. This is because the unobserved (to the econometrician) aspects of firm quality are related to the pricing decision and are also correlated with observable firm characteristics.

Controlling for selection bias by explicitly examining the matching between parties to the economic transaction is an approach that has been employed in a variety of studies in economics and finance.[5] Akkus, Cookson, and Hortaçsu (2016) develop a powerful and easily implementable methodology to control for this type of bias. Akkus, Cookson, and Hortaçsu (2021) utilize this methodology in their examination of underpricing in IPOs. The methodology combines a structural model of the matching between underwriters and issuing firms with a control function approach (e.g., Petrin and Train (2010)). We utilize their methodology to consider whether there is a differential impact of underwriter reputation on measures of performance of follow-on offerings across the available mechanisms.

We find that, in accelerated bookbuilt offerings, when controlling for the endogenous matching between issuers and underwriters, the announcement effect and the discount are significantly reduced when a high-reputation underwriter leads the deal. These findings provide strong empirical support for the importance of underwriter reputation in accelerated bookbuilt deals. In the absence of controlling for the matching between firms and underwriters, the estimated relation between the announcement effect (or the discount) and underwriter reputation is insignificant, a result that highlights the importance of controlling for the selection bias introduced by matching for inference in this setting. This contrast reflects the fact that there is substantial cross-sectional variation among issuers in the extent of their informational challenges. Assortative matching occurs in which higher quality firms and more informationally problematic issues tend to match with more reputable underwriters. If high-quality underwriters are better able to control for the adverse selection associated with issuing equity, then underwriter quality will be positively correlated with the issues' informational problems (which have unconditionally negative consequences for deal pricing). Therefore, failing to control for matching tends to understate the role of underwriter reputation in improving the performance of SEOs.

In contrast to accelerated bookbuilt deals, controlling for the matching between issuers and underwriters, the relation between underwriter reputation

[4]In the early corporate finance literature, the market for underwriting services is modeled as a one-sided selection process. Either the firm chooses the underwriter (e.g., Titman and Trueman (1986), Habib and Ljungqvist (2001)), or the underwriter selects the firm (e.g., Chemmanur and Fulghieri (1994)). More recently, there is evidence consistent with a two-sided matching process (e.g., Fernando, Gatchev, and Spindt (2005), Schroth (2006), and Lyandres, Fu, and Li (2016)).

[5]For example, studies of venture capital (Sørensen (2007)), merger markets (Rhodes-Kropf and Robinson (2008)), underwriting fees in IPOs and SEOs (Fernando, Gatchev, May, and Megginson (2015)), and bank lending relationships (Schwert (2018)).

and the announcement effect is not significant in fully marketed deals. The issuer's selection of a fully marketed deal suggests that significant information production and exchange are required to market the issue. The market infers that significant information production will take place and does not react to the underwriter's identity at the announcement of the deal. In fully marketed deals, higher underwriter reputation does result in an offer price that has both a lower discount and lower underpricing. The net marginal benefits to underwriter reputation in accelerated bookbuilt deals and fully marketed deals are similar but are realized in different ways.

Bought deals effectively combine an underwriting transaction with insurance of the offer price by the underwriter. In bought deals, the underwriter has a direct interest in the size of the discount, and this incentive conflict, as well as critical differences in the characteristics of firms that use bought deals, likely explain why higher-reputation underwriters are associated with larger (more negative) announcement effects and larger discounts of the offer price relative to the closing price on the day before the offer for bought deals. These findings indicate that the importance of underwriter reputation in controlling adverse selection is very different across the available deal types.

Finally, we find that when controlling for the matching between underwriters and firms, in all deal types, issuing firms pay lower fees as a percentage of proceeds (an approximation of marginal cost) but higher total fees when matching with a higher-quality underwriter (Fernando et al. (2015)). This implies that, consistent with the intuition of the matching model, both the issuer and the underwriter benefit from the *observed* matches. Also consistent with the matching model, the similarity of the marginal increase in fees for reputation in the 2 bookbuilt deal types (combined with the similarity of the marginal benefits) suggests that issuers would not benefit from deviating to match with a more reputable underwriter. A high-reputation underwriter charges more in total fees; however, for those issuers that choose to match with such an underwriter, the value they provide allows the issuer to raise more capital in a given deal. Our findings indicate that the cost curves associated with raising seasoned equity differ across levels of underwriter quality and across deal type, and as such, complement the results in Altinkiliç and Hansen (2000).

Prior studies of SEOs have emphasized that differences in performance relate to attributes of the issuer or the circumstances of the issuance, rather than differences in underwriter quality. These studies consider, for example, the degree to which information about issuers' prospects is clear, the firm's size, the firm's Tobin's Q, and the stakes in the firm's equity its managers maintain (e.g., Korajczyk, Lucas, and McDonald (1991), Hansen and Torregrosa (1992), and Denis (1994)). Our findings are generally consistent with the earlier findings regarding the relation between firm characteristics and SEO performance. Our study is also able to examine the importance of underwriter reputation on the performance of SEOs.

An earlier literature examined the limited use of shelf registration as an alternative to fully marketed offerings for issuing seasoned equity. Blackwell et al. (1990) argue that the reduced due diligence in shelf registrations led underwriters to charge higher fees for these offerings, which lowered this deal type's appeal. We find that, controlling for the matching between firms and underwriters, consistent with the sorting of more informationally problematic issues into fully

marketed deals, fully marketed deals are associated with higher total fees. Denis (1991) suggests a lack of underwriter certification in shelf offerings is the reason relatively few firms elect to use this type of offering. When we control for the matching between underwriters and issuers, our evidence is consistent with underwriter certification in accelerated bookbuilt deals but not in fully marketed deals. The difference in conclusions between our study and this earlier literature may result from the novelty of accelerated deals at the time of those studies.

Several studies have considered the association between underwriter reputation and aspects of SEO performance. Fang (2005) finds that higher-quality underwriters generate lower yields in public firms' bond issues. Altınkılıç and Hansen (2003) document that the *unexpected* discount is related to the underpricing in the issue and that this relation is stronger for higher-quality underwriters. Their study does not attempt to control for the matching between firms and underwriters and, due to the timing of their study, fully marketed offerings dominate their sample. Gao and Ritter (2010) and Huang and Zhang (2011) consider whether marketing by underwriters in fully marketed deals is effective in changing the elasticity of the demand curve for the issuing firm's shares. Duarte-Silva (2010) highlights the role of information production and dissemination of leading banks in the context of SEOs. Ferreira and Laux (2016) find that firms with boards dominated by independent directors experience higher abnormal announcement returns at the announcement of an SEO. They control for the Carter–Manaster underwriter rank, which is found to be insignificantly related to the announcement effect. Fernando et al. (2015) consider the relation between underwriting fees and underwriter quality in IPOs and SEOs. Similar to our findings regarding fees, they report that higher-quality underwriters receive higher fees, and firms using high-quality underwriters pay lower percentage fees. Their analysis does not exploit the differences in deal types for SEOs. Moreover, because their sample period is 1980–2010, their data are dominated by fully marketed deals.

II. Setting

A. The Market for Underwriting Services

To examine the outcomes of SEOs, we model the selection in the matching process between firms and underwriters, accounting for actual matches as well as the alternative, possible but counterfactual, matches. As in Akkus et al. (2021), the model allows each firm to match with a single lead underwriter, but for each underwriter to match with multiple firms; that is, a one-to-many matching model. Underwriters' capacity constraints prevent the best underwriters from executing all transactions and imply that they will earn higher fees relative to less reputable underwriters, ceteris paribus.[6]

Two types of players participate in the market: issuing firms and underwriters. The set of issuing firms is denoted $\mathcal{F}$ and the set of underwriters is denoted $\mathcal{U}$. A match is defined as a pair $m = (u,f)$, where $u \in \mathcal{U}$ and $f \in \mathcal{F}$. The set of feasible

[6]Khanna, Noe, and Sonti (2007) and Hanley and Hoberg (2010) provide evidence that underwriters face capacity constraints.

matches, $\mathcal{M}=\mathcal{U}\times\mathcal{F}$, includes all possible pairs of issuing firms matching with active underwriters.

The equilibrium concept Akkus et al. (2021) employ in their matching model is pairwise stable. A match $m\in\mathcal{M}$ is said to be "pairwise stable," if, for all alternative feasible pairs, neither the firm nor the underwriter benefits from breaking the stable match and choosing an alternative pairing. In other words, a match $m\in\mathcal{M}$, is pairwise stable if for every counterfactual pairing involving the firm or the underwriter, either the firm receives a greater payoff from the equilibrium match m, or the underwriter receives a greater payoff from the least valuable of its equilibrium matches, or both (Sørensen (2007)). An equilibrium match is denoted m^*, and the set of all equilibrium matches is denoted $\mathcal{M}^*$, where $\mathcal{M}\subseteq\mathcal{M}$. The set of issuing firms that match with underwriter u in equilibrium is denoted $\mathcal{F}_u^*$; that is, $\mathcal{F}_u^*\equiv\{\,f\,|(u,f)\in\mathcal{M}^*\}\subseteq\mathcal{F}$. Similarly, the underwriter that matches with firm f in equilibrium is denoted $\mathcal{U}_f^*$; that is, $\mathcal{U}_f^*\equiv\{u|(u,f)\in\mathcal{M}^*\}\subseteq\mathcal{U}$. Note that, strictly speaking, an underwriter and a firm may have multiple first-best matches. The set of equilibrium (or actual) matches, $\mathcal{M}^{**}\subseteq\mathcal{M}^*$, consists of each issuing firm matching with a single underwriter.[7]

The set of equilibrium matches is defined by the set of values generated by the feasible matches. The surplus value of a feasible match, $V_{u,f}$, is the joint value generated by pairing a specific underwriter u with a specific issuing firm f. The equilibrium in the market for underwriting services for issues of seasoned equity is developed using a nontransferable utility matching model. The nontransferrable utility model's equilibrium conditions are simpler to estimate empirically than are the equilibrium conditions of the transferrable utility model, and the results obtained from the 2 approaches have been shown to be very similar (Akkus et al. (2021)).

For a given firm f, the condition that the surplus value of every nonequilibrium match is less than the value of the equilibrium match can be written as

$$V_{u\notin\mathcal{U}_f^*,f}<V_{u\in\mathcal{U}_f^*,f}. \tag{1}$$

For a given underwriter u, the condition that the value of any counterfactual match is less than the least valuable of that underwriter's equilibrium matches can be written as

$$V_{u,f\notin\mathcal{F}_u^*}<\min_{f\in\mathcal{F}_u^*}V_{u,f}. \tag{2}$$

Pairwise stability requires that only one of the inequalities (1) or (2) holds (Sørensen (2007)). For a given underwriter u and a given firm f, these conditions may be written as

$$V_{u,f\,|\,u\notin\mathcal{U}_f^*\text{ or }f\notin\mathcal{F}_u^*}<\overline{V}_{u,f}\equiv\max\left\{V_{u\in\mathcal{U}_f^*,f},\ \min_{f\in\mathcal{F}_u^*}V_{u,f}\right\}. \tag{3}$$

$\overline{V}_{u,f}$, the equilibrium match value, is the upper bound of the match value for all counterfactual matches in the open set of all nonequilibrium matches. Therefore,

[7]We allow for ties in the match surplus (the value created and shared by the match) in equilibrium. Because of the censoring of the match surplus for counterfactual matches, this does not affect the empirical analysis.

equation (3) can be used to estimate the upper bounds of the match values for the counterfactual matches in each matching market.[8]

In the definition of pairwise stability, the inequality representing the underwriter's value implicitly assumes that the underwriter is capacity constrained so that, in each market, an underwriter may only match with a limited number of issuing firms (Khanna et al. (2007), Hanley and Hoberg (2010)). As discussed in Akkus et al. (2021), this assumption can be eliminated, making the inequality representing the issuing firm's value the only requirement. Because the definition of the upper bound of the value on counterfactual matches is a maximum, eliminating the assumption of a capacity constraint makes this bound *more* restrictive and, therefore, represents a *more significant* constraint on the data in the estimation. The empirical evidence indicating that underwriters are capacity constrained and the fact that including this constraint is a more conservative approach causes us to utilize both the firm and the underwriter constraints in our implementation of the pairwise stability condition.

B. The Match Surplus

The match surplus represents the value created by the transaction that is shared by the 2 parties to the match. This value is the basis upon which a match between an issuing firm and an underwriter is established. Conceptually, the *total* value created by a match for the firm is the sum of the funds retained from the issue plus the value-added from the use of the proceeds. The value created for the underwriter is its total compensation, including the fees, less the cost of underwriting the issue. Therefore, the total value created by a match between underwriter u and firm f can be written as

$$V_{u,f} = MVE^{*}_{t+1} + GS_{u,f} - MVE^{-}_{t+1} - C_{u,f}, \tag{4}$$

where MVE^{*}_{t+1} represents the market value of equity after the offering is complete, MVE^{-}_{t+1} represents the counterfactual market value of equity in the absence of the issue, $GS_{u,f}$ denotes the gross spread for the match between underwriter u and firm f, and $C_{u,f}$ represents the costs of underwriting.

Following Akkus et al. (2021), we model the match surplus, $V_{u,f}$, using the structural matching equation

$$V_{u,f} = \beta_0 + \mathbf{X}'_{u,f}\beta + \varepsilon_{u,f}, \tag{5}$$

which is defined for *all* feasible (observed as well as possible but unobserved) matches $(u,f) \in \mathcal{M}$. In equation (5), $\mathbf{X}_{u,f}$ is a vector of observable underwriter, firm,

[8]The matching model summarized previously, which is standard in the matching literature (Roth and Sotomayor (1990)), is described in detail in the Appendix of Akkus et al. (2021). It relies on the assumption that underwriters and issuers split the value of a match according to a fixed proportion. This implies that the model assumes nontransferrable utility in the specification of the equilibrium. The resulting equilibrium is similar to the equilibrium in a transferrable utility model in the sense that every equilibrium in a transferrable utility matching model can be identified as an underwriter-optimal stable matching in a nontransferrable utility matching model (e.g., Echenique, Lee, Shum, and Yenmez (2013)). Therefore, if the matching equilibrium is optimal for the underwriter (perhaps due to relative scarcity; e.g., Chen and Ritter (2000) in the IPO market), the empirical content of the nontransferrable utility model and a transferrable utility model will be the same.

and market characteristics that are expected to influence the size of the surplus, and $\varepsilon_{u,f}$ represents the unobservable determinants of the surplus for each feasible match.

