Why Don't Issuers Get Upset about IPO Underpricing: Evidence from the Loan Market*

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Abstract

This paper links IPO underpricing with the benefit of going public from the loan market. Specifically, we show that IPO underpricing is associated with significantly lower borrowing costs of the issuer after going public. The average reduction in the post-IPO loan interest spread for firms with IPO underpricing is about 165% larger than that for firms without underpricing. This larger reduction in borrowing costs amounts to about US $1.2 billion per year for our sample firms, which is substantial relative to the total amount of money left on the table ($22.1 billion). The results are not driven by important factors, such as price revision, that documented in the literature affect IPO underpricing, and are robust to employing exogenous variations of underpricing, indicating that underpricing plays a unique role in reducing post-IPO borrowing costs. Our findings are consistent with the marketing value of underpricing, and highlight an important trade-off faced by IPO firms: although underpricing incurs a direct loss by leaving money on the table, it brings indirect benefits from other markets.

Keywords: *IPO, Underpricing, Loans, Borrowing costs, Marketing, Signaling*

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1 Introduction

The literature on IPO underpricing is vast. However, it is still under debate why such huge money has been left on the table and why issuers do not get upset about doing so. Extant literature in general resorts to the IPO market, or the follow-up stock market, for an explanation. For example, both theoretical and empirical researches focus on studying three main players in the IPO market: the IPO firm, the underwriter, and stock investors (see e.g., reviews by Ritter and Welch, 2002; Ljungqvist, 2007; Lowry, Michaely, and Volkova, 2017). In this paper, we instead look out of the stock market and, as the first, link IPO underpricing to the benefit of going public from the loan market.

In brief, we find that firms with larger IPO underpricing experience larger reduction in post-IPO (vs. pre-IPO) borrowing costs. Specifically, the average post-IPO reduction in the loan interest spread for firms with IPO underpricing is about 165% larger than that for firms without underpricing, after controlling for IPO, firm and loan characteristics. This larger reduction in borrowing costs amounts to over US $1.2 billion per year for our sample firms with underpricing, and is substantial relative to the total amount of money left on the table by these firms (US $22.1 billion).[1] That is, the loss of the issuer due to underpricing, to a large extent, can be compensated by the benefit of going public from the loan market. The results are not driven by other factors that, documented in the literature, affect IPO underpricing, and are robust to employing exogenous variations of underpricing. In particular, although underpricing is followed by lower loan spreads of the issuer, price revision is not, indicating that underpricing plays a unique role in reducing the issuer's post-IPO borrowing costs. Our findings are consistent with the marketing value of underpricing, and highlight an important trade-off faced by an IPO firm: although underpricing incurs a direct loss by leaving money on the table, it brings indirect benefits from other markets such as the loan market. This provides a new rationale why issuers do not get upset about IPO underpricing.

We start by documenting a substantial reduction in issuers' borrowing costs after going public, based on a sample of 4,545 DealScan bank loans by 866 firms that complete an IPO between 1990 and 2013. Compared to loans made within 3 years before IPO, loans made within 3 years after

[1] All dollar amounts in this paper are in 2010 real dollars.

IPO on average lower the interest spread by 61.2 bps, which is nearly 30% of the average post-IPO interest spread (218.8 bps). Even after controlling for IPO, firm and loan characteristics, as well as year and industry fixed effects, the average post-IPO reduction in the loan interest spread is still 40.0 bps and highly significant. This benefit could stem from going public reducing the issuer's credit risk, improving its information quality, or increasing its bargaining power in debt markets (e.g., Pagano, Panetta, and Zingales, 1998). The findings are consistent with the conventional wisdom that firms go public with an aim to access cheaper financial capital.

There are two caveats in interpreting the reduction in loan spreads as benefit of going public. First, IPO firms often borrow short-term loans just before going public to avoid diluting ownership from using other funding sources, or to restructure the firm. These loans have higher spreads than common, resulting in seemingly higher borrowing costs before IPO and hence a reduction in borrowing costs after IPO. If this is the case, the post-IPO reduction in loan spreads is only a coincidence. However, we show that the reduction remains at the same level after excluding recapitalization-purpose loans, loans made within two quarters before IPO, or loans with maturity below two years. Therefore, it is not the short-term loans just before IPO that drive our results.

