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Discounting Restricted Securities

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Abstract

We examine the costs of trading restrictions by exploiting an SEC rule change eliminating an approximately 80-day restriction period in private placements for small issuers. Using a difference-in-differences specification, we find that the restriction is binding, as dollar volume increases 19 percentage points vis-à-vis proceeds, and costly, as offering discounts fall by 8 percentage points. Discounts fall more for issuers with higher information asymmetry or longer restriction periods. We account for endogenous responses to the rule change. Overall, our findings suggest that trading restrictions are costly and have large effects on firms' cost of capital.

I. Introduction

Regulators, intermediaries, and firms regularly restrict trading. For example, the SEC prevents investors who buy unregistered shares in private investments in public equities (PIPEs) from selling them in public marketplaces until the shares have been registered with the SEC, a process that usually takes about 80 days.[1] Hedge funds, venture capital firms, and private equity firms impose multiyear lockups on limited partners' investments. Underwriters ask executives and other insiders not to sell shares for 180 days after IPOs. Shareholders award executives with restricted shares that do not vest until years later. And in bad times, regulatory trading halts often interrupt trading.

Although trading restrictions are commonplace, the literature on how these restrictions affect prices is mostly theoretical and observational. Longstaff (1995), (2018) provide upper bounds on how much compensation investors might require

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[1]See https://www.sec.gov/reportspubs/investor-publications/investorpubsrule144htm.html for SEC rules on selling restricted securities.

for such restrictions. Longstaff (1995) assumes investors charge issuers the price of a lookback swap option, which reflects their expected losses from not being able to sell at the optimal time during the restriction period. Longstaff (2018) achieves tighter bounds by recognizing that investors can overcome restricted stopping rules through the purchase of an exchange option, which makes the investors whole on an ex post basis.[2] These option-theoretic perspectives imply that discounts for trading restrictions increase with the duration of the restriction and the security's volatility. The predicted discounts are large, even for short restriction periods. For instance, according to Longstaff (1995), (2018)), investors in a PIPE offering should require a 7.5% (3.6%) discount if the issuer's stock volatility is 20% and the issuer needs about 70 days to register the new shares with the SEC. Other models likewise find that short restriction periods can have large economic effects (e.g., Longstaff (2001), (2009), Kahl, Liu, and Longstaff (2003), and Finnerty (2012)).

It is difficult to empirically corroborate these models' predictions because trading restrictions and firm characteristics jointly affect pricing, making it challenging to isolate the price effect of trading restrictions. For example, large offering discounts for PIPEs may primarily compensate investors for buying shares in poorly performing and opaque firms and not for the trading restriction (e.g., Wruck (1989), Silber (1991), Brophy, Ouimet, and Sialm (2009), and Iliev and Lowry (2020)).

We identify the effect of trading restrictions on prices by exploiting the extension of shelf offerings to small issuers. Effective from Jan. 28, 2008, the SEC extended shelf offerings to issuers with less than $75 million in public float (treated firms). In a shelf offering, issuers sell preregistered shares (shares they registered with the SEC up to 3 years before the offering date) to investors, who can immediately trade them. The rule change gave treated issuers the option to sell preregistered shares in a private offering instead of selling unregistered shares.[3] Thus, following the rule change, investors in treated firms' shelf-registered private offerings (registered directs) can immediately sell their shares in public markets after the offering and no longer need to wait around 80 days for the issuer to register the shares with the SEC.

We implement a difference-in-differences design comparing outcomes (such as offering discounts) for treated firms to outcomes for control firms (first difference) before and after the rule change (second difference). Our identifying assumption is that in the absence of the rule change, trends in these outcomes would have been similar for treated and control groups (parallel trends assumption). The identifying assumptions for consistency of the difference-in-differences estimator (i.e., parallel trends) are likely satisfied in our setting.[4] Using this design, we explore three related subjects.

First, we show that, after the rule change, offering discounts for treated firms in the private placement market fall by approximately 8 percentage points (a 66% drop

[2]The decision rule in Longstaff (1995) to sell the asset when its price reaches its maximum value between time 0 and time T is not a stopping rule, since the time at which the maximum is attained is not known for certain prior to time T. An example of a stopping rule is a limit order.

[3]See Section III for a detailed discussion of various placement methods.

[4]See Section V for a detailed discussion.

relative to the average pre-period discount of 12% for treated firms).[5,6] The estimated decline in discounts closely approximates the 7.5-percentage-point drop that the Longstaff (1995) model predicts for the median issuer in our sample (with stock volatility of 20% and a restriction period of 68 days). The magnitude is somewhat larger than the 3.6% discount predicted by Longstaff (2018). One reason our results might be closer to Longstaff (1995) is that, in our setting, there is uncertainty in the length of the lockup period (mean number of days from security sale to eventual registration is 82 days, and the standard deviation is 85 days). This uncertainty maps nicely to the uncertainty of when the security will achieve its maximum price, which is a central feature of Longstaff (1995) but not Longstaff (2018). Consistent with the trading restrictions being a binding constraint, we also find that, after the rule change, the dollar volume increases 19 percentage points vis-à-vis proceeds during the 10 days following the issue date.[7] Furthermore, we find no drop in offering discounts for small issuers that continue to conduct traditional PIPEs instead of using the new option to do shelf-registered private placements (registered directs).

Second, we examine *which* small issuers benefit more from the elimination of trading restrictions. Longstaff (1995), (2018) predict that the cost of trading restrictions increases with the length of the restriction period and the volatility of a firm's stock. Consistent with these mechanisms, we find that discounts fall 2.7 percentage points more for treated issuers whose investors had to wait a standard deviation longer before they could sell (a 23% increase relative to average pre-period discounts), and by 4.1 percentage points more for treated issuers with a standard deviation higher equity volatility (a 34% increase).

Third, we test whether trading restrictions matter more for firms with high information asymmetry. Longstaff (1995) acknowledges that information asymmetry may affect discounts but does not explicitly model it. Trading restrictions could exacerbate the effects of adverse selection on security prices by preventing investors from selling when information materializes during the restriction period. We therefore expect treated firms with high information asymmetry to benefit more from the removal of such restrictions. We test this hypothesis using common proxies of information asymmetry from the literature.[8] We also combine these

[5]We measure offering discounts as the post-announcement close price divided by the offer price minus 1, consistent with a number of other articles (Silber (1991), Hertzel and Smith (1993), Wruck and Wu (2009), and Gustafson and Iliev (2017)). Our results are robust to alternative measures, as discussed in Section V.A.

[6]Early studies report large variations in discounts (between 14% and 34%) for PIPE offerings (Johnson and Racette (1981), Wruck (1989), and Silber (1991)). Our average discount (12% for treated issuers) may be lower than this because the default restriction period has been shortened from 2 years at the time of those studies to 6 months today.

[7]Field and Hanka (2001) show that turnover increases by a similar amount (40%) following the expiration of lockup agreements in IPOs.

[8]We use the following firm characteristics as proxies for information asymmetry: firm size, firm age, asset tangibility, analyst coverage, bid–ask spread, return volatility, R&D intensity, and whether the issuer employs a placement agent to broker the deal. Booth and Smith II (1986) and Chemmanur and Fulghieri (1994) show that when intermediaries such as placement agents certify firms, the firms' information costs of raising capital are reduced. We find that issuers that employ a placement agent have lower profitability, more R&D intensity, and higher equity volatility, all of which are consistent with higher information asymmetry (see Panel C of Table IA5 in the Supplementary Material).

proxies by taking the first principal component. When this principal component is a standard deviation higher, we find that treated firms see a 5-percentage-points-greater reduction in discounts (a 42% increase). This effect of information asymmetry may explain why Longstaff (1995), (2018) does not fully explain the variation in observed discounts.

Although the SEC exogenously gave all firms with public floats of below $75 million the option to issue preregistered shares, the decision to use the option is endogenous. As such, one possible alternative explanation for the decline in offering discounts is that, on average, the composition of treated small firms conducting private placements became *less* risky following the rule change, relative to the composition of large firms (the control group). Again, a change in composition is likely because issuers *choose* whether to issue equity and how to place their offerings. For example, treated firms that did not issue equity before the rule change because of the high costs of selling unregistered shares might conduct private placements following the rule change. Furthermore, treated firms that conducted public offerings (seasoned equity offerings (SEOs)) prior to the rule change might switch to private placements (registered directs) afterward. If these firms tend to be less risky than PIPE issuers (Gomes and Phillips (2012)), then offering discounts will fall due to the decreased risk.

We use four approaches to address the possible influence of composition on our results. First, we limit the sample to issuers with public floats just around the $75-million threshold (e.g., floats between $55 and $95 million) and control for a variety of deal and firm characteristics. We find results consistent with our previous findings. Second, we examine issuers conducting private placements to see whether, after the rule change, they change in any characteristics that are strongly associated with discounts (e.g., equity volatility). We find no material differences that would explain our findings. Third, we compare offering discounts for treated firms conducting private placements (PIPEs and registered directs) to offering discounts for a new control group: treated firms conducting public offerings (traditional and shelf SEOs) before and after the rule change. This control group of treated issuers faces a similar macro environment, but does not benefit from the removal of trading restrictions, as SEOs always involve placing registered shares.[9] We observe a drop in discounts only for the firms conducting private placements. Fourth, we include firm fixed effects and restrict the sample to firms with a private placement offering before and after the rule change. We find that discounts for these treated firms are lower after the rule change, relative to the *same* firms before the rule change.[10]

This article makes several contributions to the literature. First, it contributes to the literature on illiquidity. Securities can be illiquid in several ways. The majority of previous research measures illiquidity using bid–ask spreads, trading volume, and transaction costs associated with trading a security. By contrast, our article

[9]Because SEOs place shares to a broader set of investors, the SEC always requires the issuer to register the offering before closing the deal. By contrast, in traditional PIPE offerings, issuers sell unregistered shares privately to a few accredited investors and then register the shares post issuance.

[10]We can perform within-firm analyses because firms conducting private placements (PIPEs and registered directs) frequently raise funding (Hertzel, Huson, and Parrino (2012)).

contributes to the largely theoretical and observational literature on securities that the investor cannot sell for a fixed period. Our results not only empirically support the popular Longstaff (1995) model, but also complement it by considering new factors such as information asymmetry. More generally, our sizable estimates corroborate predictions, by a number of models, that trading restrictions have large economic effects.[11] The empirical literature that is most relevant for our purposes compares the prices of restricted and unrestricted securities in PIPEs (offering discounts) and other settings. However, this literature cannot determine how much of the discounts results from trading restrictions versus other firm or security characteristics.[12] For example, Brenner, Eldor, and Hauser (2001) compare the prices of listed and nonlisted currency options and conclude that hedging costs explain the 21% discount they observe. When hedging is available, the discount for a restricted security should be no more than the hedging costs. By contrast, in our setting, hedging is not allowed.[13] When hedging is not allowed, the discount compensates investors for being unable to sell at the optimal time during the restriction period.