C. The Match Surplus Proxy

A challenge for this methodology is finding a proxy for the match surplus – the value that is created by the match and shared between the issuing firm and the underwriter. Once a suitable proxy is chosen, the pairwise stability requirement can be used to infer upper-bound values for the surplus created by the feasible but counterfactual matches based on this proxy. The bounds on the match surplus for the counterfactual matches combined with the proxy for the surplus created by the observable matches allow for a consistent estimation (using information for all possible rather than only the observed matches) of the structural equation for the match surplus proxy using a censored regression.

One must identify a proxy for the portion of the total surplus created by the matching in the market for underwriting services specific to a particular match and shared between the issuing firm and the underwriter. In their examination of the IPO market, Akkus et al. (2021) uses the issuing firm's long-run value as their primary proxy for the match surplus. Their reasoning for this choice is that, because the underwriter is actively making a market in the newly public equity and is likely to hold shares in the firm for a significant period, the underwriter will necessarily share the post issue value of the firm's equity as well as help to determine this value. Furthermore, it has been argued that for IPOs, the underwriter captures a substantial portion of the underpricing in the form of indirect compensation (Kang and Lowery (2014)), further supporting the use of a long-run value to proxy for the match surplus.

Similar arguments are not commonly made for SEOs. Commonly, a liquid market in the firms' shares already exists, so the underwriter is not charged with creating such a market. Furthermore, because the issuer is public, it is unlikely that the value-added from the use of the proceeds of the offering differs across the firm's feasible set of underwriters; as opposed to venture capital finance, raising equity is not combined with advisory services for public firms. Therefore, the underwriter is not expected to capture a portion of the value-added from the firm's use of proceeds as part of its compensation.

For these reasons, our proxy for the match surplus is the total amount raised in the offering, identified as the "deal value" in the Dealogic data. This measure is the sum of the proceeds from the offer received by the issuing firm and the fees paid to the underwriter. The advantage of this proxy for the surplus is that it is an observable value in which both the issuing firm and the underwriter have a direct interest. Compared to the total value represented in equation (4), deal value omits the value-added from the use of proceeds (i.e., investment net present value (NPV)), which we assume is not affected by the underwriter and therefore is not expected to be shared between the issuing firm and the underwriter. It also omits the underwriter's costs of underwriting the deal. These costs are unobservable; however, by including deal type and industry and year fixed effects in the estimation, we capture transaction type, time, and industry variation in these unobservable costs.

For robustness, we have also performed the analysis using different representations of the more expansive definition of total surplus in equation (4) and have obtained similar results to those presented here.[9] This robustness to alternative definitions of the match surplus proxy is not surprising given the discussion and extensive evidence provided in Akkus et al. (2021) in the context of IPOs. As they discuss, the match surplus proxy must be a good proxy, not for the overall match surplus, but only for that portion of the surplus that is not accounted for by the control variables and the fixed effects in the structural matching equation. They note that what matters "is whether measuring the value of the match using our proxy (or alternative proxies) is more informative than the selected vs. not selected distinction that a Heckman selection model makes."

An alternative explanation for this robustness is that the underwriter may capture some of the value-added from the use of the SEO proceeds. If this is true, the total value represented in equation (4) can then be used as the match surplus proxy. However, if the control variables, specifically, firm size, risk, the market-to-book ratio, along with the industry and year fixed effects, account for variation in the investment opportunity set of the issuer, then the use of deal value as the match surplus proxy remains valid (Akkus et al. (2021)). Under this alternative, using these control variables to capture variation in the firm's investment opportunity set explains why deal value serves as a robust proxy for the portion of the match surplus not accounted for by the controls.

Akkus et al. (2021) consider various proxies for the match surplus in their study with little change in results. They also present a series of Monte Carlo simulations examining the effect of a match surplus proxy created by the addition of varying degrees of measurement error added to a true match surplus value. Their results demonstrate that the coefficients on the variables of interest in the second-stage regression continue to be reliably estimated across a wide range of degrees of added measurement error, providing compelling evidence of the robustness of their methodology.

III. Estimation

A. Estimation of the Structural Matching Equation

The proxy for the match surplus represents an estimate of the match value created and shared by the parties to the observed matches. This proxy and the pairwise stability condition provide upper bounds for the estimate of the match surplus that would occur in each of the counterfactual matches. The actual values and these bounds for the match surplus proxy are then utilized in a censored Tobit regression to consistently estimate the matching equilibrium based on all feasible matches.

[9]There are various ways to capture the counterfactual equity value in the absence of an offer. One is to consider the equity value just prior to the announcement of the SEO. Alternatively, an estimated value of the shares outstanding prior to the SEO adjusted for a measure of the firm's systematic return from the period prior to the announcement to a point in time after the offering. There are no meaningful differences in results using these different proxies.

To generate the bounds for the counterfactual matches from the equilibrium condition, we assume that each calendar year represents a different matching market.[10] Feasible matches for each market are between firms that announce an SEO during that calendar year and any lead underwriter associated with an SEO announced that same year (active underwriters). Firms or underwriters that are not part of any observed matches during a given calendar year are assumed not to be participating in that market.

The structural matching equation is

$$V_{u,f} = \alpha_0 + \mathbf{X}'_{u,f}\alpha + \gamma_i + \gamma_t + \varepsilon_{u,f}, \tag{6}$$

where

$$V_{u,f} = \begin{cases} V^*_{u,f}, & \text{if } (u,f) \text{ is observed} \\ \overline{V}_{u,f}, & \text{if } (u,f) \text{ is unobserved} \end{cases},$$

γ_i stands for industry fixed effects, and γ_t for year fixed effects.

We use a parsimonious model to explain the match surplus proxy in the matching equation (6). The primary explanatory variable of interest is underwriter reputation. This variable is included in the regression tests on its own and is also interacted with indicator variables for the deal type to allow reputation to have differential effects on matching for the different deal types. The number of lead underwriters reported in Dealogic is used as an explanatory variable to capture the size and the difficulty of placing the offering. Sales reported at the end of the issuing firm's fiscal year prior to the announcement are used to control for firm size. Firm size is correlated with expected deal value and, for a given expected deal value, it is easier for a larger, and therefore better known, firm to issue the new equity than it is for a small firm. The return volatility of the issuing firm's equity is used as a measure of firm risk. Amihud's (2002) measure of illiquidity provides a measure of the elasticity of the demand for the firm's equity (Gao and Ritter (2010)). We use the firm's market-to-book ratio to capture the issuing firm's growth opportunities.[11] The number of SEOs in the previous quarter is used to capture general financial market conditions as well as waves in the SEO market.[12]

Existing studies have recognized that relationships between underwriters and issuing firms tend to persist over time (e.g., Fernando et al. (2005)). Thus, one explanatory variable that may seem natural to include in the matching equation is a control for the existence of a prior match. However, it is important to note that in a given matching market, a match in a prior market is not an observable characteristic of the firm or the underwriter. Rather the prior relationship is the result of a past

[10]For robustness, we have also considered each industry in each calendar year to represent a different matching market and obtained similar results.

[11]We use the market-to-book ratio as a forward-looking measure of the firm's investment opportunity set. Following Denis (1994), we have also considered the level of the firm's lagged capital expenditures normalized by the book value of assets and obtained very similar results.

[12]We also utilize measures, over the 15 days prior to the announcement of the SEO, of the average return and the volatility of return for a market index as additional controls for financial market conditions. Including these measures provides no incremental explanatory power and no change to the results presented here.

endogenous match. The prior match may reflect both observable and unobservable characteristics of the match between the issuing firm and the underwriter, as well as the characteristics of the other underwriters competing at the time of the prior match. The objective of the matching equation is not to maximize the explanatory power of the first-stage regression test, but rather to remove the variation related to firm/underwriter/market characteristics that are observable to the econometrician, capturing the unobservable aspects of the matching in the estimated residual.[13] We therefore do not include a control for past underwriting relationships in the matching model.

An important choice in this study regarding the estimation of the matching equation concerns how to model the interaction between the matching between issuing firms and underwriters and the choice of deal type. The choice of deal type may affect the matching process. The point in the process at which deal type is selected will dictate the appropriate approach to estimating the structural matching equation. If firms select the deal type prior to matching with an underwriter, then the matching between firms and underwriters is conditional on the chosen deal type, and the structural matching equation should be estimated for each deal type separately. Such an approach also assumes that firms and underwriters consider characteristics of their match partners differently across deal types and would impose a restrictive structure on the data that is unlikely to be realistic.[14]

In contrast, if firms and underwriters are willing to implement any deal type for each offering, matching is conceptually between firms and underwriter–deal type pairs. Feasible matches would be between firm A and underwriter X for deal type S, where an alternative match is between firm A and underwriter X for deal type T (as if different divisions in an investment bank specialize in different deal types and compete with their within-firm counterparts as well as other investment banks). This flexible approach allows the choice of deal type to interact with the matching between firms and underwriters in arbitrary ways.[15] This is the approach we take in our estimations.[16]

In the structural matching equation, all feasible matches (observed and counterfactual) are included in the estimation. This allows consistent estimation of the parameters of the matching equation using a censored regression test in which the surplus for each counterfactual observation is censored at the observation-specific

[13]To the extent that some of the information contained in the past match is exogenous (e.g., superior information), because we cannot separate the exogenous aspects of this variable from the endogenous aspects, this represents unobservable variation regarding the matching process. The two-stage approach developed by Akkus et al. (2016) is explicitly designed to control for this type of unobservable variation.

[14]Estimating the first- and second-stage regressions separately for each deal type provides similar results to those presented here.

[15]For example, it may be that for a given issue, if an accelerated bookbuilt deal is selected, it is optimal to match with a high-quality underwriter, while if a fully marketed deal is selected, a lower-quality underwriter becomes optimal. Including all underwriter–deal type pairs in the set of feasible matches allows the examination of such possibilities.

[16]An intermediate approach that assumes deal type is selected prior to the matching but allows the matching equation to be estimated using all SEOs from all deal types also provides very similar results to those presented here. This approach greatly reduces the number of counterfactual matches but does not allow for arbitrary interactions between the choice of deal type and the choice regarding the underwriter's quality with which the issuer will match.

upper bound defined by the stability conditions, $\overline{V}_{u,f}$. The coefficient estimates of this model capture the effects of the observed characteristics of the issuing firms, the underwriters, and the market for SEOs on the match surplus, taking into account the match surplus value of the observed match relative to the counterfactual matches. Nonzero coefficients on the dependent variables in this regression indicate nonrandom matching between firms and underwriter–deal type pairs with respect to the relevant observed characteristics.

The residual from this equation, $\widehat{\varepsilon}_{u,f}$, captures the influence of unobserved characteristics of the underwriters and the firms on the matching process. Because the same independent variables are used in the first- and second-stage regressions, the residuals from the first-stage regression are orthogonalized with respect to this set of variables. Therefore, the inclusion of this residual in the second-stage controls for the unobserved component of matching between firms and underwriters, which allows for consistent estimation of the coefficients of interest in the outcome equations.

B. Estimation of the Outcome Equations

Our empirical specifications of the outcomes of the SEOs are

$$Y_{u,f} = \beta_0 + \mathbf{X}'_{u,f}\beta + \gamma_{\mathbf{i}} + \gamma_{\mathbf{t}} + \nu_{\mathbf{u},\mathbf{f}}, \tag{7}$$

where $Y_{u,f}$ is the outcome of interest; $\mathbf{X}_{u,f}$ is a set of firm, underwriter, and market characteristics thought to influence the outcome variable; and $\nu_{u,f}$ is an error term. The outcomes in the above equation are observed only for the actual matches. The observed characteristics, $\mathbf{X}_{u,f}$, are endogenous regressors in this equation because $\nu_{u,f}$ includes unobserved factors that affect the pattern of matching and, therefore, the resulting match surplus. If these unobserved factors related to the matching are correlated with the observed characteristics, an OLS estimation of the above equation suffers from an endogeneity problem. Therefore, one cannot consistently estimate the coefficients of interest, β, for the outcome variables without controlling for the unobserved characteristics of the matching.

The dependence of the outcome equation's error term on unobservable characteristics of the matching process can be expressed as

$$\nu_{u,f} = \delta\varepsilon_{u,f} + \rho_{u,f}, \tag{8}$$

for the observed matches. Following Akkus et al. (2021), we assume that ρ is independently distributed $N(0,\sigma_\rho)$, where the parameter δ captures the effect of the unobserved determinants of matching on the outcome variable. They show that the structural relation assumed between the errors of the matching equation and the outcome variable equation implies the following covariance matrix for the outcome and matching errors:

$$\begin{bmatrix} \nu_{u,f} \\ \varepsilon_{u,f} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_\rho^2 + \delta^2\sigma_\varepsilon^2 & \delta\sigma_\varepsilon^2 \\ \delta\sigma_\varepsilon^2 & \sigma_\varepsilon^2 \end{bmatrix} \right). \tag{9}$$

With these assumptions, the two-step control function approach is used to obtain consistent estimates of the parameters of interest, β, in the outcome equations. In the first step, the matching equation (6) is estimated using a censored regression so that the actual and all counterfactual matches may be included in the estimation. From the censored regression, we obtain the estimates $\widehat{\alpha}_0$ and $\widehat{\alpha}$, which are used to construct the vector of residuals $\widehat{\varepsilon}_{u,f}$ for all feasible matches. In the second step, equation (7) is estimated using an OLS regression in which the firm, underwriter, market, and deal-specific characteristics from the observed matches used in the first-stage regression, as well as the estimated residuals from the first-stage, $\widehat{\varepsilon}_{u,f}$, are the regressors.[17]

The use of an ex post measure to proxy for the match surplus in equation (6) raises the possibility of reverse causality in the estimation of the outcome equations. In this case, deal value is completely determined only after some of the outcome variables are determined. This could pose a problem in using the estimated residual from the first-stage regression to explain the second-stage outcome variables. However, if the channel through which any causality from outcome variable to the match surplus proxy is controlled for by the independent variables in the first-stage regression, this variation will not be present in the residual $\widehat{\varepsilon}_{u,f}$ and causality from the outcome variable to $\widehat{\varepsilon}_{u,f}$ will not be a concern.

Since the vector $\widehat{\varepsilon}_{u,f}$ is estimated in the first stage, as in Akkus et al. (2021), we bootstrap the standard errors in the second-stage regression to account for the sampling variation in the entire two-step process. The standard errors are computed using a block bootstrap procedure, where resampling is done underwriter by underwriter. This allows for within-underwriter errors to have an arbitrary correlation structure. As such, it accounts for within-underwriter correlation among the observations that may arise from the specification of the surplus proxy (the true surplus is unobservable) and the specification of the bounds of the surplus proxy for the counterfactual matches.