Second, going public changes a firm's private-public status and, at the same time, raises firm equity. One may think that the reduction in loan spreads is not due to the change of the firm's private-public status, but due to increased equity improving creditworthiness of the firm. This "benefit" from an equity increase presents even for firms not going public. To alleviate this concern, we compare, between IPOs and SEOs, the post-event change in borrowing costs. Like IPOs, SEOs increase firm equity. Unlike IPOs, SEOs do not affect the firms' private-public status. If firms experience a significant larger reduction in borrowing costs after IPOs than comparable SEOs, we would conclude that changing the private-public status reduces borrowing costs. Through a propensity score matching (PSM) approach, we create a matched sample of SEOs according to year, industry and key firm characteristics. Using the matched SEOs and IPOs as the control and treatment groups respectively, we show that the average reduction in borrowing costs after IPOs is over 200% higher than that after SEOs. Therefore, the post-IPO reduction in borrowing costs is beyond what caused only by an equity increase.

After documenting a substantial reduction in issuers' borrowing costs after going public, we

show that this benefit is neither random nor uniform. Using a difference-in-differences (DiD) approach, we compare the post- and pre-IPO loan interest spreads between firms with IPO underpricing and those without. We find that underpricing is associated with significantly larger reduction in the post-IPO loan spreads. The average reduction in the loan spread for firms with underpricing is about 29.6 bps (165%) higher than that for firms without underpricing. This magnitude is economically large. For our sample of firms with underpricing, the larger reduction in borrowing costs amounts to about US $1.2 billion per year. As the total amount of money left on the table by these firms is US $22.1 billion, the loss in the IPO market due to underpricing can be recovered within 20 years by the benefit of lower borrowing costs in the bank loan market.

The positive association between underpricing and the post-IPO reduction in borrowing costs (henceforth the positive association) is quite robust. For example, instead of comparing firms with and without underpricing, we show that the reduction in borrowing costs is significantly larger for IPOs with above-median (or top one tercile) underpricing than below-median (or bottom two terciles) underpricing. When replacing the underpricing dummy in the DiD tests by the continuous variable of underpricing, we still find a significant association between underpricing and the post-IPO reduction in loan spreads. This association, however, seems non-linear; it becomes smaller as underpricing increases.

We interpret the larger reduction in borrowing costs as a result of underpricing, but this interpretation faces a few challenges. One may think that the positive association reflects some coincidences. For example, IPO volume and underpricing are typically larger in hot stock markets (e.g., Lowry and Schwert, 2002; Lowry, 2003), which happen during economy booms and hence credit booms with lower borrowing costs. In this case, underpricing is associated with lower borrowing costs. This hot-markets effect, however, is not an important driver of our results. On the one hand, the majority of our sample loans are not made close to the IPO date. The larger reduction in loan spreads for underpriced firms presents not only in hot markets, but in all the three years following an IPO. On the other hand, the positive association remains significant after excluding periods with hot stock markets, such as years 1998-2000.

Second, underpricing could be a positive surprise to bank lenders concerning the IPO firm's market value, inducing banks to lower the price of loans. In this case, the post-IPO reduction in

loan spreads is larger with higher underpricing, but this larger reduction is only a consequence of higher-than-expected firm value, not of underpricing itself. However, if underpricing, as the change between the offer price and the first-day closing price, is a surprise to lenders, so should be price revision, defined as the change between the initial filing price and the offer price. After all, both information arrives almost at the same time (within one day around the issue date), and it is well established in the literature that price revision can largely explain underpricing (e.g., Hanley, 1993; Lowry and Schwert, 2004). To check whether this is the case, we replace underpricing by price revision in the DiD tests. Surprisingly, price revision has almost zero explanatory power over the post-IPO reduction in borrowing costs. Even after controlling for price revision, the effect of underpricing maintains with the same level of significance. The results suggest that the first-day price jump (not earlier price revision) plays a unique role in driving issuers' post-IPO borrowing costs, and this role is beyond a positive surprise to lenders concerning the IPO firm's market value.

IPO underpricing could be endogenously chosen by the issuer, so it is still possible that some other omitted variables drive both underpricing and the post-IPO reduction in borrowing costs, resulting in the positive association. Largely alleviating this concern, we show that the positive association is not affected by underwriter quality, VC-backed or not, firm size, firm age, and issue size, in addition to price revision. These are important factors identified in the literature that affect IPO underpricing (e.g., Beatty and Ritter, 1986; Ljungqvist and Wilhelm, 2003; Loughran and McDonald, 2013). To further establish the causality, we employ exogenous variations of underpricing to construct an instrument. Previous research documents that underpricing is positively related to recent market movements (e.g., Loughran and Ritter, 2002), while there is little reason to believe that these short-term market movements affect the IPO firm's borrowing costs in the next three years without through the channel of underpricing. We thus first use the 3-week (15 trading days) Nasdaq return prior to IPO to predict the probability of IPO underpricing. Using this predicted probability as an instrument for underpricing, we conduct 2-Stage Least Square (2SLS) analyses and confirm the causal effect of underpricing on the post-IPO reduction in loan spreads.