This article also extends the literature on the benefits of shelf offerings. Previous studies have documented positive market reactions and lower underwriting fees for issuers using shelf offerings, compared with issuers using nonshelf offerings (Bortolotti, Megginson, and Smart (2008), Kumar and Shome (2008), and Gao and Ritter (2010)).[14] Using the same rule change that we use, Gustafson and Iliev (2017) show that access to shelf offerings increases equity offerings and investment. One of their tests also shows an 8-percentage-point drop in offering discounts. However, because they pool private placements with public offerings, Gustafson and Iliev (2017) cannot attribute the decline in discounts to trading restrictions. By contrast, we decompose the effect by placement methods, since the rule change affects different methods in different ways. Specifically, private placements become more liquid for investors, whereas public offerings become faster for issuers.[15] By decomposing the effect, we provide evidence that discounts fall not because access to shelf offerings allows managers to better time public offerings for periods of lower discounts, but because access to shelf offerings

[11]Other theoretical work on trading restrictions includes Longstaff (2001), (2009) and Kahl et al. (2003), which suggest that trading restrictions matter for portfolio choice; Longstaff (2018), which provides an upper bound on discounts when investors face restrictions on stopping rules; and Hall and Murphy (2002), which proposes a certainty-equivalence framework for considering discounts for restricted stock compensation.

[12]See Wruck (1989), Amihud and Mendelson (1991), Silber (1991), Emory (1997), Chen and Xiong (2001), Strebulaev (2002), Ljungqvist and Richardson (2003), Chan, Menkveld, and Yang (2008), Brophy et al. (2009), and Iliev and Lowry (2020).

[13]Consistent with the SEC Rule 144 ban on hedging unregistered shares, in Table IA12 in the Supplementary Material, we find no change in shares sold short after the rule change. Furthermore, hedging with options is largely unavailable for small firms.

[14]The drop in discounts we document could be offset by unfavorable price pressure at the filing date of the shelf registration, or by higher underwriting fees. Tables IA12 and IA16 in the Supplementary Material report that filing date abnormal returns and underwriter fees do not change for small issuers after the rule change.

[15]Prior to the rule change, issuers conducting traditional SEOs had to wait about 60 days for the SEC to approve the registration statement prior to closing the transaction. Since the rule change, issuers selling preregistered shares no longer need to wait for SEC approval at the time of the offering.

eliminates trading restrictions in private placements.[16] Thus, we exploit the 2008 SEC rule change to answer a different question: Whether and why trading restrictions affect firms' cost of capital?

II. Rule Change

On May 23, 2007, the SEC proposed revising the requirements for shelf registration for small issuers.[17] Firms typically apply for shelf registration by completing Form S-3, the "short form" used by eligible companies to register securities offerings under the Securities Act of 1933. Firms filing a shelf registration statement do not usually intend to immediately sell the securities they register. Rather, they hope to avoid a lengthy registration process at the time of the actual offering. (Another option for issuers hoping to avoid registering at the time of the offering is to issue shares in private placements; however, these shares usually price at discounted values partly because of illiquidity.) Issuers can conduct multiple offerings based on the same registration statement for up to 3 years after the SEC validates Form S-3. The SEC expects that expanding shelf offerings will give "issuers a significant financing alternative to … private placements."

On Dec. 19, 2007, the SEC finalized the decision to extend shelf registration statements to issuers with less than $75 million in public float, effective from Jan. 28, 2008.[18] The public float is the value of shares held by non-affiliates (shareholders who are not board members, officers, or large shareholders with the power to influence company policy).[19] Before the rule change, small issuers could not use Form S-3 to issue equity. In the language of the SEC, small issuers were not "primary eligible," meaning they could not offer company securities for cash in a public marketplace using Form S-3. The rule change expands shelf offerings to small issuers that i) are listed on a national exchange (which excludes over-the-counter securities), ii) have not sold more than the equivalent of one-third of their public floats in primary offerings during the past 12-month period (including the current offering), and iii) are not shell companies. The SEC justified these limitations by stating that, relative to large issuers, small issuers were more likely to use shelf offerings (and rapid share issuance) to commit fraud because few investors actively trade the shares or scrutinize the financial statements of small firms. Even

[16]Consistent with practitioners' definitions (Dresner and Kim (2010), p. 195) and the literature (e.g., Billett, Floros, and Garfinkel (2019), Lim, Schwert, and Weisbach (2019)), we distinguish between shelf-registered private placements (registered directs) and shelf-registered public offerings (shelf SEOs). Both place registered shares, but the placement methods differ in important ways. For example, in registered directs (and PIPEs), the issuer files an 8-K or an amended prospectus after the offering completes. By contrast, in traditional and shelf SEOs (and traditional SEOs), the issuer announces the offering before the offering is completed.

[17]The last time the SEC amended the minimum size requirement was on Oct. 29, 1992, when it lowered the public float requirement from $150 to $75 million. See SEC Release No. 33-6964.

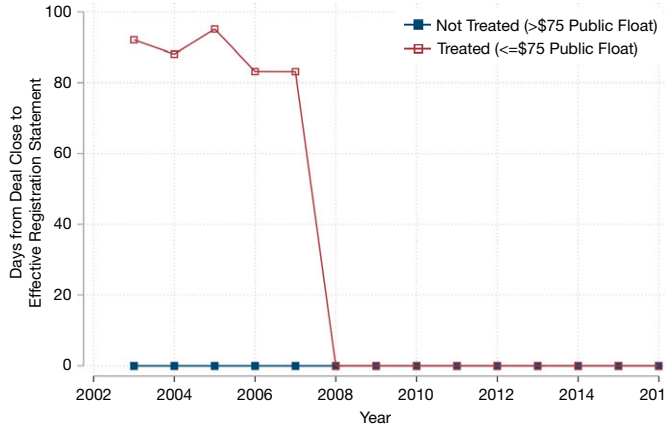
[18]See SEC release no. 33-8878.

[19]The SEC uses the measure as a gage for the degree of efficiency with which the market absorbs information and reflects the information into prices. The SEC requires that an issuer calculate its public float using the last price sold or the average bid–ask price in the 60-day window before it sells shares to investors.

FIGURE 1

Days Between Issuance to Registration over Time

Figure 1 shows the effect of an SEC rule change granting small issuers, with public floats of less than $75 million, access to shelf registration. It shows the average number of days from closing a private placement deal to when the shares were registered and investors could freely trade their shares. This figure is based on empirical data about the delays in the registration process for our sample of treated firms. Note that this figure comprises all treated firms, irrespective of whether we have data on all the covariates that we hold fixed in our regression analysis. Treated issuers conducting private placements are firms with less than $75 million in public float that conducted a PIPE before the rule change and switched to registered directs following the rule change. Over-the-counter (OTC) issuers cannot use shelf registration statements, and these firms are never in our sample.



today, the SEC continues to limit Form S-3 eligibility to issuers listed on national exchanges because exchanges have listing requirements that might mitigate fraud.

Figure 1 illustrates the effect of the rule change on the waiting time, for investors in private placement offerings, between purchasing shares and being allowed to sell into public markets. Before the rule change, when treated issuers sold unregistered shares in PIPE offerings, it took them about 80 days after the offering closed to register the shares with the SEC. The rule change eliminated the restriction period for investors, as issuers responding to the rule change could now sell preregistered shares.

III. Defining Placement Methods

In this article, we frequently refer to several placement methods: PIPEs, registered directs, SEOs, and shelf SEOs. In this section, we briefly define these placement methods, as a grasp of their differences is necessary if one is to understand our empirical design, findings, and contribution to the literature.

PIPE offerings are equity investments in a public company that are only marketed to a limited group of accredited investors. At the time of the offering, investors purchase unregistered shares, which they cannot sell for at least 1 year unless the company registers the shares earlier with the SEC.[20] Once the shares are

[20]Note that SEC Rule 144 shortened the default restriction period to 6 months from 1 year effective from Feb. 15, 2008. This coinciding rule change only affects discounts for traditional PIPE offerings in the post period. As we condition on issuers that switch to shelf-registered private placements (registered

registered, investors can resell them in a secondary offering.[21] The primary advantage of PIPEs is that firms can raise cash quickly. The main disadvantage is that investors demand large discounts for the illiquidity of the shares while the registration of the shares is pending.

A registered direct, like a PIPE, is an equity investment in a public company that is marketed to a limited number of accredited investors. Unlike in a PIPE, the shares the company is selling are preregistered, so investors can immediately resell them. Before the rule change, issuers with public floats of below $75 million could not preregister a primary offering. Issuers who wanted to raise cash quickly but did not meet the float requirement had to issue unregistered shares and suffer the resulting illiquidity discount.

An SEO is a traditional "follow-on" offering that is underwritten by an investment bank (or syndicate of banks) and is widely marketed to public investors. In an SEO, the issuer registers the securities with the SEC in a primary offering and sells them to the public only after the SEC declares the registration statement effective. After an issuer registers the securities, it usually takes about 60 days for the SEC to declare the registration statement effective. The main advantage of an SEO over a PIPE is that issuers can widely market their offering to investors, avoid the illiquidity discount, and generate more demand for their shares. The main disadvantage is that SEOs are vulnerable to changing market conditions during the registration process. PIPE offerings, in contrast, can close quickly.

A shelf SEO differs from a traditional SEO in that the issuer need not wait for the SEC to approve its registration statement at the time of the offering. The main difference between a shelf SEO and a registered direct is how the offering is distributed. Registered directs are privately marketed by the company or placement agent (who markets the offering on a best-efforts basis) to a few investors. Some shelf SEOs (Confidentially Marketed Public Offerings) involve an underwriter who confidentially markets the offering (on a firm commitment basis) to its network of institutional investors and then briefly (often from the market close to the following morning) initiates a public marketing phase during which it markets to other institutional and retail investors. Other shelf SEOs directly sell primary shares ("at the market" offerings) broadly to public investors through broker-dealers.

We consider PIPEs and registered directs to be private offerings because they are marketed to a limited number of investors. We consider SEOs and shelf SEOs to be public offerings because they are often underwritten and are more widely distributed than PIPEs. Our classification of private placements and public offerings is consistent with practitioners' definitions (Dresner and Kim (2010)) and other

directs), this rule change does not explain our main results. Interestingly, Table 4 suggests that changing the default restriction period had little consequence for discounts in PIPEs in the post period. This finding is consistent with issuers registering offerings, on average, in around 80 days, which is well within the default restriction period.

[21] Our article focuses on primary offerings rather than secondary offerings. A primary offering is the sale of new securities directly issued by a company in exchange for funding from outside investors, whereas a secondary offering is the resale of previously issued company securities by investors in the company to other investors. A company raises capital from a primary offering; the company's existing owners raise cash from a secondary offering.

academic articles (Billett et al. (2019), Lim et al. (2019)). Gomes and Phillips (2012) and Gustafson and Iliev (2017) classify all sales of registered shares as public offerings.[22]

IV. Data

A. Sample Construction and Variable Definitions

We construct our sample in four steps. (Table IA1 in the Supplementary Material outlines the details of our sample construction process.) First, because an issuer's public float determines the treatment, we gather the public floats for all firms in the CRSP–Compustat universe from 2002 to 2016.[23] This measure is not readily available, so we extract it, using a Python program we wrote, from the first page of all 10-K filings in the SEC's EDGAR database. The SEC defines public float as the share of voting and nonvoting common equity held by non-affiliates of the issuer. Affiliates of the issuer include board members, officers, and large shareholders with the power to influence company policy. We start our sample period in 2002 because it is the first year the SEC required firms to report public floats in their 10-K filings.