IV. Data

The primary data source for historical information regarding SEOs used in our analysis is the Dealogic Equity Capital Markets database. Because this study exploits differences in deal type, reported deal types must be as accurate as possible. While the SDC new issues database is a more common data source for information on new issues, Gao and Ritter (2010) report that, compared to SDC, Dealogic has greater accuracy in reported deal type.[18] Furthermore, Bortolotti et al. (2008) note that SDC's classification of deal type can be confusing as multiple designations may be assigned to a single offer. For these reasons, we use Dealogic as the source of information on SEOs. In addition, we utilize Compustat data for information on firm-specific characteristics and Center for Research in Security Prices (CRSP) data for information on returns, market values, and market conditions.

[17]The control function approach has been shown to account for selection in many recent applications in economics and finance (Card (2001), Schroth and Szalay (2009), Petrin and Train (2010), Wooldridge (2015), and Akkus et al. (2016)). Akkus et al. (2021) discuss the relation between their approach and the Heckman selection correction.

[18]Gao and Ritter (2010) also report greater accuracy for the filing dates in Dealogic relative to SDC.

A. Matching the SEO Data

We obtain data on all U.S. SEOs announced between Feb. 1993 and Dec. 2017 from the Dealogic database. A difficulty with using Dealogic is that its firm identifier is different from the firm identifiers used in the Compustat or the CRSP databases. To collect and match firm-specific characteristics and pricing data, the SEO firms from Dealogic were first matched with Compustat firms manually. To this end, we use the following process:

- Firms are first matched by exact name. If a firm in Dealogic has the exact same name as a firm in Compustat, we count the Compustat firm as a match. We confirm exact name matches using the fields TIC (ticker), CUSIP, and SIC to ensure they are true matches. Some of the exact name matches have CUSIP numbers that do not match between the Compustat and the Dealogic databases. We re-examine these cases by searching the Compustat database for matches by CUSIP number. The CUSIP matches are examined manually to determine if the CUSIP matches are superior to the match provided by an exact name match. In this process, 31 of the exact name matches are replaced with CUSIP matches.
- For SEO firms in the Dealogic database that do not have an exact name match with firms in Compustat, if the ticker symbol is available in Dealogic, and it is an exact match for a ticker symbol in the Compustat database, the firm is matched using the ticker symbol. These matches were then confirmed manually using firm name and SIC code.
- For firms in Dealogic without an exact name or ticker symbol matches, we match by CUSIP. If the Dealogic CUSIP matched a CUSIP in Compustat, we count this as a match, and these matches are confirmed manually using firm name and SIC code.
- For firms in Dealogic that do not match by exact name, ticker, or CUSIP, with a firm in Compustat, string name matches are used if the Levenshtein string match distance ratio between the Compustat firm name and the Dealogic firm name is greater than 0.8 and the SIC codes are the same in the Dealogic and the Compustat databases.

This process results in 9,654 ECMDEALS from Dealogic with an identified GVKEY in the Compustat database. The GVKEY is used to gather the relevant data from Compustat for the matched SEO firms in the Dealogic database. After eliminating duplicate observations, the matching to the CRSP database is accomplished using the CCM bridge from the merged CRSP Compustat database created by WRDS. This links the ECMDEAL, GVKEY, and PERMNO firm identifiers for the SEO firms. After matching ECMDEAL, GVKEY, and PERMNO identifiers for the different databases and eliminating the SEOs without a complete set of firm-specific characteristics, we are left with 4,663 unique SEOs without missing values for any of the required data.

One aspect of the SEOs in the sample that may be important to consider is that in roughly 14% of the total deals, Dealogic reports 0 new shares issued. Random spot-checking of these deals indicates that these deals are dedicated to insiders selling shares (i.e., all shares sold in the offering are secondary shares) rather than the firm raising new equity capital. Our discussion focuses on results generated

when we examine only the deals in which the firm raises new capital; however, we also present results from the set of all deals for completeness.

B. Variables

Our analysis includes firm- and deal-specific variables that are common in the literature. The Appendix provides detailed descriptions of these variables. Underwriter reputation (REPUTATION) is the main variable of interest. It is measured as the underwriter's market share of the SEO market in the year prior to the calendar year of the announcement. Market share is measured by the total proceeds of SEOs for which the underwriter is identified as the lead underwriter in the prior year relative to the total proceeds for SEOs in the prior year. It reflects the underwriter quality and aggregates different aspects of underwriter ability or quality that may vary over time. The Supplementary Material presents results using a market share measure defined by industry rather than all SEOs; the results are very similar. In addition, we have estimated the results using the Carter–Manaster measure (available on Jay Ritter's website), again obtaining similar results to those presented here. However, this measure is based on IPO activity rather than SEO activity, and so is less relevant for our study.

The number of lead underwriters is used to capture the size and difficulty of placing an issue.[19] Sales are used to capture firm size and the market-to-book ratio represents the firm's investment opportunities. Risk and Amihud's (2002) illiquidity measure capture characteristics of the issued security.

An important outcome variable is the announcement effect (ANNOUNCE). It is defined as the 2-day (the day of the announcement and the day after) unexpected return for the issuing firm. The 2-day effect is considered because we do not have data on the exact time of the announcement, which may occur after the close of trading on the announcement day. Our results are robust to considering 3- or 5-day announcement windows. They are also robust to estimating the market model over a 30 trading-day window beginning 60 trading days prior to the announcement day.

To limit the impact of errors and outliers in the data, we Winsorize the firm and deal characteristics at the upper and lower 1.0 percentiles and remove observations for which the book value of assets is not strictly positive and observations with negative values for sales or Amihud's measure of illiquidity.[20] After these screens, we are left with 4,663 total SEOs, 4,030 in which the firm issued a strictly positive amount of new equity.

C. Summary Statistics

Table 1 reports summary statistics for the relevant variables. These statistics are provided as a quick overview of the nature of the firms issuing seasoned equity. They also contain information about differences in firms' characteristics that utilize different deal types.

[19]For deals with more than 1 lead underwriter listed, we use the first underwriter to appear in the list provided by Dealogic (a list that has no identifiable ordering). If we instead use the most reputable underwriter in the list, the same results are obtained.

[20]Our results are robust to either trimming at the 1.0 percentiles rather than Winsorizing or trimming at the upper and lower 1/2 percentiles.

Panel A of Table 1 presents the summary statistics for the entire sample of SEOs, Panel B considers the subsample of SEOs for which the firms issued a strictly positive number of *new* shares, and Panel C the subsample of SEOs for which the offering is made up of entirely secondary shares. One of the facts that is immediately

TABLE 1

Summary Statistics

Table 1 presents the number of observations, the Means, Standard Deviations, Medians, Minima, and Maxima of variables of interest for different subsamples of the SEOs. REPUTATION is defined as the underwriter's market share of the SEO market in the prior calendar year. #LEAD is the number of lead managers reported by Dealogic. MARKET_TO_BOOK is the firm's market-to-book ratio reported at the end of the fiscal year prior to the announcement year. SALE is the hyperbolic arcsine of the dollar value of the firm's sales (in thousands of dollars) reported at the end of the fiscal year prior to the announcement year. #SEO is the number of SEOs in the 3 months prior to the announcement date. ILIQ is Amihud's measure of the illiquidity of the firm's equity. RISK is the variance of daily returns for the firm's equity measured in the month prior to the announcement date. DEAL_VALUE is dollar value (in millions of dollars) of the total proceeds raised in the SEO. COMBINED is the percent difference between the offer price in the SEO and the closing price on the day prior to the announcement day. UNDERPRICE is the percent difference between the closing price on the offer day and the offer price in the SEO. DISCOUNT is the percent difference between the closing price the trading day prior to the offer day and the offer price in the SEO. ANNOUNCE is the 2-day cumulative abnormal return (estimated using a market model) for the announcement day and the following trading day. FEES is the dollar value (in millions of dollars) of the total fees paid to the underwriter in the SEO. %FEES is the value of the total fees paid to the underwriter in the SEO normalized by the total proceeds.

Statistic	*N*	Mean	Std. Dev.	Median	Min	Max
Panel A. Full Sample						
REPUTATION	4,663	0.0650	0.0612	0.0545	0.0002	0.2879
#LEAD	4,663	1.9588	1.4952	1	1	14
MARKET_TO_BOOK	4,663	2.9652	2.8399	1.9100	0.7780	18.0891
SALE	4,663	0.8130	2.1557	0.1355	0.0000	15.6877
#SEO	4,663	36.9121	16.7305	35	1	85
ILIQ	4,663	0.0395	0.1133	0.0069	0.0001	0.8317
RISK	4,663	0.0015	0.0023	0.0008	0.00005	0.0156
DEAL_VALUE	4,663	175.5086	337.7798	94.3000	0.2400	12,189.1100
UNDERPRICE	4,663	0.0234	0.0412	0.0160	−0.1212	0.2060
COMBINED	4,663	0.0565	0.1665	0.0531	−0.7044	0.5415
DISCOUNT	4,663	0.0522	0.0649	0.0385	−0.0667	0.3226
ANNOUNCE	4,663	−0.0361	0.0682	−0.0294	−0.2944	0.1545
FEES	4,663	6.4261	6.7523	4.3578	0.2392	39.9873
%FEES	4,663	4.7754	1.4264	5.0000	0.0400	10.0000
Panel B. Positive New Shares						
REPUTATION	4,030	0.0616	0.0610	0.0479	0.0002	0.2879
#LEAD	4,030	1.9171	1.4491	1	1	14
MARKET_TO_BOOK	4,030	3.0313	2.9341	1.9328	0.7780	18.0891
SALE	4,030	0.6559	1.9525	0.1045	0.0000	15.6877
#SEO	4,030	37.0814	16.9215	35	5	85
ILIQ	4,030	0.0434	0.1188	0.0077	0.0001	0.8317
RISK	4,030	0.0017	0.0024	0.0009	0.00005	0.0156
DEAL_VALUE	4,030	157.9115	309.2199	88.2688	0.2400	12,189.1100
UNDERPRICE	4,030	0.0244	0.0427	0.0164	−0.1212	0.2060
COMBINED	4,030	0.0576	0.1728	0.0537	−0.7044	0.5415
DISCOUNT	4,030	0.0548	0.0673	0.0391	−0.0667	0.3226
ANNOUNCE	4,030	−0.0371	0.0710	−0.0302	−0.2944	0.1545
FEES	4,030	6.1523	6.4108	4.2435	0.2392	39.9873
%FEES	4,030	4.9524	1.3098	5.0700	0.0400	10.0000
Panel C. Only Secondary Shares						
REPUTATION	633	0.0868	0.0578	0.0836	0.0004	0.2879
#LEAD	633	2.2243	1.7385	2	1	11
MARKET_TO_BOOK	633	2.5447	2.0988	1.8407	0.7780	18.0891
SALE	633	1.8132	2.9692	0.7087	0.0000	15.6877
#SEO	633	35.8341	15.4280	34	1	85
ILIQ	633	0.0152	0.0629	0.0035	0.0001	0.8317
RISK	633	0.0008	0.0010	0.0005	0.00005	0.0122
DEAL_VALUE	633	287.5407	466.4000	158.2	8	7,475
UNDERPRICE	633	0.0169	0.0295	0.0134	−0.1095	0.2060
COMBINED	633	0.0496	0.1193	0.0498	−0.7044	0.5415
DISCOUNT	633	0.0356	0.0441	0.0323	−0.0667	0.3225
ANNOUNCE	633	−0.0293	0.0462	−0.0261	−0.2944	0.1545
FEES	633	8.1688	8.4140	5.3335	0.2392	39.9873
%FEES	633	3.6484	1.6125	4.0000	0.0500	7.7780

(continued on next page)

TABLE 1 (continued)
Summary Statistics

Panel D. Fully Marketed Deals						
REPUTATION	2,715	0.0604	0.0569	0.0519	0.0002	0.2879
#LEAD	2,715	1.5694	1.0326	1	1	11
MARKET_TO_BOOK	2,715	3.1731	2.9828	2.1457	0.7780	18.0891
SALE	2,715	0.5765	1.6176	0.1152	0.0000	15.6877
#SEO	2,715	36.0276	17.0257	34	6	85
ILIQ	2,715	0.0456	0.1173	0.0102	0.0001	0.8317
RISK	2,715	0.0016	0.0022	0.0009	0.00005	0.0156
DEAL_VALUE	2,715	153.9359	271.4489	87.5564	0.2400	7,475.0000
UNDERPRICE	2,715	0.0271	0.0382	0.0189	−0.1212	0.2060
COMBINED	2,715	0.0520	0.1914	0.0545	−0.7044	0.5415
DISCOUNT	2,715	0.0431	0.0618	0.0315	−0.0667	0.3226
ANNOUNCE	2,715	−0.0263	0.0596	−0.0246	−0.2944	0.1545
FEES	2,715	6.5648	6.5657	4.5876	0.2392	39.9873
%FEES	2,715	5.1701	0.8984	5.2300	1.1430	10.0000
Panel E. Accelerated Deals						
REPUTATION	1,536	0.0682	0.0683	0.0547	0.0002	0.2879
#LEAD	1,536	2.7904	1.8975	2	1	14
MARKET_TO_BOOK	1,536	2.8733	2.7694	1.7845	0.7780	18.0891
SALE	1,536	1.0421	2.6288	0.1244	0.0000	15.6877
#SEO	1,536	38.5085	16.4384	37	1	85
ILIQ	1,536	0.0378	0.1188	0.0045	0.0001	0.8317
RISK	1,536	0.0016	0.0026	0.0007	0.00005	0.0156
DEAL_VALUE	1,536	197.0325	436.8556	101.0563	1.1500	12,189.1100
UNDERPRICE	1,536	0.0220	0.0471	0.01539	−0.1212	0.2059
COMBINED	1,536	0.0788	0.1094	0.0609	−0.7044	0.5415
DISCOUNT	305	0.0423	0.0527	0.0348	−0.0667	0.2941
ANNOUNCE	305	−0.0364	0.0653	−0.0301	−0.2944	0.1545
FEES	1,536	7.1314	7.3763	4.8198	0.2392	39.9873
%FEES	1,536	4.8920	1.2158	5	0	8
Panel F. Bought Deals						
REPUTATION	412	0.0833	0.0562	0.0811	0.0004	0.2879
#LEAD	412	1.4248	0.9996	1	1	8
MARKET_TO_BOOK	412	1.9376	1.6464	1.4004	0.7780	15.8730
SALE	412	1.5173	2.9259	0.4301	0.0000	15.6877
#SEO	412	36.7888	15.3929	34	6	84
ILIQ	412	0.0061	0.0253	0.0014	0.0001	0.4251
RISK	412	0.0007	0.0012	0.0003	0.00005	0.0156
DEAL_VALUE	412	237.4247	293.6215	128.7600	2.0625	2,175.8750
UNDERPRICE	412	0.0042	0.0295	0.0015	−0.0941	0.1921
COMBINED	412	0.0031	0.1516	0.0271	−0.7044	0.5415
DISCOUNT	20	0.0459	0.0838	0.0355	−0.0667	0.3226
ANNOUNCE	20	−0.0208	0.0451	−0.0278	−0.0820	0.1039
FEES	412	2.8820	3.8364	1.7548	0.2392	35.1953
%FEES	412	1.7400	1.3832	1.2855	0.0400	7.7780

apparent from Panel A is that raising seasoned equity is costly. Average (median) fees as a percent of proceeds are 4.77% (5.00%).[21] In addition, the average (median) discount of the offer price from the closing price on the day before the offer of 5.22% (3.85%) also represents a cost related to the issue.[22]

Comparison of Panel C with Panel B shows that SEOs in which only secondary (preexisting) shares are offered tend to be larger deals, to be led by more

[21]The standard deviation of 1.43% and the range of outcomes (a minimum of 0.40% and a maximum of 10.0%) do not reflect the same level of clustering found for IPOs (Chen and Ritter (2000)). However, the interquartile range of 4.25%–5.70% does indicate some clustering of percent fees.