Second, we obtain private placement data from Placement Tracker. We merge equity issuance data with the sample of firms in the CRSP–Compustat universe for which we have public float data. At this stage, we drop firms whose securities are not tracked by CRSP because their shares are not traded on one of the four main exchanges (NYSE, Nasdaq, AMEX, and ARCA). To calculate issuance discounts, we further require that firms have closing-day prices on the day they announce the offering. We compute the discount as the post-announcement price divided by the offer price minus 1 (Silber (1991), Hertzel and Smith (1993), Wruck and Wu (2009), and Gustafson and Iliev (2017)). Our results are robust to using the pre-announcement price or the filing date price in place of the post-announcement price (see Tables IA14 and IA15 in the Supplementary Material).

Third, because Placement Tracker's data on the time between the PIPE offering and the registration of the shares (the restriction period) are sparse, we complete data on the length of the restriction period by examining the issuer's filings following an offering. We only examine the filings in the subsequent year because after 1 year the participating investors are allowed to sell into the public markets. To identify whether the issuer registered the shares within the following year, we first keep all filings related to registering an offering (e.g., S-1, S-3, and 424B3). Next, we do a keyword search for "selling" because the word is found

[22] Although Gustafson and Iliev (2017) find a similar drop in discounts under their definition, that article does not document the specific mechanism through which trading restrictions affect the cost of capital. Our definition allows us to reveal the mechanism. We find that the overall drop in discounts is attributable to the private placements, where liquidity improved, and not to the SEOs, where managers obtained the ability to better time the market.

[23] A $75-million cutoff was also used for the enforcement of the Sarbanes–Oxley (SOX) Act of 2004. Firms under the $75-million public float were given a delay in compliance with the SOX 404 rules (the most onerous part of the rule). The SEC has used the same cutoff in various other rules, including Say-on-Pay and the current CEO Pay Ratio Rule. Our results are robust to shortening the sample to exclude these other changes related to the $75-million threshold.

TABLE 1
Description of the Main Variables

Table 1 describes the variables used in this study.

Firm Characteristics
TREATED: Dummy variable that is equal to 1 if the firm has a public float of less than $75 million.
PUBLIC_FLOAT: Part of equity not held by management or large shareholders, as reported on the first page of the company's 10-K filing.
MARKET_EQUITY: Market value of equity measured at most recent fiscal year end.
MARKET_TO_BOOK: Market value of equity divided by book value of equity.
PREVIOUS_YEAR_RETURN: Stock return for the past 12 months.
PROFITABILITY: Ratio of operating income before depreciation to lagged total assets.
TANGIBILITY: Ratio of net PP&E to total assets.
CASH_TO_ASSETS: Ratio of cash to total assets less cash.
INSTITUTIONAL_OWNERSHIP: Percentage of common stock held by institutions as reported on Form 13F.
FIRM_AGE: Years since IPO.
MARKET_LEVERAGE: Ratio of total debt to market value of equity.
EQUITY_VOLATILITY: Annualized standard deviation of daily stock returns.
AMIHUD: Monthly average of daily stock returns scaled by daily dollar volume for 12 months before the transaction.
RDD: R&D expenditures scaled by lagged total assets.
DEFAULT_PROBABILITY: We follow Gustafson and Iliev (2017) and use the naive Merton's measure (Bharath and Shumway (2008)) as a proxy for default probability.
ANALYST_COVERAGE: Indicator variable that is equal to 1 if the firm has analyst coverage.
BID_ASK_SPREAD: Average bid–ask spread from $t - 15$ to $t - 126$, where t is the day of equity transaction.

Equity Issuance Characteristics
ISSUANCE_DISCOUNT: Post-announcement closing stock price divided by the offer price minus 1.
EQUITY_PROCEEDS: Gross proceeds from the sale of equity.
PLACEMENT_AGENT: Dummy variable that is equal to 1 if private investments in public equity (PIPE) are facilitated by a placement agent.
MANDATORY_REGISTRATION: Dummy variable that is equal to 1 if PIPE contract contains mandatory registration clause.
WARRANT_COVERAGE: Dummy variable that is equal to 1 if PIPE contract contains warrants.
DAYS_LOCKUP: Length of the registration process for PIPE firms estimated prior to the rule change.
ISSUE_FREQUENCY: Number of equity and debt financing activities during the past 12 months.

in phrases that commonly appear in registration documents following a PIPE offering (e.g., "selling shareholders" or "selling stockholders").[24] We keep all documents with at least five mentions of the word "selling." Then, we compute the days from the issuance to the related filings of interest. Finally, we calculate the average number of days from the offering to the filings, a proxy for when the securities were registered.[25]

Fourth, for our main tests, we exclude treated firms with public floats of below $75 million that continue to conduct traditional PIPE offerings following treatment and thus do not switch to shelf offerings. We separately examine what happens to the discounts of these noncompliers in Table 4.

Table 1 describes the variables used in this study. In addition to the aforementioned variables, we use Compustat and CRSP to construct several firm characteristics that previous research has shown affect offering discounts (e.g., equity volatility and information asymmetry), as well as other firm characteristics (e.g., profitability, cash-to-assets, leverage, and past returns). We present the correlations of the main variables in Table IA3 in the Supplementary Material.

[24]For example, in this post-PIPE filing by Aikido Inc., there are 43 mentions of the word selling, suggesting that the filing registers shares for a secondary offering by selling shareholders. However, after the rule change, there is only one mention of the word selling in this post registered-direct filing, consistent with a shelf offering.

[25]In Table IA13 in the Supplementary Material, we report that our results are robust to using the median and max number of days.

Regarding the construction of our control group, recall that the treated firms conducting private placements (PIPEs before the rule change and registered directs afterward) all have public floats of below $75 million. Thus, one of our control groups is the full sample of nontreated firms conducting shelf-registered private placements (registered directs). Additionally, we use a limited sample that we believe is more comparable to the treated firms. For the limited sample, we follow Gustafson and Iliev (2017) and define control firms as firms with public floats between $80 and $150 million. We exclude firms with public floats between $70 and $80 million because these issuers are more likely to change treatment status before the rule change. (Our results are not sensitive to including these firms.)

In a few robustness tests, we use firms that raise capital using SEOs. SEO data come from the SDC New Issues database. We follow Lowry, Michaely, and Volkova (2017) to filter the public offering sample from SDC and keep only common stock offerings. Table IA2 in the Supplementary Material details how we construct the sample of SEOs.[26]

B. Descriptive Statistics for Treated and Control Firms

In Table 2, we present summary statistics for firms issuing equity via a private placement from 2002 to 2016. In Panel A, we split the summary statistics by treated and control groups using our limited sample (i.e., public floats of $<$ $150 million). Panel B reports the split using the full sample of control firms. Treated firms make up roughly 62% of the 1,774 issuances in our full sample. In Panel A, the average offering size for treated firms is $10 million, which represents about 28% of their public floats (75% of the maximum they can raise in any 12-month period) and 13% of market equity. Around 71% of offerings by treated issuers involve a placement agent who markets the offering on a best-efforts basis.

Limiting the control group to firms that are closer in public float to treated firms reduces differences in the covariates of our treated and control groups. There are no longer any differences in some variables, including firm age and equity volatility. Even where differences persist, the normalized difference is markedly lower. However, as Panel A of Table 2 reports, there are still significant differences in stock liquidity (measured following Amihud and Mendelson (1991)) and cash-to-assets. In general, level differences in covariates are not an issue for difference-in-differences designs. In Section V.B, we show that the parallel trends assumption is likely satisfied in our setting. In Section V.C, we analyze whether there are changes in the composition of treated and control firms before and after the rule change.

[26]If the SDC classifies an offering as a public offering but Placement Tracker considers it a private placement (PIPE or Registered Direct), then we reclassify the case to match our definition of private and public offerings in Section III. Specifically, if the offering is underwritten, we classify it as a public offering. If it is marketed by a placement agent on a best-efforts basis and announced after the fact, we call it a private placement. Our results are not affected if we classify as public offerings, or omit, all offerings about which Placement Tracker and SDC disagree.

TABLE 2

Summary Statistics for Treated and Control Issuers Conducting Private Placements

Table 2 reports differences in mean firm and equity issuance characteristics, along with *t*-statistics of the differences. Panels A and B present differences by treatment status for the limited sample and the full sample of private placements. In the full sample, roughly 62% of private placements are made by treated issuers. Treated issuers have a public float of below $75 million. The limited sample includes firms in a narrow band around the threshold (treated firms with $10–$70 million and control firms with $80–$150 million in public float). All variables are defined in Table 1.

	MEAN_NOT_TREATED	MEAN_TREATED	STD_DEV_NOT_TREATED	STD_DEV_TREATED	NORMALIZED_DIFFERENCE	TEST_STATISTIC
Panel A. Differences by Treatment Status for Limited Sample of Private Placements						
ISSUANCE_DISCOUNT	5.61	10.79	11.33	13.42	0.41	5.13***
PUBLIC_FLOAT	93.22	36.05	33.26	16.56	−2.44	−25.38***
MARKET_EQUITY	149.67	77.99	98.37	75.65	−0.85	−9.57***
MARKET_TO_BOOK	5.36	4.28	4.90	4.38	−0.24	−1.97**
PREVIOUS_YEAR_RETURN	23.81	51.56	111.73	128.05	0.23	3.01***
PROFITABILITY	−0.18	−0.12	0.18	0.17	0.30	2.18**
TANGIBILITY	0.16	0.20	0.17	0.22	0.17	2.13**
CASH_TO_ASSETS	0.52	0.34	0.30	0.29	−0.59	−6.90***
INSTITUTIONAL_OWNERSHIP	0.23	0.15	0.18	0.16	−0.48	−5.18***
FIRM_AGE	8.91	8.44	6.17	6.78	−0.07	−0.85
MARKET_LEVERAGE	17.45	18.77	29.24	27.03	0.05	0.57
EQUITY_VOLATILITY	0.26	0.27	0.10	0.11	0.10	1.11
AMIHUD	0.20	1.56	0.38	2.95	0.56	9.68***
RDD	0.13	0.09	0.17	0.15	−0.31	−2.85***
EQUITY_PROCEEDS	15.63	10.13	13.46	12.34	−0.43	−5.57***
PLACEMENT_AGENT	0.77	0.71	0.42	0.46	−0.13	−1.76*
WARRANT_COVERAGE	0.37	0.63	0.48	0.48	0.54	6.91***
NO_INVESTORS	32.22	15.92	15.49	12.88	−1.18	−11.85***
DAYS_LOCKUP	0.00	72.62	0.00	60.07	1.48	22.59***
Panel B. Differences by Treatment Status for Full Sample of Private Placements						
ISSUANCE_DISCOUNT	4.79	10.62	10.72	13.84	0.46	7.36***
PUBLIC_FLOAT	280.00	34.87	787.72	19.84	−0.47	−6.72***
MARKET_EQUITY	388.33	75.59	1,010.83	76.08	−0.47	−5.93***
MARKET_TO_BOOK	4.80	4.06	4.44	4.17	−0.17	−2.09**
PREVIOUS_YEAR_RETURN	12.28	54.09	92.89	131.66	0.36	6.16***
PROFITABILITY	−0.15	−0.12	0.17	0.17	0.17	1.83*
TANGIBILITY	0.20	0.20	0.22	0.22	0.01	0.13
CASH_TO_ASSETS	0.47	0.34	0.31	0.29	−0.44	−6.01***
INSTITUTIONAL_OWNERSHIP	0.29	0.15	0.22	0.15	−0.78	−10.30***
FIRM_AGE	9.56	8.71	7.10	6.85	−0.12	−1.67*
MARKET_LEVERAGE	21.30	18.83	31.39	26.37	−0.09	−1.17
EQUITY_VOLATILITY	0.24	0.28	0.11	0.12	0.35	4.67***
AMIHUD	0.13	1.98	0.29	3.60	0.68	11.62***
RDD	0.11	0.08	0.16	0.14	−0.21	−2.71***
EQUITY_PROCEEDS	26.05	9.78	46.03	11.92	−0.51	−6.82***
PLACEMENT_AGENT	0.72	0.70	0.45	0.46	−0.04	−0.65
WARRANT_COVERAGE	0.34	0.64	0.48	0.48	0.63	9.75***
NO_INVESTORS	46.20	15.34	34.29	12.87	−1.25	−15.87***
DAYS_LOCKUP	0.00	71.69	0.00	60.37	1.58	22.87***

V. Effect of the Rule Change on Offering Discounts

Before the SEC extended shelf offerings to small issuers conducting private placements, these issuers sold unregistered shares to accredited investors in PIPE offerings. The participating investors could not sell the acquired stock until the issuer completed the registration process with the SEC. After the rule change, small issuers gained the ability to privately place preregistered shares off the shelf. Participating investors could immediately resell these shares in registered direct offerings (also known as shelf PIPEs). In this section, we estimate the effect of this change on offering discounts for treated issuers that complied with the rule change.

A. Empirical Specification

We use difference-in-differences regressions to compare the issuance discounts for our treated firms relative to our control firms (first difference) before and after the rule change (second difference). Our identifying assumption is that in the absence of the rule change, trends in issuance discounts would have been similar for the treatment and control groups (parallel trends assumption). Specifically, we employ the following difference-in-differences regression:

$$\text{DISCOUNT}_{it} = \beta_1 \text{TREATED}_{it} \times \text{POST} + \beta_2 \text{TREATED}_{it} + \beta_3 \text{POST}_t + \sum_{v=1}^{N} \gamma_v (\text{X})_{ivt} + \lambda_i + \eta_t + \varepsilon_{it}. \quad (1)$$

A unit of observation is an equity offering from 2002 to 2016 for which we have the requisite data on firm characteristics. The dependent variable, DISCOUNT_{it}, is the post-announcement close price divided by the offer price minus 1.[27] TREATED_{it} is an indicator variable that is equal to 1 if firm i has a public float of less than $75 million in year t. POST_t is an indicator variable that is equal to 1 if the issuance date is after Jan. 2008.[28] X_{ivt} are various firm and offering characteristics that have been shown to affect issue discounts in private placement offerings (Wruck (1989), Corwin (2003), and Iliev and Lowry (2020)). λ_i is a firm fixed effect, and η_t is a year–quarter indicator that controls for quarterly changes in macroeconomic conditions that are unrelated to the rule change, such as those during the financial crisis of 2008 and 2009.[29]

B. Overall Effect

Table 3 presents the results of equation (1). We tabulate results using five specifications. Column 1 presents a specification without control variables and fixed effects. In columns 2–5, we control for several variables that explain issuance discounts (e.g., issuer's equity volatility), and we include various fixed effects. Column 5 is our preferred specification, as it includes issuer fixed effects and uses a more comparable control group: firms with public floats between $80 and $150 million.

Table 3 reports that offering discounts for treated firms conducting private placements were higher before the rule change. Following the rule change, discounts decline by 6–13 percentage points. This drop is meaningful relative to an average discount of 12% for treated issuers before the rule change (see Panel

[27] A measure of offering discount using a post-announcement close relative to the offer price has been used in a number of articles (Silber (1991), Hertzel and Smith (1993), Wruck and Wu (2009), and Gustafson and Iliev (2017)). Other articles compare the offer price to a pre-announcement close price (Wruck (1989), Corwin (2003), and Iliev and Lowry (2020)). Our results are robust to using the pre-announcement close price (see Table IA14 in the Supplementary Material).

[28] In Table IA7 in the Supplementary Material, we report that our main results are robust to the multicollinearity induced by including TREATED_{it} and POST_t and their interaction by omitting the individual terms.

[29] In Table IA8 in the Supplementary Material, we drop the years 2008 and 2009 and find similar results, which is not surprising since issuance activity dropped dramatically during the crisis.

TABLE 3

Effect of the SEC Rule Change on Private Placement Offering Discounts

Table 3 reports difference-in-differences results. It shows the effect of the rule change on offering discounts for private placements. The unit of observation is a completed equity offering. The dependent variable, ISSUANCE_DISCOUNT, is the post-announcement closing stock price divided by the offer price minus 1 times 100. Specifications 1–3 include the full sample of offerings, whereas specifications 4 and 5 only include offerings by firms whose public floats at the time of the offering fall within a narrow band around the $75-million threshold (treated firms with $10–$70 million and control firms with $80–$150 million in public float). TREATED is an indicator variable that is equal to 1 if the firm has a public float of less than $75 million. POST is an indicator variable that is equal to 1 if the issuance date is after Jan. 2008. Columns 3 and 5 have smaller samples relative to columns 2 and 4, respectively, because of the firm fixed effects, which require that an issuer conduct at least two private placements during our sample period. We cluster standard errors at the firm level and report *t*-statistics in the parentheses below the point estimates. All variables are defined in Table 1.

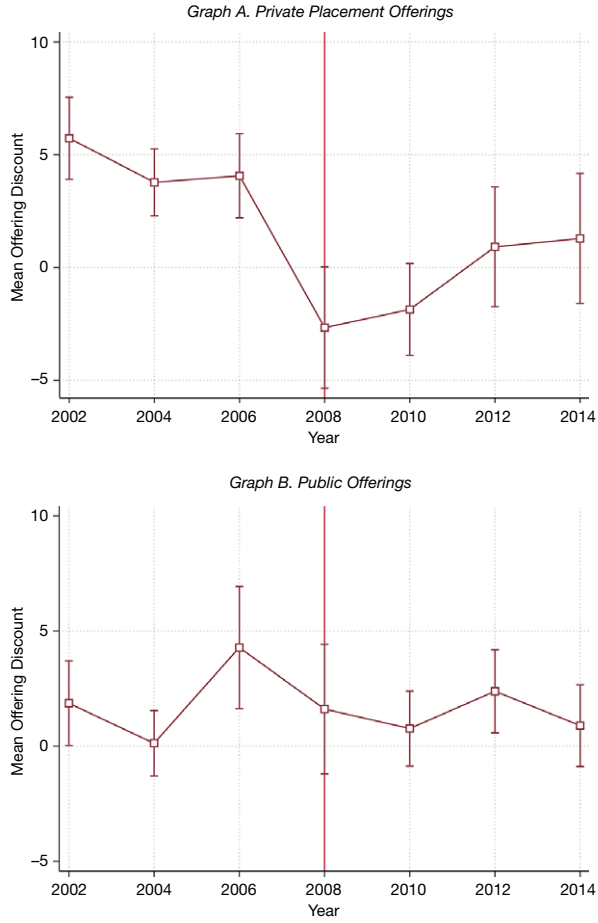
	Dependent Variable: ISSUANCE_DISCOUNT				
	1	2	3	4	5
TREATED × POST	−5.853***	−7.413***	−9.890***	−7.632***	−13.157***
	(−4.46)	(−5.23)	(−4.23)	(−4.26)	(−4.36)
TREATED	5.289***	5.260***	4.695***	3.710***	4.907**
	(6.50)	(4.95)	(2.83)	(3.01)	(2.38)
POST	−4.024***				
	(−4.40)				
FIRM_AGE		−0.666*	−1.005	−0.527	1.132
		(−1.68)	(−0.30)	(−1.19)	(0.38)
CASH_TO_ASSETS		−1.584***	−1.126	−1.824***	−0.799
		(−2.91)	(−0.90)	(−2.87)	(−0.58)
MARKET_LEVERAGE		−0.513	0.644	−0.714*	1.098
		(−1.41)	(1.06)	(−1.76)	(1.31)
ln(EQUITY_VOLATILITY)		0.558	0.218	0.470	−0.349
		(1.36)	(0.24)	(1.00)	(−0.30)
ln(MARKET_EQUITY)		−1.597	−4.038*	−4.080**	−2.462
		(−1.27)	(−1.65)	(−2.49)	(−0.81)
ln(PUBLIC_FLOAT)		2.443**	−0.437	−0.431	−2.333
		(2.26)	(−0.28)	(−0.25)	(−0.94)
ln(MARKET_TO_BOOK)		1.485***	1.639	2.457***	1.891
		(2.97)	(1.45)	(4.03)	(1.35)
PREVIOUS_YEAR_RETURN		0.545	−0.311	0.698*	−1.059
		(1.44)	(−0.54)	(1.65)	(−1.38)
PROFITABILITY		−0.633	−0.273	−0.309	−0.342
		(−1.08)	(−0.29)	(−0.45)	(−0.29)
ln(PROCEEDS)		−2.045**	−1.898	−2.186**	−2.792*
		(−2.33)	(−1.64)	(−2.09)	(−1.96)
ln(AMIHUD)		0.053	0.361	−0.562	0.611
		(0.13)	(0.47)	(−1.21)	(0.74)
OWNERSHIP		−0.806	0.887	−0.503	0.818
		(−1.23)	(0.56)	(−0.56)	(0.36)
RDD		−0.465	−0.387	−0.578	−0.383
		(−1.06)	(−0.62)	(−1.12)	(−0.53)
PLACEMENT_AGENT		2.666***	2.535**	3.170***	2.924*
		(3.29)	(2.08)	(3.21)	(1.76)
WARRANT_COVERAGE		−4.502***	−4.541***	−4.597***	−4.749***
		(−5.85)	(−3.58)	(−5.44)	(−3.05)
Sample	Full	Full	Full	Limited	Limited
Year–quarter FE	No	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes	No
Firm FE	No	No	Yes	No	Yes
Adj. R^2	0.09	0.18	0.27	0.21	0.25
No. of unique issuers	874	874	374	656	285
No. of obs.	1,774	1,774	1,274	1,280	909

A of Table IA5 in the Supplementary Material) and is highly significant. Results in column 5 suggest that using the more comparable control group and fixed effects increases the magnitude of the treatment effect. Note that the standard deviation of discounts before the rule change for the treated issuers in column 5 is

FIGURE 2

The Rule Change and Offering Discounts

Figure 2 shows the trends in the difference in discount rates between treated firms (public floats of ≤ $70 million) and control firms (public floats of ≥$80 and ≤ $150 million) for private placement offerings (Graph A) and public offerings (Graph B). More specifically, we compute the average offering discount for treated firms over 2-year periods (e.g., 2002 and 2003) and then subtract the average offering discount for control firms. We plot 90% confidence intervals. The vertical line shows the year (2008) the SEC extended shelf offerings to firms with public floats of ≤ $75 million (treated firms).