[22]If we restrict the sample to firms with more than 1 day between the announcement and the offer day, then the average discount remains large at 3.5%. In this way, the discount is measured subsequent to the abnormal market reaction (mean of −3.6%) to the announcement that the firm is seeking new equity financing.

reputable underwriters, and tend to list a greater number of lead underwriters. Panel C also shows that issuers in these deals have lower market-to-book ratios, lower levels of Amihud's illiquidity measure, and are less risky relative to firms that raise new capital (Panel B). As these offers are essentially large block trades, it is not surprising that they have lower discounts, lower underpricing, and smaller announcement effects. Therefore, we consider our main findings to be those for the sample in which the issuing firm raises new capital.

One way to classify the available choices over deal type is by whether the demand curve for the issuing firm's equity is elastic or inelastic. Gao and Ritter (2010), for example, examine whether underwriters' marketing in fully marketed deals increases the demand elasticity for shares in the issuing firm's stock. From this perspective, accelerated bookbuilt and bought deals may be the chosen deal types for issuers whose demand curves are highly elastic (or are expected to be elastic post-announcement). A fully marketed format may be more likely to be used in cases for which the current demand curve for the firm's share is expected to be inelastic conditional on the announcement of the offering. From a different perspective, both fully marketed and accelerated bookbuilt deals are sold to external investors, while bought deals are purchased by the underwriter. A distinction between these deal types is that bought deals are likely to be utilized by issuers for which, from the underwriter's perspective, the possibility that asymmetric information is the motivation behind the offer is very small. For the firms that utilize fully marketed or accelerated bookbuilt deals, appropriate pricing conditional on the firm's decision to issue is less certain from the underwriter's perspective.

To shed light on the differences in firms pursuing different types of offers, we report summary statistics conditional on the chosen deal type in Panels D, E, and F. Bought deals are notable in several respects. On average, bought deals are led by the most reputable underwriters with fewer lead underwriters than either fully marketed or accelerated bookbuilt deals. Bought deals are also used by the least risky, most liquid issuing firms. SEOs from these issuers, on average, result in the lowest discounts, have the lowest underpricing, and the lowest total and percent fees. Not only are the averages for risk and illiquidity lower for bought deals, but the standard deviations of these measures for the firms employing bought deals are low relative to those of the other deal types, suggesting a low level of cross-sectional heterogeneity for these offers.

Accelerated bookbuilt deals have an intermediate level for average underwriter reputation and, on average, the highest number of lead underwriters are involved in this type of deal. Accelerated bookbuilt deals also have the highest average discount and the largest (most negative) average announcement effect of the different deal types. Average risk and illiquidity for firms that choose accelerated bookbuilt deals are lower than for firms utilizing fully marketed deals. Firms using accelerated bookbuilt deals also have the second-highest average level of percent fees.

Finally, fully marketed deals are used for (on average) smaller, riskier, less liquid issuers that have the highest market-to-book ratios and issue the smallest amount of equity. The dispersion in these measures across firms using fully marketed deals is also relatively high. Not surprisingly, the fully marketed deals have the highest level of average percent fees. The high fees likely reflect the cost of the

roadshow, but may also reflect other costs the underwriter is exposed to for this deal type. The average announcement effect and the average discount for fully marketed deals are similar to those of bought deals. However, recall that, for fully marketed deals, the offer date occurs long after the announcement, and so the discount and underpricing are measured relative to market prices that can incorporate the information produced during the roadshow.

These differences in deal type summary statistics are consistent with the sorting of firms into deal types. Bought deals appear to be utilized for a narrow set of the highest-quality (least-opaque) offerings. The summary statistics and the nature of the deal suggest that there is less of a problem associated with asymmetric information and that their shares are very liquid. Firms with highly uncertain quality appear to use fully marketed offers. The use of an extended roadshow indicates a significant possibility for asymmetric information and a need for information production and exchange to identify a price at which there will be demand for the new shares. Accelerated bookbuilt deals are chosen for firms between these extremes. The relative size of the average discount in accelerated bookbuilt deals is suggestive of the potential for asymmetric information, but the accelerated nature of the deal implies that demand for the new shares can be created with appropriate pricing by the underwriter.

Table 2 reports the number of deals and the aggregate proceeds of deals by year and by deal type. These data show a sharp shift between 2007 and 2008, at which point accelerated deal types became the dominant methods for performing SEOs. Examination of the data in these years indicates this sharp change is not due to a data

TABLE 2

Summary Statistics: Number of Deals by Year and Type

Table 2 presents the number of SEOs and the proceeds of deals per year by deal type. For each calendar year and each deal type, Number is the number of SEOs completed using a given deal type in a given year. Proceeds is the total proceeds of all SEOs completed using that deal type in that year reported in millions of dollars.

	Fully Marketed		Bought		Accelerated Bookbuilt	
Year	Number	Proceeds	Number	Proceeds	Number	Proceeds
1993	144	7,635	NA	NA	NA	NA
1994	95	6,512	NA	NA	NA	NA
1995	193	14,228	1	17	NA	NA
1996	220	18,274	2	36	NA	NA
1997	197	17,509	3	101	8	561
1998	131	17,960	8	978	6	502
1999	173	33,695	7	2,934	3	285
2000	190	53,326	10	2,470	6	248
2001	135	28,767	9	1,611	10	983
2002	114	18,027	6	2,623	12	3,879
2003	144	17,529	15	1,847	21	3,600
2004	160	26,763	33	4,241	24	4,388
2005	135	21,387	8	572	21	4,388
2006	134	24,193	14	1,448	25	4,497
2007	112	24,258	16	2,913	19	5,799
2008	26	5,546	4	353	48	24,667
2009	33	5,072	12	2,848	145	34,520
2010	61	13,696	19	4,275	113	20,158
2011	58	16,455	33	8,283	125	23,519
2012	41	6,459	39	8,641	153	24,772
2013	58	10,873	51	17,683	191	47,840
2014	68	18,365	49	12,512	177	31,060
2015	48	7,964	45	15,353	218	35,586
2016	28	2,046	18	3,925	133	20,544
2017	17	1,384	10	2,144	78	10,835

error. Rather we conjecture that the financial crisis imposed a dramatic restriction on the set of firms that could complete an SEO. An examination of the correlations (Supplementary Material) between the explanatory variables used in this study shows no strong correlations.

V. Findings

A. First-Stage Regressions

Table 3 presents the results of the first-stage regressions. The findings presented here use the log of DEAL_VALUE as the proxy for the match surplus. Columns 1 and 3 report, respectively, the findings of an OLS estimation and the censored Tobit estimation of equation (5), using all SEOs with no missing variables.

TABLE 3

First-Stage Regression Tests

Table 3 reports the findings of the first-stage regression tests. Columns 1 and 3 report the OLS and Censored Tobit estimates, respectively, of equation (6) using the entire sample of SEOs to explain the matching. Columns 2 and 4 report the OLS and Censored Tobit estimates, respectively, of equation (6) using the subsample of SEOs in which the issuing firm issues a strictly positive number of new shares. VALPROXY is the natural logarithm of the dollar value of the total proceeds raised in the SEO. REPUTATION is defined as the underwriter's market share of the SEO market in the prior calendar year. #LEAD is the number of lead managers reported by Dealogic. MARKET_TO_BOOK is the firm's market-to-book ratio reported at the end of the fiscal year prior to the announcement year. SALE is the hyperbolic arcsine of the firm's sales (divided by 1,000) reported at the end of the fiscal year prior to the announcement year. #SEO is the number of SEOs in the 3 months prior to the announcement date. ILIQ is Amihud's measure of the illiquidity of the firm's equity. RISK is the variance of daily returns for the firm's equity measured in the month prior to the announcement date. Standard errors are in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	OLS		Tobit	
	1	2	3	4
Constant	2.0407***	2.2004***	−0.1168	0.1323
	(0.1419)	(0.1609)	(0.1206)	(0.1358)
REPUTATION	4.0400***	3.9060***	6.8469***	6.5387***
	(0.2805)	(0.2851)	(0.2185)	(0.2236)
BOUGHT	0.1791***	0.1566**	−0.8121***	−0.9737***
	(0.0683)	(0.0794)	(0.0384)	(0.0435)
FULL	0.2483***	0.2139***	0.1474***	0.1092***
	(0.0407)	(0.0422)	(0.0252)	(0.0256)
REPUTATION × BOUGHT	0.6774	0.9552	1.2939***	1.2991***
	(0.6681)	(0.7672)	(0.3762)	(0.4175)
REPUTATION × FULL	−0.8157**	−0.4769	0.6934**	0.3952
	(0.3637)	(0.3794)	(0.2795)	(0.2903)
#LEAD	0.1997***	0.2141***	0.1804***	0.1892***
	(0.0091)	(0.0098)	(0.0065)	(0.0071)
SALE	0.2025***	0.1836***	0.1836***	0.1653***
	(0.0063)	(0.0067)	(0.0056)	(0.0059)
#SEO	0.0040***	0.0035***	0.0029***	0.0024***
	(0.0008)	(0.0008)	(0.0006)	(0.0007)
ILIQ	−1.9840***	−2.0097***	−1.5230***	−1.5595***
	(0.0960)	(0.0964)	(0.0955)	(0.0960)
RISK	−16.0662***	−17.7606***	−9.4336**	−10.3020**
	(4.9773)	(4.9645)	(4.1868)	(4.1455)
MARKET_TO_BOOK	0.0678***	0.0644***	0.0560***	0.0528***
	(0.0043)	(0.0045)	(0.0034)	(0.0035)
No. of obs.	4,663	4,030		
R^2	0.5993	0.6040		
Log likelihood			−21,774.4400	−18,567.7400

Columns 2 and 4 report, respectively, the findings of the OLS and censored Tobit regressions restricting the sample to SEOs in which the firm raises new equity capital.

For both the restricted and the full samples, the significant coefficient estimates in the censored Tobit regression indicate significant nonrandom sorting related to the included characteristics of the underwriters, the issuing firms, and the financial market. The coefficient estimates show that higher reputation underwriters are associated with more valuable deals. In the sample of SEOs in which the issuing firm raises new capital, the interaction terms between deal type indicator variables and reputation indicate that the relation between underwriter reputation and deal value is stronger for bought deals than it is for accelerated bookbuilt or fully marketed deals. In the full sample, the interaction between the indicator for fully marketed deals and the reputation variable is also significantly positive; however, reputation remains most important in bought deals. The difference in the findings for fully marketed deals suggests that the nature of the matching between firms and underwriters is different across the 2 samples.

The number of "lead" underwriters is strongly positively related to deal value. Also, larger firms and firms that have higher market-to-book ratios are the issuers with more valuable deals. Riskier firms and firms with more illiquid equity undertake less valuable deals. More valuable deals are observed when the SEO market is more active (during so-called "hot" markets).

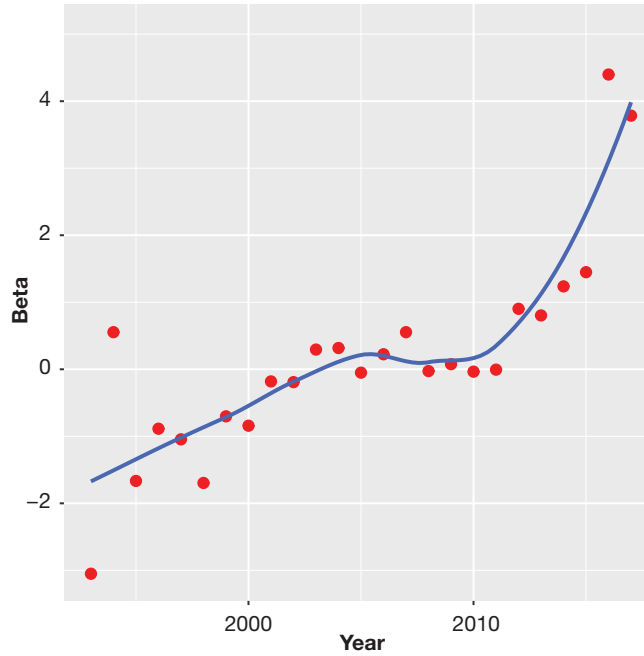
The differences in the coefficient estimates between the OLS and the censored Tobit estimators demonstrate the importance of including all feasible (rather than only the observed) matches in the estimation. The information problems associated with SEOs are not solely a *firm* characteristic but are an issue characteristic. High-quality underwriters are not just solving the problems of high-asymmetric information firms. Instead, they are solving the problems of high-asymmetric information *offerings*, which may include, for example, unexpected offerings by firms that do not exhibit strong potential for asymmetric information. Such offer characteristics may influence the matching between issuing firms and underwriters. This also highlights the importance of controlling for the unobserved characteristics of the matching in the examination of the outcome variables.