15% (the maximum is 50%). Thus, the magnitude in column 5 represents a 1-standard-deviation drop in discounts relative to the distribution of pre-period discounts.

Graph A of Figure 2 shows the difference in offering discounts between treated private placement issuers (issuers conducting PIPE offerings prior to the rule change and registered directs afterward) and control firms (firms conducting registered directs the entire period) from 2002 to 2016. The trends in discounts for treated and control issuers appear similar both before and after the rule change. A gap between the two groups' respective discount rates before 2008 vanishes following the rule change, providing visual evidence that access to shelf registration

lowered offering discounts for treated issuers that sold unregistered shares before the rule change.

In Graph B of Figure 2, we plot the change in offering discounts for treated issuers conducting public offerings (traditional SEOs prior to the rule change and shelf SEOs afterward), relative to the control group of nontreated issuers conducting public offerings (shelf SEOs). For treated issuers conducting public offerings, we do not see a change in offering discounts. This suggests that discounts fell for the treated issuers conducting private placements because their investors were no longer subject to regulatory trading restrictions.

Table 4 reports no robust drop in discounts for treated issuers that do not switch to shelf-registered private placements (registered directs) and instead continue to conduct traditional PIPEs following the rule change. The absence of a decline for this sample of noncompliers suggests that, for the treated firms that complied with the rule change, the mechanism for the drop in discounts is their use of the option to do a shelf offering.

Overall, because the treated firms that endogenously *comply* with the rule change are the firms for which marketability restrictions were likely to be most costly, our main treatment effects likely represent an upper bound (in the spirit of Longstaff (1995), (2018)) on the value of marketability restrictions. Our findings are likely an upper bound because the treated firms that face the highest offering discounts, since they cannot offer tradable registered securities, will optimally choose to switch to registered directs. Treated firms that face discounts because of other reasons (such as governance or informational asymmetry) might not optimally choose this route.

C. Change in Composition of Firms

An alternative explanation for our results is that the composition of treated issuers conducting PIPE offerings prior to the rule change differs from that of treated issuers conducting registered direct offerings after the rule change. More specifically, the treated firms could become safer. In Figure 3, we show how such a change in composition could explain our estimated drop in discounts. The rule change might cause issuers who had previously preferred public offerings (traditional SEOs) to switch to registered direct offerings. Discounts for traditional SEOs are lower (~3%) than for PIPEs (~12%). If offering discounts reflect differences in the risk of the issuers more than differences in the liquidity of the issued shares, then a mechanical drop in discounts would be observed in this scenario.

Another reason to expect that the composition of issuers changed is the Gustafson and Iliev (2017) finding that the introduction of shelf offerings increased the number of treated firms that raise equity. Treated firms that could afford to forgo equity offerings before the rule change but entered the market afterward might be less risky than other treated firms. If this is the case, the presence of these firms would reduce the average risk of the pool of treated firms conducting registered direct offerings.

We use two approaches to address concerns about the composition of treated issuers conducting private placements. First, we examine whether, after the rule change, firms' characteristics change in ways that could affect offering discounts

TABLE 4

Effect of the SEC Rule Change on Private Placement Offering Discounts (Noncompliers)

Table 4 reports difference-in-differences results for the sample of treated firms that do not comply with the new regulation and continue to issue shares privately via private investments in public equity offerings following the rule change. The unit of observation is a completed equity offering. The dependent variable, ISSUANCE_DISCOUNT, is the post-announcement closing stock price divided by the offer price minus 1 times 100. Specifications 1–3 include the full sample of offerings, whereas specifications 4 and 5 only include offerings by firms whose public floats at the time of the offering fall within a narrow band around the $75-million threshold (treated firms with $10–$70 million and control firms with $80–$150 million in public float). TREATED is an indicator variable that is equal to 1 if the firm has a public float of less than $75 million. POST is an indicator variable that is equal to 1 if the issuance date is after Jan. 2008. Columns 3 and 5 have smaller samples relative to columns 2 and 4, respectively, because of the firm fixed effects, which require that an issuer conduct at least two private placements during our sample period. We cluster standard errors at the firm level and report *t*-statistics in the parentheses below the point estimates. All variables are defined in Table 1.

	Dependent Variable: ISSUANCE_DISCOUNT				
	1	2	3	4	5
TREATED × POST	−2.232*	−1.622	1.070	−2.609	3.781
	(−1.80)	(−1.19)	(0.47)	(−1.48)	(1.36)
TREATED	5.011***	3.926***	4.167***	2.925***	2.537
	(6.51)	(4.23)	(3.21)	(2.75)	(1.54)
POST	−2.770***				
	(−3.26)				
FIRM_AGE		0.024	3.525***	0.049	3.593*
		(0.07)	(2.89)	(0.12)	(1.70)
CASH_TO_ASSETS		−1.760***	−0.713	−2.384***	−1.261
		(−3.59)	(−0.77)	(−3.97)	(−1.05)
MARKET_LEVERAGE		−0.816**	0.291	−1.006**	0.379
		(−2.47)	(0.53)	(−2.56)	(0.46)
ln(EQUITY_VOLATILITY)		0.505	0.482	0.854	2.360*
		(1.06)	(0.55)	(1.43)	(1.91)
ln(MARKET_EQUITY)		−1.184	−0.749	−1.922*	1.397
		(−1.57)	(−0.60)	(−1.94)	(0.84)
ln(PUBLIC_FLOAT)		0.427	−0.928	−1.562	−2.845*
		(0.67)	(−0.86)	(−1.58)	(−1.78)
ln(MARKET_TO_BOOK)		1.907***	0.024	2.743***	−0.477
		(4.18)	(0.02)	(4.77)	(−0.40)
PREVIOUS_YEAR_RETURN		0.599	−0.089	0.736*	−0.822
		(1.64)	(−0.15)	(1.76)	(−1.00)
PROFITABILITY		−0.883	−1.212	−1.066	−1.844*
		(−1.54)	(−1.44)	(−1.61)	(−1.83)
ln(PROCEEDS)		0.063	1.105*	−0.164	0.985
		(0.12)	(1.66)	(−0.26)	(1.20)
ln(AMIHUD)		0.545	2.058***	0.309	0.904
		(1.08)	(2.59)	(0.51)	(0.82)
OWNERSHIP		0.312	0.525	0.298	0.047
		(1.22)	(1.22)	(0.69)	(0.08)
RDD		−0.841*	−0.481	−1.239***	−0.532
		(−1.89)	(−0.90)	(−2.61)	(−0.98)
PLACEMENT_AGENT		3.153***	2.707**	3.115***	3.951***
		(4.38)	(2.51)	(3.74)	(3.11)
WARRANT_COVERAGE		−2.465***	−1.836*	−2.787***	−2.769**
		(−3.29)	(−1.79)	(−3.38)	(−2.10)
Sample	Full	Full	Full	Limited	Limited
Year_quarter FE	No	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes	No
Firm FE	No	No	Yes	No	Yes
Adj. R^2	0.06	0.14	0.26	0.17	0.31
No. of obs.	1,779	1,779	1,290	1,228	849

(e.g., age, volatility, market-to-book, profitability, institutional ownership, and R&D intensity). Figure 4 shows the issuer characteristics that are most strongly correlated with offering discounts. The most important are equity volatility, past year's return, and market-to-book. Ownership, cash-to-assets, and market leverage

FIGURE 3

Firm Composition and Offering Discounts

Figure 3 depicts a hypothetical change in the composition of issuers conducting private placements, which could explain why discounts fell for treated firms following the rule change. Specifically, firms conducting public offerings (traditional SEOs) are typically less risky than PIPE issuers (Gomes and Phillips (2012)). If treated firms conducting public offerings switch to private placements (registered directs) following the rule change, this change in composition (and not the ability to sell registered shares) could explain the lower discounts for treated firms conducting private placements. In this simple example, an equal proportion of issuers conducting PIPEs and traditional SEOs prior to the rule change switch to registered direct offerings following the rule change. The resulting change in composition would automatically lead to lower discounts for treated firms.

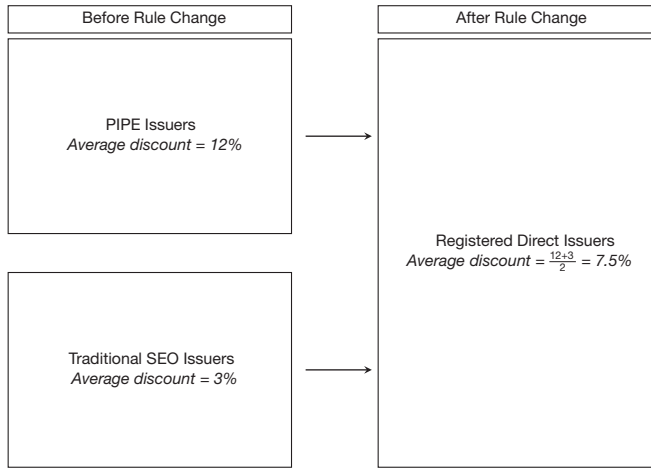
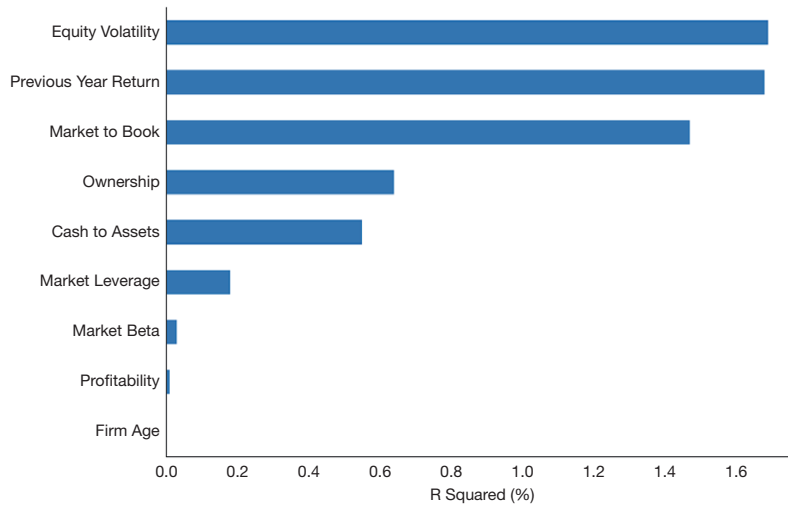


FIGURE 4

Firm Characteristics and Offering Discounts

Figure 4 plots the importance of various issuer characteristics for PIPE offering discounts. The *x*-axis shows the R^2 from a regression of issuance discounts on each characteristic on the *y*-axis.



matter less. There is no meaningful relationship between offering discounts and market beta, profitability, and firm age.

Next, just as in equation (1), we examine whether, after the rule change, these characteristics change for treated firms relative to control firms. Table 5 reports that

TABLE 5

Characteristics of Private Placement Issuers Before and After the Rule Change

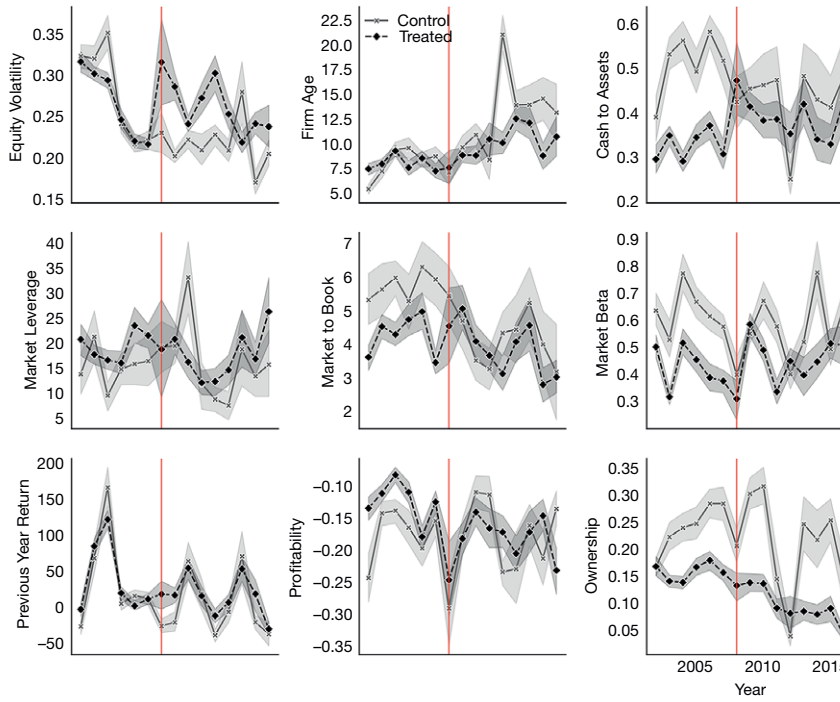
Table 5 examines the characteristics of treated issuers conducting private placements (private investments in public equities prior to the rule change and registered directs afterward) before and after the rule change, relative to the control group of larger issuers conducting registered directs. To explain our results, any change in characteristics would have to indicate that the treated private placement issuers became safer. To help address this concern about the composition of issuers, we make each control variable in Table 3 the dependent variable. Panel A includes industry and year–quarter fixed effects. Panel B includes firm and year–quarter fixed effects. TREATED is an indicator variable that is equal to 1 if the firm has a public float of less than $75 million. POST is an indicator variable that is equal to 1 if the issuance date is after Jan. 2008. We cluster standard errors at the firm level and report *t*-statistics in the parentheses below the point estimates. All variables are defined in Table 1.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Panel A. Within Industry Analysts														
TREATED × POST	−0.159	0.308**	−0.193	0.488***	0.053	−0.201***	0.219	0.250**	−0.183	0.059	−0.163	−0.081	0.198	0.292***
	(−1.10)	(2.39)	(−1.30)	(3.54)	(0.85)	(−6.06)	(1.33)	(2.11)	(−0.85)	(0.78)	(−1.35)	(−0.95)	(1.03)	(4.64)
TREATED	−0.151*	−0.318***	0.081	−0.110	−0.445***	−0.468***	−0.198	−0.049	0.069	−0.339***	0.959***	−0.237***	−0.171	−0.125***
	(−1.78)	(−3.61)	(0.86)	(−1.25)	(−11.78)	(−18.40)	(−1.50)	(−0.55)	(0.34)	(−6.72)	(14.26)	(−3.96)	(−1.00)	(−3.16)
SPECIFICATION	AGE	CASH_TO_ ASSETS	MARKET_ LEVERAGE	EQUITY_ VOLATILITY	MARKET_ EQUITY	PUBLIC_ FLOAT	MARKET_TO_ BOOK	PAST_12M_ RETURN	PROFITABILITY	PROCEEDS	AMIHUD	INSTITUTIONAL_ OWNERSHIP	R&D	PLACEMENT_ AGENT
Year–quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Adj. R^2	0.06	0.43	0.08	0.20	0.23	0.46	0.22	0.28	0.21	0.17	0.24	0.13	0.32	0.07
No. of unique issuers	732	732	719	732	732	732	719	706	696	732	700	732	732	732
No. of obs.	1,435	1,435	1,405	1,435	1,434	1,435	1,404	1,375	1,374	1,435	1,366	1,435	1,435	1,435
Panel B. Within-Firm Analysis														
TREATED × POST	−0.008	0.051	0.113	−0.030	0.074	−0.321***	0.093	0.462***	−0.099	0.188*	0.214	0.101	0.028	0.157
	(−0.10)	(0.47)	(0.60)	(−0.20)	(0.95)	(−5.45)	(0.64)	(2.71)	(−0.56)	(1.94)	(1.24)	(1.53)	(0.16)	(1.64)
TREATED	−0.046	−0.048	−0.066	0.007	−0.197***	−0.287***	−0.050	−0.046	0.104	−0.171**	0.285**	−0.126***	−0.042	−0.025
	(−1.20)	(−0.62)	(−0.59)	(0.10)	(−3.25)	(−5.99)	(−0.43)	(−0.31)	(0.58)	(−2.51)	(2.28)	(−3.04)	(−0.27)	(−0.39)
SPECIFICATION	AGE	CASH_TO_ ASSETS	MARKET_ LEVERAGE	EQUITY_ VOLATILITY	MARKET_ EQUITY	PUBLIC_ FLOAT	MARKET_TO_ BOOK	PAST_12M_ RETURN	PROFITABILITY	PROCEEDS	AMIHUD	INSTITUTIONAL_ OWNERSHIP	R&D	PLACEMENT_ AGENT
Year–quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.92	0.82	0.61	0.72	0.60	0.67	0.71	0.41	0.62	0.49	0.61	0.70	0.64	0.29
No. of unique issuers	317	317	310	317	316	317	309	303	309	317	301	317	317	317
No. of obs.	1,020	1,020	996	1,020	1,018	1,020	994	972	987	1,020	967	1,020	1,020	1,020

FIGURE 5

Changes in Firm Characteristics Following Rule Change

Figure 5 plots various issuer characteristics that in previous research have been shown to affect offering discounts, for treated and control firms over time, before and after the rule change. The goal of this figure is to visually test whether, after the rule change, the characteristics that matter most for offering discounts change for treated firms in a direction consistent with the drop in discounts we document in Figure 2. The years along the *x*-axis are denoted in the bottom-right figure examining "ownership."



most characteristics of treated and control firms conducting private placements do not change following the rule change. If anything, the evidence suggests that private placement issuers become riskier after the rule change, as they become smaller and have higher equity volatility. Furthermore, note that in all our main regressions, we control for these firm characteristics to further reduce the possibility that a change in composition is driving our findings.

Figure 5 shows visual evidence that the characteristics of treated and control issuers conducting private placements are not changing in a manner that would explain our findings.

Second, in Table IA10 in the Supplementary Material, we use a limited sample of issuers that conducted private placements in both the pre and post periods and show effects that are similar to those for the full sample. In this limited sample, discounts for treated firms are still lower after the rule change, relative to the *same* firms before the rule change.

Another alternative explanation for the drop in discounts is that the characteristics of the control group changed differentially relative to the treated group,

such that the treated group became safer in relation to the control group. We address this concern in two ways.

First, in Table IA11 in the Supplementary Material, we tighten the range of public floats for treated and control firms to increase the firms' comparability. Specifically, we limit the sample of treated firms to those with public floats between \$55 and \$75 million and control firms to those with floats between \$75 and \$95 million. The effect of the treatment is similar in magnitude to our previous result and remains statistically significant.

Second, we repeat our difference-in-differences analysis using treated issuers conducting public offerings (SEOs) as the control group. Small issuers conducting SEOs with public floats below the \$75-million threshold face a macro environment that is similar to the one for treated firms conducting private placements. Like the treated firms conducting private placements, the small issuers conducting SEOs also gained the ability to sell shares off the shelf. Importantly, shifting from traditional to shelf SEOs did not change the ability of participating investors to sell because investors in SEOs always purchase registered stock. Instead, the rule change enabled the SEO issuers to complete their offerings more quickly, as they no longer needed to wait for the SEC to declare their registration statements effective.

In Table 6, we find a drop in discounts for treated private placement issuers (those conducting PIPEs prior to the rule change and registered directs afterward) relative to discounts for treated public offering issuers (those conducting traditional SEOs prior to the rule change and shelf SEOs afterward). Moreover, in Table IA9 in the Supplementary Material, we find no evidence that treated firms conducting public offerings had higher offering discounts before the rule change. Nor is there consistent evidence that discounts fell for these firms after the rule change. (The sign on the difference-in-differences estimator flips between positive and negative.) A drop in offering discounts occurs only for the treated issuers conducting private placements. This suggests that the drop in discounts resulted from the SEC's lifting of trading restrictions.

VI. Effect of Trading Restrictions

In this section, we first test whether the trading restrictions before the rule change were actually binding. Then, to shed light on why trading restrictions affected discounts, we study which treated issuers benefited more.

A. Were Trading Restrictions Binding?

If the trading restrictions were binding, then relaxing them should result in a larger increase in dollar volume vis-à-vis proceeds for treated firms than for i) control firms conducting private placements with public floats between \$75 and \$150 million and ii) treated issuers conducting public offerings (SEOs). (We do not expect to see an increase in dollar volume for treated firms conducting public offerings because these firms always sold registered shares.) Table 7 presents the results of the tests. Column 1 reports that in the 10 days following the offering, the dollar volume of proceeds increases 19 percentage points for treated issuers

TABLE 6

Effect of the SEC Rule Change on Discounts for Treated Firms Conducting Private Placements Relative to Treated Firms Conducting Public Offerings

Table 6 estimates the effect of the rule change on offering discounts for treated issuers conducting private placements, this time using treated issuers conducting public offerings as the control group. Treated firms have public floats of less than $75 million. The dependent variable, ISSUANCE_DISCOUNT, is the post-announcement closing stock price divided by the offer price minus 1 times 100. Private Placement is an indicator variable that is equal to 1 if the issuer conducted a private placement (private investments in public equity or registered direct), and 0 otherwise. POST is an indicator variable that is equal to 1 if the issuance date is after Jan. 2008. We cluster standard errors at the firm level and report *t*-statistics in the parentheses below the point estimates. All variables are defined in Table 1.