To examine whether the importance of underwriter reputation has changed with the introduction of the accelerated deal types, we consider the times series behavior in the coefficient estimate of the reputation variable in the matching equation. Specifically, we estimated the first-stage regression, year by year, over our sample period, omitting the interaction terms of deal type with the reputation variable to consider a summary of the impact of reputation on the matching between issuers and underwriters. Figure 1 plots the coefficient estimates across time to examine the trend in these coefficients. It reveals that, shortly after 2009, the coefficient estimate indicates a distinct change in the way reputation affects matching in the market for underwriting services for follow-on offerings.[23]

[23]We are grateful to the anonymous referee for suggesting this analysis.

FIGURE 1
Beta Reputation

Figure 1 depicts changes in the impact of underwriter reputation on the matching between underwriters and issuing firms over time. The first-stage regression (equation (6)), excluding the interactions between deal type and the reputation measure, is estimated for each calendar year. The coefficient estimate on the reputation variable is plotted against the calendar year used in the estimation. The figure shows the change in the importance of the reputation variable for the matching between issuing firms and underwriters as the new mechanisms see wider use over time.



B. Combined Price Impact

In our second-stage regressions, we utilize the estimated residual from the corresponding first-stage regression. If the second-stage regression is estimated for all SEOs (vs. only those in which the firm raises new capital), then the second-stage regression uses the estimated residual from the censored Tobit in column 3 (4) of Table 3.

There is evidence of predictable trading patterns between the announcement and offer dates for SEOs (e.g., Henry and Koski (2010), Dutordoir, Strong, and Sun (2019)), which makes comparisons between fully marketed deals and the accelerated deals somewhat difficult. To aid in making comparisons across the different deal types, we first examine a "combined effect" that measures the price impact of the offering, aggregating the announcement effect and the discount. The combined effect is measured as the percent difference between the closing price on the day prior to the announcement day and the offer price. The findings are reported in Table 4. Columns 1 and 3 consider all SEOs, while columns 2 and 4 consider only those SEOs with a strictly positive number of new shares sold by the issuing firm.

TABLE 4

Second-Stage Regression Results: Combined (Announcement and Discount) Effect

Table 4 reports the findings of OLS and matching market-corrected versions of equation (7) for which the dependent variable is the combined effect. Columns 1 and 3 present the findings for all SEOs in the sample, and columns 2 and 4 present the findings restricting the sample to only those SEOs in which the issuing firm issues a strictly positive number of new shares. COMBINED is the percent difference between the offer price in the SEO and the closing price on the day prior to the announcement day. REPUTATION is defined as the underwriter's market share of the SEO market in the prior calendar year. #LEAD is the number of lead managers reported by Dealogic. MARKET_TO_BOOK is the firm's market-to-book ratio reported at the end of the fiscal year prior to the announcement year. SALE is the hyperbolic arcsine of the firm's sales (divided by 1,000) reported at the end of the fiscal year prior to the announcement year. #SEO is the number of SEOs in the 3 months prior to the announcement date. ILIQ is Amihud's measure of the illiquidity of the firm's equity. RISK is the variance of daily returns for the firm's equity measured in the month prior to the announcement date. Standard errors are in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	OLS		Matching Market-Corrected	
	1	2	3	4
Constant	0.1100***	0.1280***	0.2105***	0.2382***
	(0.0329)	(0.0394)	(0.0336)	(0.0356)
REPUTATION	−0.0280	−0.0326	−0.1588***	−0.1730***
	(0.0650)	(0.0698)	(0.0303)	(0.0315)
BOUGHT	−0.0780***	−0.0854***	−0.0318***	−0.0252***
	(0.0158)	(0.0194)	(0.0039)	(0.0041)
FULL	0.0297***	0.0349***	0.0344***	0.0405***
	(0.0094)	(0.0103)	(0.0034)	(0.0034)
REPUTATION × BOUGHT	0.3321**	0.4305**	0.3034***	0.4122***
	(0.1547)	(0.1879)	(0.0277)	(0.0279)
REPUTATION × FULL	−0.0077	0.0144	−0.0781**	−0.0321
	(0.0842)	(0.0929)	(0.0314)	(0.0317)
#LEAD	−0.0067***	−0.0059**	−0.0058***	−0.0046***
	(0.0021)	(0.0024)	(0.0010)	(0.0010)
SALE	−0.0029**	−0.0032*	−0.0021*	−0.0022*
	(0.0015)	(0.0016)	(0.0012)	(0.0012)
#SEO	−0.0015***	−0.0015***	−0.0014***	−0.0015***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
ILIQ	0.0247	0.0268	0.0032	0.0028
	(0.0222)	(0.0236)	(0.0322)	(0.0302)
RISK	3.8114***	4.2241***	3.5023***	3.8266***
	(1.1524)	(1.2157)	(1.1394)	(1.1606)
MARKET_TO_BOOK	−0.0025**	−0.0024**	−0.0019*	−0.0017
	(0.0010)	(0.0011)	(0.0012)	(0.0011)
ehat			−0.0466***	−0.0533***
			(0.0030)	(0.0031)
No. of obs.	4,663	4,030	4,663	4,030
R^2	0.0978	0.1039	0.1344	0.1463

In both columns 3 and 4, controlling for the unobservable effects of the matching between issuers and underwriters, REPUTATION is negatively related to (i.e., reduces) the combined price impact of the offering. Higher reputation underwriters lead accelerated bookbuilt deals with a lower combined price impact. Importantly, note that in the OLS regressions (columns 1 and 2), the coefficient estimates on REPUTATION are insignificant, highlighting the value of controlling for the endogenous matching using the two-step procedure.

For fully marketed deals, the coefficient estimate on the interaction term, REPUTATION × FULL, is insignificant in the sample of SEOs in which the issuer raises new equity capital, indicating a similar impact of underwriter reputation on the combined price impact of these deals. The coefficient estimate on REPUTATION × FULL is negative and significant in the sample of all SEOs, suggesting that in the sample of all SEOs, reputation leads to a greater reduction in

TABLE 5

Second-Stage Regression Results: Announcement Effect

Table 5 reports the findings of OLS and matching market-corrected versions of equation (7) for which the dependent variable is the announcement effect. Columns 1 and 3 present the findings for all SEOs in the sample, and columns 2 and 4 present the findings restricting the sample to only those SEOs in which the issuing firm issues a strictly positive number of new shares. ANNOUNCE is the 2-day cumulative abnormal return (estimated using a market model) for the announcement day and the following trading day. REPUTATION is defined as the underwriter's market share of the SEO market in the prior calendar year. #LEAD is the number of lead managers reported by Dealogic. MARKET_TO_BOOK is the firm's market-to-book ratio reported at the end of the fiscal year prior to the announcement year. SALE is the hyperbolic arcsine of the firm's sales (divided by 1,000) reported at the end of the fiscal year prior to the announcement year. #SEO is the number of SEOs in the 3 months prior to the announcement date. ILIQ is Amihud's measure of the illiquidity of the firm's equity. RISK is the variance of daily returns for the firm's equity measured in the month prior to the announcement date. Standard errors are in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	OLS		Matching Market-Corrected	
	1	2	3	4
Constant	−0.0666***	−0.0711***	−0.0881***	−0.0916***
	(0.0153)	(0.0173)	(0.0092)	(0.0093)
REPUTATION	0.0953	0.0966	0.1259***	0.1236***
	(0.0598)	(0.0681)	(0.0175)	(0.0169)
BOUGHT	0.0386	0.0239	0.0403***	0.0278***
	(0.0236)	(0.0270)	(0.0016)	(0.0016)
FULL	0.0051	0.0035	0.0074***	0.0059***
	(0.0070)	(0.0078)	(0.0015)	(0.0015)
REPUTATION × BOUGHT	−0.5821**	−0.4446	−0.6729***	−0.5519***
	(0.2745)	(0.3545)	(0.0126)	(0.0120)
REPUTATION × FULL	−0.1028	−0.1160	−0.0950***	−0.1107***
	(0.0628)	(0.0715)	(0.0144)	(0.0142)
#LEAD	0.0030**	0.0031*	0.0027***	0.0024***
	(0.0012)	(0.0016)	(0.0006)	(0.0006)
SALE	0.0010	0.0009	0.0008	0.0007
	(0.0007)	(0.0008)	(0.0005)	(0.0005)
#SEO	0.0001	0.0001	0.0001*	0.0001*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
ILIQ	0.0106	0.0123	0.0103	0.0117
	(0.0100)	(0.0107)	(0.0117)	(0.0113)
RISK	0.4910	0.4600	0.4958	0.4725
	(0.5678)	(0.6038)	(0.5817)	(0.5775)
MARKET_TO_BOOK	0.0006	0.0007	0.0005	0.0006
	(0.0004)	(0.0005)	(0.0004)	(0.0004)
ehat			0.0088***	0.0089***
			(0.0013)	(0.0013)
No. of obs.	3,037	2,596	3,037	2,596
R^2	0.0507	0.0593	0.0598	0.0675

the combined price impact of fully marketed deals than in the accelerated book-built deals.[24] Fully marketed and accelerated book built deals are similar in that they are both sold to external investors. These findings are evidence that higher-reputation underwriters provide service to the issuing firm by reducing the negative price impact of the offering. As we will show in Tables 5 and 6, the combined

[24]The coefficient estimates on the interaction term, REPUTATION × FULL, are insignificant in both OLS regressions. As a way to further emphasize the added value of the matching model, if we include the log of DEAL VALUE and DEAL VALUE scaled by the issuing firm's market capitalization in the OLS regression to capture the size of the offering, underwriter reputation remains insignificantly related to the measure of price impact. The same analysis has been done for all the outcome variables, and in each case, there is no change in the significance of the reputation measure or its interactions with deal type in the OLS regression. We are grateful to the anonymous referee for suggesting this analysis.

TABLE 6

Second-Stage Regression Results: Discount

Table 6 reports the findings of OLS and matching market-corrected versions of equation (7) for which the dependent variable is the discount. Columns 1 and 3 present the findings for all SEOs in the sample, and columns 2 and 4 present the findings restricting the sample to only those SEOs in which the issuing firm issues a strictly positive number of new shares. DISCOUNT is the percent difference between the closing price the trading day prior to the offer day and the offer price in the SEO. REPUTATION is defined as the underwriter's market share of the SEO market in the prior calendar year. #LEAD is the number of lead managers reported by Dealogic. MARKET_TO_BOOK is the firm's market-to-book ratio reported at the end of the fiscal year prior to the announcement year. SALE is the hyperbolic arcsine of the firm's sales (divided by 1,000) reported at the end of the fiscal year prior to the announcement year. #SEO is the number of SEOs in the 3 months prior to the announcement date. ILIQ is Amihud's measure of the illiquidity of the firm's equity. RISK is the variance of daily returns for the firm's equity measured in the month prior to the announcement date. Standard errors are in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	OLS		Matching Market-Corrected	
	1	2	3	4
Constant	0.0705***	0.0760***	0.0975***	0.1067***
	(0.0145)	(0.0164)	(0.0110)	(0.0110)
REPUTATION	0.0072	0.0064	−0.0313**	−0.0340**
	(0.0566)	(0.0645)	(0.0139)	(0.0139)
BOUGHT	0.0170	0.0293	0.0148***	0.0235***
	(0.0223)	(0.0256)	(0.0014)	(0.0014)
FULL	0.0114*	0.0143*	0.0087***	0.0108***
	(0.0066)	(0.0074)	(0.0013)	(0.0013)
REPUTATION × BOUGHT	0.0547	0.1574	0.1687***	0.3179***
	(0.2599)	(0.3358)	(0.0098)	(0.0098)
REPUTATION × FULL	−0.0095	−0.0098	−0.0193*	−0.0177
	(0.0595)	(0.0678)	(0.0117)	(0.0117)
#LEAD	−0.0029**	−0.0029*	−0.0024***	−0.0020***
	(0.0012)	(0.0015)	(0.0005)	(0.0005)
SALE	−0.0053***	−0.0055***	−0.0050***	−0.0052***
	(0.0007)	(0.0008)	(0.0005)	(0.0005)
#SEO	−0.0002***	−0.0002**	−0.0002***	−0.0002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
ILIQ	0.0969***	0.0941***	0.0974***	0.0949***
	(0.0095)	(0.0102)	(0.0116)	(0.0116)
RISK	3.0452***	2.9000***	3.0392***	2.8813***
	(0.5376)	(0.5719)	(0.4612)	(0.4612)
MARKET_TO_BOOK	−0.0020***	−0.0022***	−0.0019***	−0.0020***
	(0.0004)	(0.0005)	(0.0004)	(0.0004)
ehat			−0.0111***	−0.0133***
			(0.0011)	(0.0011)
No. of obs.	3,037	2,596	3,037	2,596
R^2	0.1878	0.1936	0.2015	0.2112

price impact of REPUTATION reflects different channels of influence for accelerated bookbuilt and fully marketed deals.

The coefficient estimate on the interaction term REPUTATION × BOUGHT is positive and highly significant. The bootstrapped standard errors indicate that the sum of the coefficients on the variables REPUTATION and REPUTATION × BOUGHT is positive and significant. This suggests that a higher underwriter reputation increases the price impact of the offering in bought deals. Since accelerated bookbuilt deals and bought deals are both done on an accelerated timeline, this finding may seem confusing. However, in bought deals, the underwriter purchases the issue directly from the issuing firm and so derives a direct benefit from the price impact associated with the issue. Therefore, this finding may be interpreted similarly to the findings in Loughran and Ritter (2004) regarding

underwriters' exercise of market power, only in this case, this exercise of market power directly benefits the underwriter. Overall, these findings indicate that the nature and the importance of underwriter reputation differ significantly across deal types.

Concerning the control variables, larger firms and less risky firms tend to see a smaller price impact associated with the offering. There is evidence suggesting that firms with a higher market-to-book ratio experience a smaller price impact. However, the coefficient estimate is only significant in the full sample.[25] SEOs with more lead underwriters and those offered during hot markets experience a smaller price impact. Finally, the significance of the coefficient estimate on the variable "ehat" indicates the importance of controlling for the unobservable effects of the matching between issuers and underwriters in the estimation.

C. Announcement Effect

To provide a closer look at the price impact of the offering, we also examine the standard, disaggregated measures of price impact: the announcement effect and the discount. To this end, however, we must drop observations for which the number of days between the announcement and the offer is not strictly greater than 1.[26] Therefore, this eliminates a number of bought deals and is not ideal for examining the impact of the explanatory variable on the outcomes of this deal type. Despite this requirement, a consistent story emerges from the analysis.