	Dependent Variable: ISSUANCE_DISCOUNT		
	1	2	3
PRIVATE_PLACEMENT × POST	−10.256***	−7.504**	−16.698**
	(−4.33)	(−2.25)	(−2.21)
PRIVATE_PLACEMENT	7.911***	6.108*	14.727*
	(3.67)	(1.89)	(1.92)
POST	1.132		
	(0.53)		
FIRM_AGE		−1.253**	−1.020
		(−2.30)	(−0.27)
CASH_TO_ASSETS		−2.391***	−2.746
		(−3.23)	(−1.48)
MARKET_LEVERAGE		−0.285	0.103
		(−0.58)	(0.14)
ln(EQUITY_VOLATILITY)		0.001	0.094
		(0.00)	(0.08)
ln(MARKET_EQUITY)		−5.138***	−5.066**
		(−3.32)	(−1.98)
ln(PUBLIC_FLOAT)		1.928	3.200*
		(1.30)	(1.75)
ln(MARKET_TO_BOOK)		2.454***	2.693**
		(3.62)	(1.98)
PREVIOUS_YEAR_RETURN		0.684	−0.508
		(1.54)	(−0.75)
PROFITABILITY		0.219	1.085
		(0.35)	(1.03)
ln(PROCEEDS)		0.717	−0.232
		(0.74)	(−0.18)
ln(AMIHUD)		−0.134	0.686
		(−0.28)	(0.83)
OWNERSHIP		1.305	1.424
		(1.28)	(0.89)
RDD		−0.501	−0.465
		(−1.25)	(−0.46)
Sample	Limited	Limited	Limited
Year–quarter FE	No	Yes	Yes
Industry FE	No	Yes	No
Firm FE	No	No	Yes
No. of unique issuers	367	367	367
Adj. R^2	0.09	0.17	0.26
No. of obs.	1,112	1,112	1,112

conducting private placements, relative to firms conducting private placements with public floats between $75 and $150 million. Column 2 reports that, as expected, dollar volume does not change for treated firms conducting public offerings when they gain access to shelf registration. The sample in column 3 pools private placement and public offerings and shows that dollar volume increases (by 15 percentage points) only for treated firms conducting private

TABLE 7

Were Trading Restrictions Binding?

Table 7 compares trading around the announcement of private placement offerings for treated firms conducting private placements before and after the rule change, relative to the changes in trading for treated firms conducting public offerings and for control firms. The dependent variable is the average percentage of offering proceeds traded in the 10 days following the equity issue date. Only firms with at least 5 days of data following the equity issue window are included in regressions. All regressions include only firms in a narrow band around the public-float threshold (treated firms with $10–$70 million and control firms with $80–$150 million in public float). PRIVATE_PLACEMENT is an indicator variable that is equal to 1 if the issuer conducted a private placement (private investments in public equity (PIPE) or registered direct) offering, and 0 otherwise. POST is an indicator variable that is equal to 1 if the issuance date is after Jan. 2008. We cluster standard errors at the firm level and report *t*-statistics in the parentheses below the point estimates. All variables are defined in Table 1.

	Dependent Variable: $\frac{1}{10}\sum_{d=0}^{10}\left(\frac{\text{PRICE}\times\text{VOLUME}}{\text{OFFERING\_PROCEEDS}}\right)\times 100$		
	1	2	3
TREATED × POST	18.676***	1.524	−0.173
	(2.69)	(0.38)	(−0.04)
TREATED × POST × PRIVATE_PLACEMENT			15.134**
			(2.21)
TREATED × PRIVATE_PLACEMENT			−8.049
			(−1.43)
POST × PRIVATE_PLACEMENT			−10.354*
			(−1.82)
PRIVATE_PLACEMENT			5.756
			(1.14)
TREATED	−8.057	0.767	1.955
	(−1.64)	(0.19)	(0.53)
FIRM_AGE	0.151	0.866	0.038
	(0.10)	(0.61)	(0.03)
CASH_TO_ASSETS	1.488	2.007	2.089
	(0.66)	(0.95)	(1.24)
MARKET_LEVERAGE	0.629	−2.605**	−0.193
	(0.50)	(−2.19)	(−0.21)
ln(EQUITY_VOLATILITY)	6.984***	5.373***	6.624***
	(3.64)	(2.81)	(4.34)
ln(MARKET_EQUITY)	2.007	0.706	1.820
	(0.59)	(0.21)	(0.78)
ln(PUBLIC_FLOAT)	3.549*	1.634	2.919**
	(1.91)	(0.71)	(2.01)
ln(MARKET_TO_BOOK)	−3.902*	1.368	−1.788
	(−1.73)	(0.58)	(−1.08)
PREVIOUS_YEAR_RETURN	5.529***	4.132**	4.919***
	(2.60)	(2.34)	(3.46)
PROFITABILITY	0.877	2.448	0.910
	(0.34)	(1.14)	(0.50)
ln(PROCEEDS)	−9.219***	−4.342	−7.316***
	(−3.24)	(−1.21)	(−3.38)
ln(AMIHUD)	−5.611***	−3.256	−5.111***
	(−3.02)	(−1.48)	(−3.60)
OWNERSHIP	−0.669	1.337	0.471
	(−0.37)	(1.47)	(0.53)
RDD	2.309	0.538	0.853
	(1.20)	(0.32)	(0.62)
Sample	PIPE	SEO	Combined
Year–month FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Adj. R^2	0.09	0.12	0.10
No. of obs.	1,115	688	1,838

placements. This magnitude is consistent with the Field and Hanka (2001) finding that turnover increases by 40% following the expiration of lockup agreements in IPOs. Altogether, these results suggest that trading restrictions were indeed binding.

B. The Length of Trading Restrictions and Volatility

The results in Section V.B show that discounts fell by about 66% for treated firms conducting private placements after these firms gained access to shelf registration. This substantial drop in discounts raises the question of why investors require such large discounts for purchasing unregistered shares. Longstaff (1995) argues that unregistered shares impede an investor's ability to sell the security at the optimal time. Thus, Longstaff (1995) posits that investors would charge the issuer, at most, the value of a lookback swap option, which allows the investor to sell the stock for its maximum price during the restriction period. A more recent article (Longstaff (2018)) provides a tighter upper bound by recognizing that an exchange option would help investors overcome a restriction period's limits on available stopping rules.

For the firms in our sample, Panel A (B) of Table 8 reports the discounts for trading restrictions that the Longstaff (1995), (2018) model predicts using the closed-form formulas. The calculations are a function of a firm's equity volatility and the length of the restriction period. Our main effect shows a drop of 6–13 percentage points in offering discounts for private placements, which is strikingly similar to the predictions in Longstaff (1995). Our point estimates are somewhat larger than the predictions in Longstaff (2018). Both models do not consider the effects of information asymmetry, which may be particularly high for smaller firms (the treated firms in our setting).

Figure 6a (b) shows an almost linear relationship between Longstaff's (1995), (2018) predicted offering discounts and the discounts for PIPE issuances by treated

TABLE 8

Expected Discount for Trading Restrictions

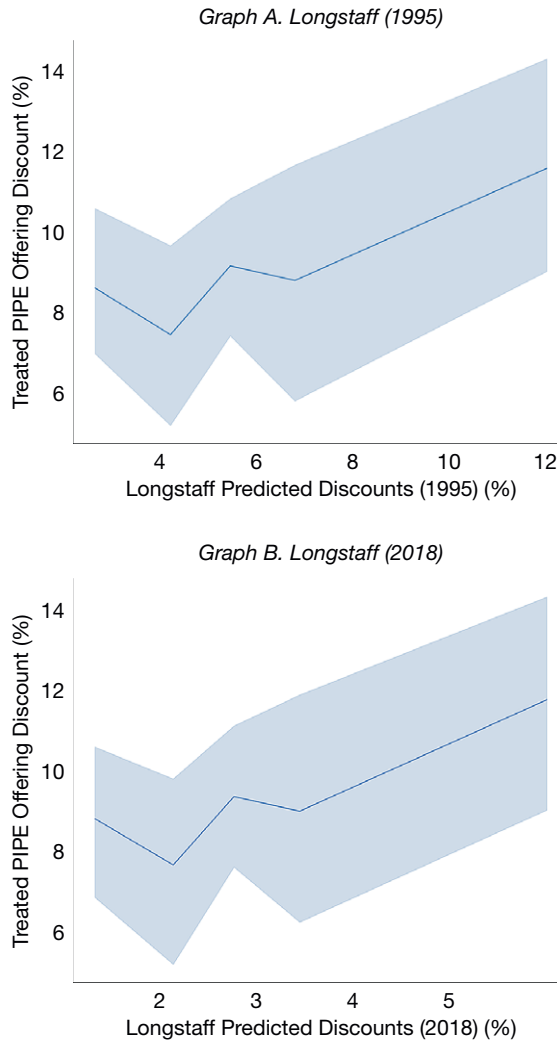
Panel A of Table 8 reports predicted discounts (upper bound) for trading restrictions for firms in our sample using the Longstaff (1995) model. Panel B reports predicted discounts (lower bound) for trading restrictions for firms in our sample using the Longstaff (2018) model. Replications of Longstaff (1995), (2018) models are presented in Table IA6 in the Supplementary Material. Note that Longstaff (2018) estimates lower bounds for illiquid asset values. To be consistent with Panel A and our overall message in this article, in Panel B, we present results as 100 minus lower bound. Our sample period is from 2003 to 2016. We estimate the volatility of issuers, σ, by averaging squared daily returns for the period of 30–400 days prior to the closing date of the private investments in public equity (PIPE) offering. The specific values of sigma used in the table correspond to quintiles of our sample of issuers' annualized volatility. RESTRICTION_PERIOD is the number of days from the date the PIPE closes to the date the registration statement is declared effective, enabling shareholders to sell their shares. Similarly, the specific values of sigma used in the table correspond to the first to fifth quintiles of the restriction period over our sample period.

	RESTRICTION_PERIOD				
	$\sigma = 0.136$	$\sigma = 0.182$	$\sigma = 0.209$	$\sigma = 0.237$	$\sigma = 0.293$
Panel A. Our Sample (Longstaff's (1995) Model)					
18_DAYS	2.450	3.289	3.784	4.299	5.336
40_DAYS	3.669	4.933	5.681	6.461	8.034
68_DAYS	4.804	6.469	7.456	8.487	10.573
108_DAYS	6.084	8.205	9.466	10.786	13.462
270_DAYS	9.750	13.210	15.28	17.458	21.910
Panel B. Our Sample (Longstaff's (2018) Model)					
18_DAYS	1.213	1.623	1.864	2.114	2.613
40_DAYS	1.808	2.420	2.779	3.151	3.895
68_DAYS	2.358	3.155	3.623	4.107	5.077
108_DAYS	2.971	3.975	4.564	5.175	6.395
270_DAYS	4.696	6.281	7.211	8.174	10.096

FIGURE 6

Model Predicted and Actual Change in Offering Discount

Figure 6 plots the average discounts for treated firms conducting PIPEs against the predicted discounts for trading restrictions from the Longstaff (1995) model (Graph A) and the Longstaff (2018) model (Graph B). For each treated firm, we use the equity volatility and length of the restriction period prior to the rule change to predict the discounts for trading restrictions. We plot the predicted discounts for lack of marketability on the actual drop in discounts following the rule change.



firms prior to the rule change. If the models perfectly predicted offering discounts, we would expect a 45-degree line.

Next, we test whether the decline in offering discounts is sensitive to the two primary parameters from the Longstaff (1995), (2018) models (the total volatility of the issuer's stock and the number of days from closing to registration (restriction period)). In the models, investors' potential loss from trading restrictions increases with the issuers' volatility and the restriction period's length. Thus, we expect the

treatment effect to be larger for treated issuers with high equity volatility and longer restriction periods.

Consistent with this reasoning, columns 1 and 2 of Table 9 report that discounts fall more for issuers with higher volatility and longer restriction periods. The estimate on the length of the restriction period is negative and marginally statistically significant. A 1-standard-deviation increase in the restriction period increases discounts by 2.7 percentage points (a 22% increase relative to average pre-period discounts for treated firms of 12%). The estimate on volatility is also negative and marginally significant. A 1-standard-deviation increase in a firm's volatility increases discounts by 4.1 percentage points (a 34% increase).

C. Trading Restrictions and Information Asymmetry

Next, we test whether the drop in discounts is larger for treated firms with high information asymmetry. Trading restrictions could be more costly when information asymmetry is high because investors may perceive higher adverse selection risk or be unable to exploit their information advantages. Although Longstaff (1995) acknowledges that investors should require a higher discount for firms with high information asymmetry, he abstracts away from it in the model, leaving the magnitude of the relationship between information asymmetry and discounts for trading restrictions uncertain.

Our test uses a variety of common proxies for information asymmetry: R&D intensity, equity volatility, log assets, tangibility, age, analyst coverage, and bid–ask spreads. Table IA4 in the Supplementary Material defines these measures and identifies the studies that use them. We also use an information-asymmetry measure that is specific to private placements: whether an issuer employs a placement agent to broker the offering. Booth and Smith II (1986) and Chemmanur and Fulghieri (1994) show that, by certifying firms, intermediaries such as placement agents reduce the information costs of raising capital. Without access to a placement agent's network of investors, high-information-asymmetry firms may be less likely than low-information-asymmetry firms to raise the capital they need. Consequently, the high-information-asymmetry firms may be more likely to employ placement agents. Panel C of Table IA5 in the Supplementary Material reports that firms using placement agents have lower profitability, more R&D intensity, and higher equity volatility, all of which are consistent with higher information asymmetry. Additionally, we find that firms that use a placement agent have higher offering discounts. Thus, firms using placement agents "reveal" their higher information asymmetry relative to other firms.[30]

Columns 2–10 of Table 9 present the results of the effects of information asymmetry on the treatment effect (the effect of the rule change on offering discounts). The discount effect is significantly and meaningfully greater for treated firms with high R&D expenses and for treated firms employing a placement agent. Discounts fall by 3 percentage points more for treated firms with a standard-deviation higher R&D intensity than for other treated firms. Treated issuers that

[30]Placement agents do not underwrite PIPEs. The placement agents typically earn a retainer fee and a fee on the amount raised.

TABLE 9

When are Trading Restrictions More Costly?

Table 9 examines how the effect of the SEC rule change on discounts for treated issuers conducting private placement offerings varies with issuer and offering characteristics. The unit of observation is a completed private placement offering (private investments in public equity (PIPE) or registered direct). All regressions only include firms in a narrow band around the public-float threshold (treated firms with $10–$70 million and control firms with $80–$150 million in public float). The dependent variable, ISSUANCE_DISCOUNT, is the post-announcement closing stock price divided by the offer price minus 1 times 100. TREATED is an indicator variable that is equal to 1 if the firm has a public float of less than $75 million. RESTRICTION_PERIOD is the length of the registration process for issuers conducting PIPE offerings. EQUITY_VOLATILITY is the median monthly total volatility of an issuer's stock. R&D is the past 12 months of R&D expenditures scaled by assets. ln(ASSETS) is log assets. ASSET_TANGIBILITY is the ratio of property, plant, and equipment to total assets. AGE is the time since IPO. ANALYST_COVERAGE is an indicator variable that is equal to 1 if the firm has analyst coverage. BID_ASK_SPREAD is the average bid–ask spread from $t-15$ to $t-126$. PLACEMENT_AGENT is a dummy variable that is equal to 1 for firms that use placement agents for fundraising. IA_PRINCIPAL_COMPONENT is the first principal component of the proxies for issuer information asymmetry presented in Table 10 and in columns 2–9. POST is an indicator variable that is equal to 1 if the issuance date is after Jan. 2008. Controls include firm age, cash-to-assets, market leverage, equity volatility, market equity, public float, market-to-book, previous-year return, profitability, dummy for whether a placement agent brokers the private placement, warrant coverage, proceeds, Amihud illiquidity, ownership, and R&D expenses. All continuous variables are winsorized and standardized for ease of interpretation. We cluster standard errors at the firm level and report *t*-statistics in the parentheses below the point estimates. All variables are defined in Table 1.

	Dependent Variable: ISSUANCE_DISCOUNT									
MODEL	RESTRICTION_ PERIOD	EQUITY_ VOLATILITY	R&D	ln(ASSETS)	ASSET_ TANGIBILITY	AGE	ANALYST_ COVERAGE	BID_ASK_ SPREAD	PLACEMENT_ AGENT	IA_PRINCIPAL_ COMPONENT
	1	2	3	4	5	6	7	8	9	10
TREATED × POST × INTERACTION	−2.738*	−4.094*	−2.740*	2.978	−2.302	0.785	6.954*	−0.307	−10.122***	−5.098**
	(−1.69)	(−1.69)	(−1.88)	(0.86)	(−0.84)	(0.39)	(1.91)	(−0.11)	(−2.60)	(−2.01)
TREATED × POST	−3.730	−5.644***	−6.218***	−4.809	−8.416***	−7.596***	−12.235***	−5.863***	0.214	−5.677***
	(−1.41)	(−2.85)	(−3.03)	(−1.49)	(−4.00)	(−4.25)	(−3.85)	(−2.72)	(0.07)	(−3.01)
TREATED × INTERACTION	1.928*	1.922**	0.089	−1.754	2.376**	−1.955	−0.261	1.550	6.089***	2.181
	(1.83)	(2.03)	(0.09)	(−0.79)	(1.97)	(−1.43)	(−0.15)	(0.97)	(3.09)	(1.39)
POST × INTERACTION	0.076	1.862	1.475	1.532	2.083	−0.941	−1.393	−3.033	−0.236	−0.195
	(0.07)	(0.87)	(1.24)	(0.53)	(0.81)	(−0.55)	(−0.44)	(−1.17)	(−0.08)	(−0.08)
INTERACTION	−0.152	−0.469	−0.573	−3.274	−1.591	1.416	−2.364	1.375	0.540	2.944*
	(−0.28)	(−0.59)	(−0.68)	(−0.70)	(−1.47)	(0.76)	(−1.58)	(0.94)	(0.32)	(1.85)
TREATED	0.039	2.386*	3.798***	2.282	4.144***	3.328***	3.575**	3.462**	−0.676	3.514***
	(0.02)	(1.75)	(2.97)	(1.21)	(3.28)	(2.58)	(1.98)	(2.56)	(−0.35)	(2.77)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited
Year–quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No
Adj. R^2	0.21	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.23
No. of unique issuers	650	650	650	650	650	650	650	650	650	650
No. of obs.	1,269	1,269	1,269	1,269	1,269	1,269	1,269	1,269	1,269	1,269

TABLE 10

Information Asymmetry Measures

Table 10 presents univariate correlations among several measures of information asymmetry. EQUITY_VOLATILITY is the median monthly total volatility of an issuer's stock. R&D is the past 12 months of R&D expenditures scaled by assets. ASSETS is log assets. TANGIBILITY is the ratio of property, plant, and equipment to total assets. AGE is the time since IPO. ANALYST_COVERAGE is an indicator variable that is equal to 1 if the firm has analyst coverage. BID_ASK_SPREAD is the average bid–ask spread from $t-15$ to $t-126$. PLACEMENT_AGENT is a dummy variable that is equal to 1 for firms that use placement agents for fundraising. IA_PRINCIPAL_COMPONENT is the first principal component of the proxies for issuer information asymmetry presented in Table 10 and in columns 2–9. All variables are defined in Table 1. All values are winsorized to mitigate the influence of outliers. ***, **, and * indicate that the correlation has statistical significance at the 1%, 5%, and 10% levels, respectively.

	R&D	PLACEMENT_ AGENT	EQUITY VOLATILITY	ln (ASSETS)	TANGIBILITY	AGE	ANALYST_ COVERAGE	BID_ASK_ SPREAD
R&D								
PLACEMENT_AGENT	0.11***							
EQUITY_VOLATILITY	0.09***	0.13***						
ln(ASSETS)	−0.4***	−0.13***	−0.38***					
TANGIBILITY	−0.16***	−0.04*	−0.02	0.18***				
AGE	−0.03	−0.04	−0.11***	0.08***	0.04*			
ANALYST_COVERAGE	0.04*	0.05*	−0.19***	0.27***	−0.05**	−0.04*		
BID_ASK_SPREAD	0.05**	−0.04*	0.42***	−0.41***	−0.02	−0.05**	−0.33***	
IA_PRINCIPAL_ COMPONENT	0.40***	0.18***	0.69***	−0.81***	−0.19***	−0.16***	−0.49***	0.71***

use a placement agent see a 10-percentage-point larger decline in discounts (an 83% increase relative to average pre-period discounts). The discount effect is significantly weaker for treated firms with higher analyst coverage (a sign of lower information asymmetry).

In column 10 of Table 9, we find similar results when we use the first principal component of the different measures of information asymmetry in place of individual proxies. Treated firms with high information asymmetry experience a 5-percentage-point greater drop in discounts (a 42% increase). Table 10 reports that these measures of information asymmetry are highly correlated.

These results imply that models of discounts for trading restrictions (Longstaff (1995), (2018)) may underestimate discounts for small firms, as information asymmetry is likely to be higher for these firms and investors may therefore require greater discounts. When courts and practitioners value illiquid ownership transfers for gift taxes and other purposes, they would benefit from using models that incorporate the information asymmetry of the issuer.

VII. Conclusion

In this article, we find that most of the offering discounts for PIPEs can be explained by trading restrictions. An increase in trading following the SEC rule change suggests that trading restrictions were binding. The effect of trading restrictions on offering discounts appears greater for issuers with higher volatility, issuers facing more extended restriction periods (registration periods), and issuers with more information asymmetry. The fact that trading restrictions have a stronger effect on such firms has implications for the widely used models of trading restrictions (Longstaff (1995), (2018)), which abstract away from information asymmetry.

Our findings inform policymakers about the costs of imposing trading restrictions on investors and have implications for the more than 10,000 over-the-counter

firms that still lack access to shelf offerings. Extrapolating our article's findings to these issuers, we predict large decreases in the cost of capital for these firms if they gain access to shelf offerings, especially since they tend to have high levels of information asymmetry. This point is especially salient during the COVID-19 pandemic as policymakers expand capital access to small firms, including a recent extension of shelf offerings to business development companies.

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S0022109022000862.

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