The announcement effect (e.g., Mikkelson and Partch (1986)), which is commonly interpreted as a market response to potential adverse selection (Myers and Majluf (1984)), is measured as the abnormal price response at the announcement of the offering. This measure represents a measure of the market's assessment of the combined impact of the announcement of an equity issue and the identity of the underwriter leading the offering. Therefore, it allows us to examine the market's expectation of the impact underwriter reputation has on the performance of the offers. The findings regarding this measure are reported in Table 5. Columns 1 and 3 consider all SEOs, while columns 2 and 4 consider only those SEOs with a strictly positive number of new shares sold for the issuing firm.

The main finding from Table 5 is that, controlling for the unobserved characteristics of the matching between firms and underwriters, both columns (3) and (4) indicate that the use of a high-quality underwriter is associated with a significantly smaller (less negative) announcement effect for accelerated bookbuilt deals. This finding illustrates the importance of underwriter reputation for this deal type. The use of a highly reputable underwriter in an accelerated bookbuilt deal serves to

[25]The negative coefficient estimate on the market-to-book ratio is consistent with the findings in Denis (1994), which examines whether firms with better investment opportunities experience a lower announcement effect. In our analysis, substituting capital expenditures (scaled by book assets) for the market-to-book ratio also results in a significant coefficient estimate.

[26]This must be done to ensure that the announcement effect is measured relative to a closing price unaffected by the news of the offering. Similar results are obtained if we restrict "days announcement to offer" to be greater than 2 or greater than 4. However, doing so effectively restricts the analysis to fully marketed deals.

reassure investors of the value of the offering despite the potential for adverse selection in these deals.[27]

Columns 1 and 2 report insignificant coefficient estimates for REPUTATION in the OLS regressions. The contrast in these findings stems from the endogeneity introduced by the assortative matching between firms and underwriters, illustrating the importance of controlling for this matching when examining the relation between outcomes and underwriter quality. As expected, correction for the endogeneity problem in the reduced form regression tests corrects bias in the point estimate of the coefficient on the variable REPUTATION and increases its precision. For example, comparing the coefficient estimates in columns 2 and 4, there is a 28% increase in the magnitude of the coefficient estimate on the REPUTATION variable, while the standard error of this estimate is reduced by 75%. The high level of statistical significance of the coefficient estimate on the residual from the first-stage regression (ehat) provides further evidence of the importance of controlling for the unobserved aspects of the endogenous matching between underwriters and issuers.

The coefficient estimate on the interaction term REPUTATION × FULL indicates that the relation between underwriter quality and the magnitude of the announcement effect is significantly smaller in fully marketed deals. Furthermore, the sum of the coefficient estimate on REPUTATION and the coefficient estimate on REPUTATION × FULL is close to 0, and the bootstrapped standard errors indicate the relation between the announcement effect and underwriter reputation for fully marketed deals is significant. This finding is consistent with the argument that there is little scope for underwriter certification in establishing a price for the offering in a set of firms for which a fully marketed deal structure is chosen. It is also consistent with the argument that the underwriter's role in fully marketed deals is information production and exchange, limiting the potential for differential performance of high vs. low-quality underwriters in an offering for a public firm.

The coefficient estimates on the interaction term REPUTATION × BOUGHT, reported in columns 3 and 4, are negative and significant. Summing these coefficients and the estimated coefficients on the REPUTATION variable indicates that, in both samples, there is a significantly negative relation between underwriter quality and the announcement effect in bought deals; higher-quality underwriters are associated with larger announcement effects. As noted above, in bought deals, the underwriter has a direct interest in the price impact of the offering. If high-quality underwriters in bought deals select uncompetitively high discounts (as indicated by the analysis of the combined effect and, as discussed below), then this finding is evidence that the market anticipates this behavior. These coefficient estimates are based on relatively few observations, suggesting some caution in interpreting these results. However, the consistency of the results suggests this is not a concern.

Few of the other control variables are significantly related to the announcement effect. The announcement effect is smaller (less negative) when the number of

[27]Gao and Ritter (2010) and Huang and Zhang (2011) suggest that high-quality underwriters' superior marketing efforts can lower the price impact of the issue (a smaller discount) in fully marketed deals, and that this explains the use of a slow and costly mechanism. The limited time between the announcement of the issue and the offer suggests that this is unlikely to explain our result.

lead underwriters is larger and (weakly) smaller during periods of high issuance activity. These findings are consistent with the view that asymmetric information is an important friction when public firms raise new equity capital and that the underwriter's reputational capital is employed to certify the value of the issued shares in accelerated bookbuilt offerings.

D. Discount

The discount of the offer price relative to the closing market price on the day before the offer is a choice variable. It may serve as an inducement or compensation for investors who purchase shares in the offering. As such, higher-reputation underwriters should need to rely less on this costly mechanism than should lower-quality underwriters. The discount is also a direct benefit to the underwriter in bought offerings, which may alter the nature of the findings for these deals.

Table 6 examines the discount, defined as the percent difference between the offer price and the closing price on the day before the offer. As above, columns 1 and 3 present, respectively, the OLS and the matching market-corrected coefficient estimates, based on the sample of all SEOs. Columns 2 and 4 report the coefficient estimates, restricting the estimation to consider only those SEOs in which the issuing firm raises new equity capital.

Controlling for the matching between underwriters and issuing firms, column 4 shows a significantly negative relation between underwriter quality and the discount for accelerated bookbuilt deals (the coefficient estimate on the variable REPUTATION). This finding indicates that more reputable underwriters can limit this cost associated with accelerated bookbuilt offerings. In column 3, where estimates are based on a sample that includes SEOs made up entirely of secondary shares, the coefficient estimate on reputation is also significantly negative. Again, in columns 1 and 2 the coefficient estimates on the reputation variable from the OLS regressions are both insignificant, highlighting the change in the inference generated by controlling for the matching between underwriters and issuing firms when examining the performance of SEOs. This finding indicates that a highly reputable underwriter can market accelerated bookbuilt offers with less price inducement for investors than required by a less reputable underwriter.

The coefficient estimate on the interaction term (REPUTATION $\times$ FULL) is negative but insignificantly different from 0 in column 4 (it is negative and marginally significant for the full sample, column 3). This indicates that, for fully marketed deals, the effect of underwriter reputation on the discount is similar to that in accelerated deals. However, in a fully marketed deal, the offer occurs several weeks after the announcement rather than a day or two after the announcement as it does in an accelerated bookbuilt deal. This suggests that the underwriter's role is very different in fully marketed deals than in accelerated bookbuilt deals. Specifically, underwriter reputation may improve information exchange during the roadshow, even though it has no significant effect on the announcement date price impact of fully marketed deals.

For bought deals, the coefficient estimate on the interaction term REPUTATION $\times$ BOUGHT is positive and highly significant in columns 3 and 4. The magnitude of the coefficients indicates that the discount increases in

underwriter reputation for bought deals. In other words, issuing firms are subject to a higher discount when using high-reputation underwriters in bought deals. This is consistent with the estimated relation between underwriter reputation and the announcement effect as well as between underwriter reputation and the combined price impact in bought deals.

The coefficient estimates also indicate that the discount is smaller for deals with a greater number of lead underwriters, larger firms, firms with higher market-to-book ratios, and periods of high SEO activity. The discount is larger for riskier firms and firms with less liquid equity. Finally, the significance of the coefficient estimate on the residual from the first-stage regression again illustrates the importance of controlling for the unobservable aspects of the matching between firms and underwriters when examining the discount.

E. Underpricing

A liquid market in the offered securities does not exist before the offering in an IPO. Therefore, to compare the price set by the underwriter to a market price, the most relevant measure is the underpricing of the offer price relative to the aftermarket price. The existence of a liquid market in the issued security in the case of an SEO implies that a more relevant comparison is the discount of the offer price relative to the closing price on the day before the offer. In an SEO, underpricing is less directly a choice variable than is the discount. However, underpricing a seasoned offering on the day of the offer may represent a cost associated with the offering, and as such, it may be expected to be smaller for higher-quality underwriters. It is also true that, for the deal types for which the size of the discount required to market the new issue, the new issue may convey information that influences the underpricing (Altınkılıç and Hansen (2003)). Therefore, for completeness and comparison to the prior literature, we examine underpricing in our sample of SEOs.

Table 7 reports the findings regarding the underpricing in the offerings, defined as the percent difference between the closing price on the offer day and the offer price. Columns 1 and 3 present, respectively, the OLS and matching market-corrected estimates for the sample of all SEOs, and columns 2 and 4 present the findings using only those SEOs for which the issuing firm raised new equity capital. Note that, when examining underpricing, there is no need to restrict attention to deals for which there is more than 1 day between the announcement and the offer.

The findings in columns 3 and 4 show a significantly positive relation between underpricing and REPUTATION for accelerated bookbuilt deals. Columns 1 and 2 indicate that the relation between REPUTATION and underpricing is positive, but only marginally significant for these deals. In columns 3 and 4, the coefficient estimates on the interaction terms REPUTATION $\times$ FULL and REPUTATION $\times$ BOUGHT are negative and significant. On net, underwriter reputation is negatively related to underpricing in fully marketed deals and bought deals, but is positively related to reputation in accelerated bookbuilt deals.

These findings indicate that underwriter reputation increases the underpricing for accelerated bookbuilt deals but decreases it for fully marketed and bought deals.

TABLE 7

Second-Stage Regression Results: Underpricing

Table 7 reports the findings of OLS and matching market-corrected versions of equation (7) for which the dependent variable is the underpricing. Columns 1 and 3 present the findings for all SEOs in the sample, and columns 2 and 4 present the findings restricting the sample to only those SEOs in which the issuing firm issues a strictly positive number of new shares. UNDERPRICE is the percent difference between the closing price on the offer day and the offer price in the SEO. REPUTATION is defined as the underwriter's market share of the SEO market in the prior calendar year. #LEAD is the number of lead managers reported by Dealogic. MARKET_TO_BOOK is the firm's market-to-book ratio reported at the end of the fiscal year prior to the announcement year. SALE is the hyperbolic arcsine of the firm's sales (divided by 1,000) reported at the end of the fiscal year prior to the announcement year. #SEO is the number of SEOs in the 3 months prior to the announcement date. ILIQ is Amihud's measure of the illiquidity of the firm's equity. RISK is the variance of daily returns for the firm's equity measured in the month prior to the announcement date. Standard errors are in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	OLS		Matching Market-Corrected	
	1	2	3	4
Constant	0.0248***	0.0313***	0.0276***	0.0342***
	(0.0082)	(0.0099)	(0.0056)	(0.0056)
REPUTATION	0.0285*	0.0293*	0.0248**	0.0256***
	(0.0162)	(0.0175)	(0.0099)	(0.0098)
BOUGHT	−0.0082**	−0.0034	−0.0069***	−0.0018*
	(0.0039)	(0.0049)	(0.0010)	(0.0011)
FULL	0.0098***	0.0103***	0.0100***	0.0105***
	(0.0024)	(0.0026)	(0.0010)	(0.0010)
REPUTATION × BOUGHT	−0.0493	−0.0488	−0.0501***	−0.0493***
	(0.0386)	(0.0471)	(0.0074)	(0.0077)
REPUTATION × FULL	−0.0720***	−0.0779***	−0.0739***	−0.0791***
	(0.0210)	(0.0233)	(0.0092)	(0.0091)
#LEAD	−0.0002	−0.0002	−0.0002	−0.0001
	(0.0005)	(0.0006)	(0.0003)	(0.0003)
SALE	−0.0018***	−0.0018***	−0.0017***	−0.0018***
	(0.0004)	(0.0004)	(0.0003)	(0.0003)
#SEO	0.00002	0.00003	0.00002	0.00003
	(0.00004)	(0.00005)	(0.00004)	(0.00004)
ILIQ	0.0216***	0.0196***	0.0210**	0.0190*
	(0.0055)	(0.0059)	(0.0102)	(0.0106)
RISK	0.9233***	0.8995***	0.9147**	0.8888**
	(0.2877)	(0.3049)	(0.3774)	(0.3794)
MARKET_TO_BOOK	−0.0002	−0.0001	−0.0001	−0.0001
	(0.0003)	(0.0003)	(0.0003)	(0.0002)
ehat			−0.0013	−0.0014*
			(0.0008)	(0.0008)
No. of obs.	4,663	4,030	4,663	4,030
R^2	0.0820	0.0759	0.0824	0.0764

In accelerated bookbuilt deals, the discount and underpricing effects of higher underwriter reputation are roughly equal and opposite in sign, which suggests an ambiguous effect on price around the offer date. In contrast, in fully marketed deals, higher underwriter reputation makes both the discount and the underpricing lower, suggesting a positive effect of underwriter reputation on pricing at the time of the offer. As we discuss further below, these findings are consistent with the findings in Altınkılıç and Hansen (2003), which studies a related question for a sample of fully marketed deals. They find that the unexpected discount is related to the unexpected underpricing on the offer day.

The coefficient estimates on the control variables indicate that riskier and less liquid firms see significantly greater underpricing, while larger firms experience less underpricing. Finally, in this case, the coefficient estimate on the first-stage residual is only marginally significant.

F. Fees

Table 8 reports findings related to the fees associated with the follow-on offerings. Panel A considers the subset of SEOs in which the issuer raises new capital, and Panel B considers the sample of all SEOs. In both panels, columns 1 and 2 report the findings for OLS estimates in which the dependent variables are the log of total fees and total fees as a percentage of proceeds, respectively. Columns 3 and 4 report the findings for the matching market-corrected estimates in which the dependent variables are the log of total fees and total fees as a percent of proceeds, respectively. The findings across the samples are similar, so in the interest of space, we discuss Panel A's findings unless there is a difference. The findings provide interesting insights into underwriting costs.

TABLE 8

Second-Stage Regression Results: Fees

Table 8 reports the findings of OLS and matching market-corrected (MMC) versions of equation (7) for which the dependent variable is a measure of the underwriter's fees in the SEO. All findings are derived from the subsample of SEOs in which the issuing firm issues a strictly positive number of new shares. In columns 1 and 3, the dependent variable is the log of the dollar value of total fees in the SEO, and in columns 2 and 4, the dependent variable is the ratio of total fees relative to the proceeds of the SEO. FEES is the natural logarithm of the dollar value (in millions of dollars) of the total fees paid to the underwriter in the SEO. %FEES is the value of the total fees paid to the underwriter in the SEO normalized by the total proceeds. REPUTATION is defined as the underwriter's market share of the SEO market in the prior calendar year. #LEAD is the number of lead managers reported by Dealogic. MARKET_TO_BOOK is the firm's market-to-book ratio reported at the end of the fiscal year prior to the announcement year. SALE is the hyperbolic arcsine of the firm's sales (divided by 1,000) reported at the end of the fiscal year prior to the announcement year. #SEO is the number of SEOs in the 3 months prior to the announcement date. ILIQ is Amihud's measure of the illiquidity of the firm's equity. RISK is the variance of daily returns for the firm's equity measured in the month prior to the announcement date. Standard errors are in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Log(Fees) OLS	%Fees OLS	Log(Fees) MMC	%Fees MMC
	1	2	3	4
Panel A. SEOs in Which Firm Raises New Equity Capital				
Constant	−0.4984***	6.2541***	−2.3164***	7.2246***
	(0.1543)	(0.1748)	(0.2185)	(0.2185)
REPUTATION	3.7200***	−0.8437***	6.0343***	−2.0792***
	(0.2733)	(0.3096)	(0.2480)	(0.2480)
BOUGHT	−0.7149***	−2.3443***	−1.7084***	−1.8138***
	(0.0761)	(0.0862)	(0.0365)	(0.0365)
FULL	0.2915***	0.3224***	0.1995***	0.3716***
	(0.0405)	(0.0459)	(0.0228)	(0.0228)
REPUTATION × BOUGHT	−1.5970**	−3.6129***	−1.2947***	−3.7743***
	(0.7355)	(0.8330)	(0.3290)	(0.3290)
REPUTATION × FULL	−0.4963	−0.6656	0.2703	−1.0748***
	(0.3637)	(0.4120)	(0.2049)	(0.2049)
#LEAD	0.2025***	−0.0973***	0.1805***	−0.0856***
	(0.0094)	(0.0107)	(0.0125)	(0.0125)
SALE	0.1274***	−0.2108***	0.1114***	−0.2022***
	(0.0064)	(0.0073)	(0.0096)	(0.0096)
#SEO	0.0039***	0.0004	0.0029***	0.0009
	(0.0008)	(0.0009)	(0.0010)	(0.0010)
ILIQ	−1.8174***	1.2541***	−1.4218***	1.0429***
	(0.0925)	(0.1047)	(0.1342)	(0.1342)
RISK	−13.6438***	21.8611***	−7.0874	18.3608***
	(4.7596)	(5.3906)	(5.4862)	(5.4862)
MARKET_TO_BOOK	0.0535***	−0.0370***	0.0433***	−0.0316***
	(0.0043)	(0.0048)	(0.0057)	(0.0057)
ehat			0.8790***	−0.4693***
			(0.0211)	(0.0211)
No. of obs.	4,030	4,030	4,030	4,030
R^2	0.5534	0.6935	0.9288	0.7508

(continued on next page)

TABLE 8 (continued)
Second-Stage Regression Results: Fees

Panel B. All SEOs				
Constant	−0.6796***	6.2389***	−2.5363***	7.2567***
	(0.1365)	(0.1582)	(0.2277)	(0.2277)
REPUTATION	3.8205***	−0.7838**	6.2361***	−2.1080***
	(0.2698)	(0.3128)	(0.2495)	(0.2495)
BOUGHT	−0.8003***	−2.5027***	−1.6534***	−2.0351***
	(0.0657)	(0.0761)	(0.0362)	(0.0362)
FULL	0.3177***	0.2936***	0.2308***	0.3412***
	(0.0392)	(0.0454)	(0.0229)	(0.0229)
REPUTATION × BOUGHT	−1.8705***	−3.0557***	−1.3400***	−3.3466***
	(0.6425)	(0.7451)	(0.3280)	(0.3280)
REPUTATION × FULL	−0.7086**	−0.5561	0.5901***	−1.2680***
	(0.3497)	(0.4056)	(0.2010)	(0.2010)
#LEAD	0.1936***	−0.0870***	0.1769***	−0.0779***
	(0.0087)	(0.0101)	(0.0128)	(0.0128)
SALE	0.1344***	−0.2379***	0.1181***	−0.2290***
	(0.0061)	(0.0071)	(0.0092)	(0.0092)
#SEO	0.0041***	−0.0003	0.0031***	0.0003
	(0.0007)	(0.0009)	(0.0010)	(0.0010)
ILIQ	−1.7885***	1.2909***	−1.3917***	1.0734***
	(0.0923)	(0.1071)	(0.1350)	(0.1350)
RISK	−11.7388**	24.4950***	−6.0309	21.3660***
	(4.7864)	(5.5506)	(5.7439)	(5.7439)
MARKET_TO_BOOK	0.0544***	−0.0425***	0.0442***	−0.0369***
	(0.0042)	(0.0049)	(0.0057)	(0.0057)
ehat			0.8606***	−0.4718***
			(0.0209)	(0.0209)
No. of obs.	4,663	4,663	4,663	4,663
R^2	0.5576	0.7148	0.9119	0.7658

Column 3 in Panel A of Table 8 shows that, as expected, the conditional average of total fees is highest for fully marketed deals and lowest for bought deals. For accelerated bookbuilt deals, there is a significantly positive relation between the total fees paid by the issuing firm and the underwriter's reputation. The coefficient estimate on REPUTATION × FULL is positive but insignificant, indicating the relation between underwriter reputation and total fees in fully marketed deals is similar to that in accelerated bookbuilt deals.[28] Consistent with the lack of measurable benefits to underwriter reputation in bought deals, the coefficient estimate on the interaction term REPUTATION × BOUGHT indicates a significantly weaker relation between reputation and total fees relative to accelerated deals. Thus, the total fees differ in a way consistent with the variation in direct underwriting costs across deal types and consistent with the benefits the issuing firm receives from a high-reputation underwriter. There is significant heterogeneity in the benefits and costs for an issuing firm matching with a highly reputable underwriter across the different deal types.

Column 3 indicates a higher total fee for larger firms (possibly reflecting a larger expected offer size) and for firms with higher market-to-book ratios. Fees are higher during periods of greater SEO market activity and for deals with a higher

[28]In the sample of all SEOs (Panel B), this coefficient is positive and significant, indicating a stronger relation between reputation and fees in the full sample.

number of lead underwriters. Fees are smaller for more illiquid firms. This last finding is difficult to reconcile with intuition. It is likely that more illiquid equity is associated with a higher premium for quality. It may be that the smaller expected sizes of these offerings reduce the fees in spite of the higher per dollar cost of marketing them.

Column 4 in Panel A of Table 8 presents the matching market-corrected estimates using the percentage fee as the dependent variable. The constant and the indicator variables for deal type indicate that the (conditional) average percentage fee is largest for fully marketed deals and smallest for bought deals. For all deal types, underwriter quality is negatively related to (this approximation of) the marginal cost of raising capital. The interaction terms indicate that this negative relation is stronger for both bought and fully marketed deals than for accelerated bookbuilt deals. Therefore, based upon the suggested sorting of issuers into deal type, the most and the least informationally problematic issuers benefit from a greater reduction in the marginal cost of raising capital as the quality of the lead underwriter rises. For bought deals, underwriters may charge less in fees because of the compensation they earn in the form of the low price they pay for the offering.

An interpretation of the results in Table 8 is that the cost curve for raising equity capital using a high-quality underwriter has a higher intercept but a lower marginal cost relative to the cost curve associated with a low-quality underwriter. This indicates that issuing firms derive a benefit from matching with a high-quality underwriter, and the heterogeneity across deal types is consistent with the differential role of the underwriter across these different mechanisms. These findings complement the findings in Altinkiliç and Hansen (2000), who characterize the cost curves for issuing seasoned equity. Their characterization examines the costs based upon different sizes of the issues. We add the examination of the differences across levels of underwriter quality and deal types, controlling for the matching between issuing firms and underwriters.

Consider the total proceeds of a given SEO. The use of a higher-quality underwriter improves the performance of the seasoned offer, increasing the proceeds of the deal. It also increases the value captured by the underwriter in the form of higher total fees. Therefore, consistent with the matching model's logic, the issuer and the underwriter share the improvement in performance generated by a higher-quality underwriter. Also consistent with the matching model, the coefficient estimate on the firm characteristics indicates that this tradeoff is not equally valuable for every firm.

For a given firm, the net benefit of using a higher-quality underwriter depends upon the extent to which that underwriter can increase the offer's proceeds net of fees. The first-stage regression results indicate that larger firms tend to match with higher-quality underwriters. If larger firms also tend to issue larger amounts of equity, then the different shapes of the cost curves for high vs. low-quality underwriters explain the interest large firms have in matching with high-quality underwriters. Similarly, if riskier firms with less liquid equity tend to issue smaller amounts of equity, then the nature of the cost curves we identify suggests that these types of firms may not find it beneficial to match with the highest quality underwriters. These findings are consistent with the findings from the first-stage regression, as well as the intuition of the matching model.

G. Residuals

Table 9 reports an analysis of the relation between the residuals of the different second-stage regression tests. This analysis is similar to that in Altınkılıç and Hansen (2003) concerning the correlation between unexpected values of the discount and unexpected underpricing. We focus on the relation between unexpected values of the total fees in the deal and the unexpected levels of the announcement and the discount effects, as well as the relation between unexpected levels of the discount and unexpected underpricing. This analysis sheds light on questions related to competition in the market for underwriting services and the underwriter's role.

Panel A of Table 9 presents the simple cross-correlations between the residuals of the second-stage regressions explaining the announcement effect, the discount, underpricing, and the total fees. It shows that the unexpected level of the announcement effect correlates positively with the unexpected levels of the fees paid by the issuing firm. Given that the residuals are from regressions that control for deal type, the quality of the lead underwriter, and the number of lead underwriters in the deal, this correlation addresses the question of whether the underwriter can undertake actions to limit the negative price response to the announcement of the new issue, actions motivated by the payment of a higher than the expected fee.

Note that higher unexpected fees are associated with lower than expected levels of the discount and underpricing for the issue. This suggests some substitutability between the 2 primary sources of cost to the issuer in the SEO. The discount is a choice variable for the underwriter, which will directly benefit the underwriter (in bought deals) or their investors (in accelerated bookbuilt or fully marketed deals). Issuing firms that pay higher than expected fees (conditional on the matching and the predictive firm, underwriter, and market characteristics) subsequently tend to see a superior performance in the SEO. This evidence may be seen as consistent with the arguments in Chen and Ritter (2000) who note that the underwriter's market power allows for an absence of price competition for IPO underwriting services.

Panels C, D, and E of Table 9 consider this analysis conditional on the deal type. This analysis shows that the relation between unexpected fees and the unexpected discount/underpricing is concentrated in the fully marketed deals. This finding is not surprising, given that the time and effort the underwriter spends on the roadshow is in part motivated by the level of fees associated with a fully marketed deal and that these inputs may impact the elasticity of the demand curve for the shares of the issuing firm (Gao and Ritter (2010)). There is also a marginally significant negative relationship between unexpected fees and the unexpected discount in the set of accelerated bookbuilt deals. The discount is a choice variable for the underwriter and can be manipulated even with a condensed time frame.

For all deals, we find that the unexpected discount is highly correlated with the unexpected level of underpricing. This finding is related to the findings in Altınkılıç and Hansen (2003), who interpret their result as a consequence of the underwriter's conveying information to the investors via the unexpected discount. They argue that information regarding the value of the issue is contained in the chosen discount, and

TABLE 9
Residuals

Table 9 reports an examination of the residuals from the second-stage regressions. Panel A reports the simple cross-correlations of the residuals from the second-stage matching market-corrected regressions of the measures of performance. Panel B reports the findings of OLS regressions using the residuals from the second-stage matching market-corrected regressions of the measures of performance as the dependent and explanatory variables. UNDERPRICE is the percent difference between the closing price on the offer day and the offer price in the SEO. DISCOUNT is the percent difference between the closing price the trading day prior to the offer day and the offer price in the SEO. ANNOUNCE is the 2-day cumulative abnormal return (estimated using a market model) for the announcement day and the following trading day. FEES is the dollar value (in millions of dollars) of the total fees paid to the underwriter in the SEO. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Correlations

	ANNOUNCE_Resid.	DISCOUNT_Resid.	UNDERPRICE_Resid.	FEES_Resid.
ANNOUNCE_Resid.	1			
DISCOUNT_Resid.	0.0172	1		
UNDERPRICE_Resid.	−0.0155	0.4608	1	
FEES_Resid.	0.0507	−0.1119	−0.1167	1

	Announce	Discount	Underpricing
	1	2	3
Panel B. Regression Tests (ALL)			
Constant	−0.0000	0.0000	0.0000
	(0.0012)	(0.0011)	(0.0006)
FEES_Resid.	0.0043***	−0.0089***	−0.0034***
	(0.0016)	(0.0015)	(0.0009)
ANNOUNCE_Resid.		0.0216	−0.0124
		(0.0184)	(0.0108)
DISCOUNT_Resid.			0.2980***
			(0.0115)
No. of obs.	2,596	2,596	2,596
R^2	0.0026	0.0131	0.2170
Panel C. Regression Tests (Fully Marketed)			
Constant	0.0000	−0.0000	0.0000
	(0.0012)	(0.0012)	(0.0007)
FEES_Resid.	0.0038**	−0.0103***	−0.0040***
	(0.0019)	(0.0018)	(0.0011)
ANNOUNCE_Resid.		0.0224	−0.0235**
		(0.0196)	(0.0115)
DISCOUNT_Resid.			0.2945***
			(0.0121)
No. of obs.	2,344	2,344	2,344
R^2	0.0017	0.0138	0.2139
Panel D. Regression Tests (Accelerated)			
Constant	−0.0000	0.0000	−0.0000
	(0.0042)	(0.0033)	(0.0019)
FEES_Resid.	0.0049	−0.0050*	−0.0021
	(0.0034)	(0.0027)	(0.0016)
ANNOUNCE_Resid.		0.0311	0.0691**
		(0.0512)	(0.0292)
DISCOUNT_Resid.			0.3755***
			(0.0371)
No. of obs.	239	239	239
R^2	0.0083	0.0147	0.3296
Panel E. Regression Tests (Bought)			
Constant	0.0000	0.0000	−0.0000
	(0.0125)	(0.0243)	(0.0094)
FEES_Resid.	0.0187	−0.0088	0.0027
	(0.0136)	(0.0285)	(0.0111)
ANNOUNCE_Resid.		−0.6671	−0.0345
		(0.5855)	(0.2413)
DISCOUNT_Resid.			0.0047
			(0.1226)
No. of obs.	13	13	13
R^2	0.1477	0.1633	0.0071

it allows investors to more accurately price the firm's shares in the aftermarket. Specifically, positive information known by the underwriter is communicated by the use of a larger than expected discount, which leads to a larger than expected underpricing. We show that this finding holds true in accelerated bookbuilt deals as well. These are the deal types for which there is a role for information transmission between the underwriter and external investors.

In bought deals, the underwriter has a direct interest in the discount, and there are no external investors to which the underwriter would convey information in this manner. Therefore, we would not expect this to occur in bought deals set of deals. The lack of a significant effect within the set of bought deals may be due to the small number of observations for this deal type. However, the relevant coefficient estimate in bought deals is 2 orders of magnitude lower than those for fully marketed deals or accelerated bookbuilt deals. Again, our findings indicate significant differences in the nature of the outcomes of SEOs and the role of the underwriter across deal types.

VI. Conclusion

We examine the extent to which the introduction of accelerated mechanisms by which public firms raise new equity capital has altered the underwriter's role and the importance of underwriter reputation. We present 4 main findings: First, controlling for the matching between issuing firms and underwriters, the immediate price impact of announcing an SEO is only positively affected by the underwriter's reputation in accelerated bookbuilt offerings. Second, for both fully marketed and accelerated bookbuilt SEOs (those marketed to external investors), the discount of the offer price from the closing price the day before is lower for higher reputation underwriters. Third, for fully marketed deals, underpricing on the offer day is also lower the higher is the underwriters' reputation. Finally, in bought deals, the discount and the announcement effect are both larger for higher-reputation underwriters. These findings illustrate the differential importance of underwriter reputation across the available mechanisms. On the net, the discount and underpricing effects offset one another in accelerated bookbuilt deals, indicating that in these deals, the main effect of underwriter reputation on price is the announcement effect. For fully marketed deals, the discount and underpricing effects reinforce one another, and the main effect of reputation on pricing occurs at the completion of the offering. Bought deals appear to be similar to a large private placement to the underwriter, and higher-reputation underwriters obtain lower prices in these deals.

The accelerated aspect of underwriting accelerated bookbuilt or bought deals reduces the direct costs associated with raising new equity capital; however, the accelerated timeline limits investor due diligence and precludes significant information production. Our findings indicate that the accelerated bookbuilt mechanism relies on the underwriter's reputation to certify the pricing of the offering. This allows the accelerated bookbuilt deal structure to be a cost-effective mechanism for the set of issuers with relatively limited informational problems.

In contrast to the accelerated bookbuilt deals, in fully marketed deals, the time and cost associated with the production and dissemination of information imply that there is little role for certification of the pricing of the issue at the time of the

announcement, and hence little role for underwriter reputation to affect the price at the time of the announcement. For the more informationally problematic equity offerings, the time and expense associated with a fully marketed deal appear to be more efficient than relying on certification. The higher total fees, lower percentage fees, lower discount, and lower underpricing associated with a higher-quality underwriter in a fully marketed deal are consistent with the value a high-quality underwriter provides as a producer of information in this deal type.

The most reputable underwriters appear to utilize bought deals to accomplish the largest offerings of seasoned equity for the least informationally problematic issues. Screening by the underwriter and the underwriter's willingness to purchase the offering controls the adverse selection. The large discount in these deals provides a direct benefit to the underwriter.

For all deal types, the total fees paid to the underwriter vary positively with underwriter quality. However, across all deal types, fees as a percentage of deal value are negatively related to underwriter quality. The sensitivities of these relations between fees and quality vary significantly across deal types. The findings are consistent with the intuition of the matching model according to which issuing firms pay more to match with higher-quality underwriters yet share in the higher value created by the match. They also suggest that the nature of the cost curve for raising seasoned equity differs significantly across levels of underwriter quality. Specifically, higher-quality underwriters have a higher fixed fee, but a lower marginal cost per dollar raised.

Our findings highlight the importance of informational asymmetry for public firms when raising equity capital and the alternative mechanisms for controlling this friction. They characterize a diverse role for the underwriter and highlight differences in the importance of underwriter reputation across the mechanisms. They also pave the way for further research examining how uncertainty influences the selection of different mechanisms and the timing of equity issues.

Appendix. Variable Definitions

REPUTATION: Underwriter Reputation measured as the underwriter's market share of the SEO market in the year prior to the calendar year of the announcement (Megginson and Weiss (1991)). Market share represents a measure of underwriter quality that aggregates different aspects of underwriter ability or quality that may vary over time.

#LEAD: The number of lead underwriters for an issue listed by Dealogic. For deals with more than one lead underwriter listed by Dealogic (a list that has no identifiable ordering), we use the first underwriter in the list. If we instead use the highest reputation underwriter in the list as the lead underwriter, the same results are obtained.

SALE: The net sales of the issuing firm in thousands of dollars in the year of the SEO, is used to control for firm size. In all regressions, we use the hyperbolic arcsine of this number. This is very similar to using the natural logarithm of sales except that it allows values of 0. Filtering the data to eliminate observations for which the firm's sales are reported as 0 and using the natural log of sales provides the same results but imposes an unnecessary restriction on the data.

MARKET_TO_BOOK: The firm's market-to-book ratio reported at the end of the fiscal year prior to the SEO.

#SEO: The number of SEOs in the month prior to a given SEO and is used to control for financial market conditions and waves in the SEO market.

ILIQ: The illiquidity, measured by Amihud's (2002) illiquidity measure, of the issuing firm's equity at fiscal year-end of the year prior to the SEO.

RISK: The firm's risk during the month prior to the SEO. It is computed as the variance of daily returns. Each month, we then compute the monthly variance of stock returns using the average of daily variances, scaled to a monthly frequency.

DEAL_VALUE: The total proceeds of the deal (expressed in millions of dollars). The natural log of this value serves as the match surplus proxy.

ANNOUNCE: The announcement effect, defined as the 2-day (the day of the announcement and the day after) unexpected return for the issuing firm, where the expected return is calculated using a single factor market model estimated over the 30 trading days prior to the announcement day. The 2-day effect is considered because we do not have data on the exact time of the announcement, which may occur after the close of trading on the announcement day.

COMBINED: The combined effect is defined as the difference between the offer price and the closing price on the day prior to the announcement day. This effect is examined to control for issues related to predictable trading patterns between the announcement and issuance of fully marketed SEOs as identified by, for example, Henry and Koski (2010) and Dutordoir et al. (2019).

UNDERPRICE: The underpricing, defined as the percent difference between the closing price on the offer day and the offer price.

DISCOUNT: The percent difference between the closing price on the day prior to the offering and the offer price.

FEES: The dollar value (in millions of dollars) of the total underwriter fees reported in Dealogic. In all regressions, we use the natural logarithm of this value.

%FEES: The percentage fee, an approximation of marginal fee, defined as total dollar fees divided by total proceeds.

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S002210902100065X.

References

Akkus, O.; J. A. Cookson; and A. Hortaçsu. "The Determinants of Bank Mergers: A Revealed Preference Analysis." *Management Science*, 62 (2016), 2241–2258.

Akkus, O.; J. A. Cookson; and A. Hortaçsu. "Assortative Matching and Reputation in the Market for First Issues." *Management Science*, 67 (2021), 2049–2074.

Altinkiliç, O., and R. S. Hansen. "Are There Economies of Scale in Underwriting Fees? Evidence of Rising External Financing Costs." *Review of Financial Studies*, 13 (2000), 191–218.

Altınkılıç, O., and R. S. Hansen. "Discounting and Underpricing in Seasoned Equity Offers." *Journal of Financial Economics*, 69 (2003), 285–323.

Amihud, Y. "Illiquidity and Stock Returns: Cross-Section and Time-Series Effects." *Journal of Financial Markets*, 5 (2002), 31–56.

Beatty, R. P., and J. R. Ritter. "Investment Banking, Reputation, and the Underpricing of Initial Public Offerings." *Journal of Financial Economics*, 15 (1986), 213–232.

Blackwell, D. W.; M. W. Marr; and M. F. Spivey. "Shelf Registration and the Reduced Due Diligence Argument: Implications of the Underwriter Certification and the Implicit Insurance Hypotheses." *Journal of Financial and Quantitative Analysis*, 25 (1990), 245–259.
Booth, J. R., and R. L. Smith II. "Capital Raising, Underwriting and the Certification Hypothesis." *Journal of Financial Economics*, 15 (1986), 261–281.
Bortolotti, B.; W. Megginson; and S. B. Smart. "The Rise of Accelerated Seasoned Equity Underwritings." *Journal of Applied Corporate Finance*, 20 (2008), 35–57.
Card, D. "Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems." *Econometrica*, 69 (2001), 1127–1160.
Carter, R., and S. Manaster. "Initial Public Offerings and Underwriter Reputation." *Journal of Finance*, 45 (1990), 1045–1067.
Chemmanur, T. J., and P. Fulghieri. "Investment Bank Reputation, Information Production, and Financial Intermediation." *Journal of Finance*, 49 (1994), 57–79.
Chen, H.-C., and J. R. Ritter. "The Seven Percent Solution." *Journal of Finance*, 55 (2000), 1105–1131.
Denis, D. J. "Shelf Registration and the Market for Seasoned Equity Offerings." *Journal of Business*, 64 (1991) 189–212.
Denis, D. J. "Investment Opportunities and the Market Reaction to Equity Offerings." *Journal of Financial and Quantitative Analysis*, 29 (1994), 159–177.
Duarte-Silva, T. "The Market for Certification by External Parties: Evidence from Underwriting and Banking Relationships." *Journal of Financial Economics*, 98 (2010), 568–582.
Dutordoir, M.; N. Strong; and P. Sun. "Shelf Versus Traditional Seasoned Equity Offerings: The Impact of Potential Short Selling." *Journal of Financial and Quantitative Analysis*, 54 (2019), 1285–1311.
Echenique, F.; S. Lee; M. Shum; and M. B. Yenmez. "The Revealed Preference Theory of Stable and Extremal Stable Matchings." *Econometrica*, 81 (2013), 153–171.
Fang, L. H. "Investment Bank Reputation and the Price and Quality of Underwriting Services." *Journal of Finance*, 60 (2005), 2729–2761.
Fernando, C. S.; V. A. Gatchev; A. D. May; and W. L. Megginson. "Prestige Without Purpose? Reputation, Differentiation, and Pricing in U.S. Equity Underwriting." *Journal of Corporate Finance*, 32 (2015), 41–63.
Fernando, C. S.; V. A. Gatchev; and P. A. Spindt. "Wanna Dance? How Firms and Underwriters Choose Each Other." *Journal of Finance*, 60 (2005), 2437–2469.
Ferreira, M., and P. Laux "Corporate Boards and SEOs: The Effect of Certification and Monitoring." *Journal of Financial and Quantitative Analysis*, 51 (2016), 899–927.
Gao, X., and J. R. Ritter. "The Marketing of Seasoned Equity Offerings." *Journal of Financial Economics*, 97 (2010), 33–52.
Habib, M. A., and A. P. Ljungqvist. "Underpricing and Entrepreneurial Wealth Losses in IPOs: Theory and Evidence." *Review of Financial Studies*, 14 (2001), 433–458.
Hanley, K. W., and G. Hoberg. "The Information Content of IPO Prospectuses." *Review of Financial Studies*, 23 (2010), 2821–2864.
Hansen, R. S., and P. Torregrosa. "Underwriter Compensation and Corporate Monitoring." *Journal of Finance*, 47 (1992), 1537–1555.
Henry, T. R., and J. L. Koski. "Short Selling Around Seasoned Equity Offerings." *Review of Financial Studies*, 23 (2010), 4389–4418.
Huang, R., and D. Zhang. "Managing Underwriters and the Marketing of Seasoned Equity Offerings." *Journal of Financial and Quantitative Analysis*, 46 (2011), 141–170.
Kang, A., and R. Lowery. "The Pricing of IPO Services and Issues: Theory and Estimation." *Review of Corporate Finance Studies*, 2 (2014), 188–234.
Khanna, N.; T. H. Noe; and R. Sonti. "Good IPOs Draw in Bad: Inelastic Banking Capacity and Hot Markets." *Review of Financial Studies*, 21 (2007), 1873–1906.
Korajczyk, R. A.; D. J. Lucas; and R. L. McDonald. "The Effect of Information Releases on the Pricing and Timing of Equity Issues." *Review of Financial Studies*, 4 (1991), 685–708.
Loughran, T., and J. Ritter. "Why Has IPO Underpricing Changed Over Time?" *Financial Management*, 33 (2004) 5–37.
Lyandres, E.; F. Fu; and E. X. Li. "Do Underwriters Compete in IPO Pricing?" *Management Science*, 64 (2016), 925–954.
Megginson, W. L., and K. A. Weiss. "Venture Capitalist Certification in Initial Public Offerings." *Journal of Finance*, 46 (1991), 879–903.
Mikkelson, W. H., and M. M. Partch. "Valuation Effects of Security Offerings and the Issuance Process." *Journal of Financial Economics*, 15 (1986), 31–60.
Myers, S. C., and N. S. Majluf. "Corporate Financing and Investment Decisions When Firms Have Information that Investors Do Not Have." *Journal of Financial Economics*, 13 (1984), 187–221.

Petrin, A., and K. Train. "A Control Function Approach to Endogeneity in Consumer Choice Models." *Journal of Marketing research*, 47 (2010), 3–13.
Rhodes-Kropf, M., and D. T. Robinson. "The Market for Mergers and the Boundaries of the Firm." *Journal of Finance*, 63 (2008), 1169–1211.
Roth, A. E., and M. A. O. Sotomayor. *Two-Sided Matching: A Study in Game-Theoretic Modeling and Analysis*, Econometric Society Monographs. Cambridge: Cambridge University Press (1990).
Schroth, E. "Innovation, Differentiation, and the Choice of an Underwriter: Evidence from Equity-Linked Securities." *Review of Financial Studies*, 19 (2006), 1041–1080.
Schroth, E., and D. Szalay. "Cash Breeds Success: The Role of Financing Constraints in Patent Races." *Review of Finance*, 14 (2009), 73–118.
Schwert, M. "Bank Capital and Lending Relationships." *Journal of Finance*, 73 (2018), 787–830.
Sherman, A. E. "Underwriter Certification and the Effect of Shelf Registration on Due Diligence." *Financial Management*, 28 (1999), 5–19.
Sørensen, M. "How Smart is Smart Money? A Two-Sided Matching Model of Venture Capital." *Journal of Finance*, 62 (2007), 2725–2762.
Titman, S., and B. Trueman. "Information Quality and the Valuation of New Issues." *Journal of Accounting and Economics*, 8 (1986), 159–172.
Wooldridge, J. M. *Introductory Econometrics: A Modern Approach*. Toronto, Canada: Nelson Education (2015).