Our findings highlight an important trade-off in IPO pricing and provide a rationale for why issuers do not get upset about leaving money on the table. Underpricing incurs a direct loss to the issuer in the equity market, but it brings indirect gains from other markets. As we show, the

money saved from lower post-IPO borrowing costs for firms with underpricing can largely recover their loss due to underpricing, not to mention that underpricing, for example, benefits the issuer in product markets (e.g., Demers and Lewellen, 2003; Chemmanur and Yan, 2009). With these benefits compensating the loss, it is not difficult to understand why issuers do not get upset about underpricing.

One important question follows: Why does IPO underpricing reduce borrowing costs of the issuer? That is, what are the possible explanations for our findings? The literature proposes a few theories of IPO underpricing (e.g., Ljungqvist, 2007). First to say, our findings seem to have nothing to do with the behavioural explanations that entail certain irrationality of issuers or investors (e.g., Loughran and Ritter, 2002), nor with the agency-related explanations that rely mostly on the presence of agency of underwriters (e.g., Reuter, 2006; Ritter and Zhang, 2007) and the control-based theory that emphasizes ownership change after going public (e.g., Brennan and Franks, 1997; Stoughton and Zechner, 1998).

The most possible explanations are information-based. In particular, our findings are consistent with the marketing role of IPO underpricing. In playing such a role, underpricing attracts market attention and may affect post-IPO borrowing costs through three possible channels. First, underpricing substitutes advertising and enhances competitive advantages of the IPO firm in product markets. Supporting this channel, Demers and Lewellen (2003) report that greater underpricing of internet firms is associated with a post-IPO increase in website traffic and media exposure, and Chemmanur and Yan (2009) find that product market advertising and underpricing are indeed substitutes. Second, underpricing increases analyst coverage, which mitigates information asymmetry and hence moderates firms' financial constraints. For example, Cliff and Denis (2004) show that underpricing raises post-IPO analyst coverage from highly ranked analysts, while Billett, Garfinkel, and Yu (2017) show that reductions in analyst coverage worsen a firm's sales growth relative to industry peers.

Third, underpricing raises investors' familiarity with the firm, and subsequently raises the firm's investor base and stock liquidity. Higher stock liquidity improves corporate governance and reduces cost of capital. As supportive evidence, Grullon, Kanatas, and Weston (2004) show that firms with greater advertising expenditures have a broader investor base and better liquidity of

their common stock, suggesting that the investors' degree of familiarity with a firm may affect its cost of capital. Aggarwal, Krigman, and Womack (2002) show that underpricing raises investors' demand for the IPO stock, and hence stock liquidity and firm value. This channel is consistent with the **?** prediction that greater investor recognition can lead to higher firm value.

All above three channels of underpricing in playing the marketing role point to a positive association between underpricing and the post-IPO reduction in the issuer's borrowing costs. Although it is not easy to separate the three channels as they all stem from market attention, we further show that the effect of underpricing is more pronounced for information opaque firms, such as young and high-tech firms, consistent with the fact that the marginal benefits of information creation by underpricing's marketing role should be more pronounced for these firms.

Our findings also seem to be consistent with the traditional signaling theory that simply argues underpricing as a signal for firm quality (e.g., Allen and Faulhaber, 1989; Welch, 1989). This signal is costly for the issuer, but if successful, it may allow the firm to issue equity on better terms at a later date (i.e., SEOs). Empirical evidence from follow-up SEOs is mixed, but our findings from the loan market seem to support the theory. However, unlike the marketing role of underpricing that creates value directly, the signaling role does not create value by itself and hence requires certain post-IPO benefits to recover the issuer's loss. For the signal to generate sufficient benefits, information asymmetry is assumed to be persistent over a long period after IPO, for example, in the 3-year or even more years after IPO in our case. This is not convincing, as going public largely improves information transparency. Different from signaling, the marketing role reduces firms' borrowing costs by creating direct value, even if underpricing does not signal firm quality.

Other information-based theories may also potentially explain our results. For example, according to the partial adjustment theory (Benveniste and Spindt, 1989), underpricing is used to compensate institutional investors to reveal their private information concerning the value of the IPO firm. Consistent with the theory, the empirical literature finds that price revision (or partially adjusting the offer price) largely explains underpricing. A larger divergence in valuations between institutional investors and the IPO firm (and hence bank lenders) needs higher underpricing to compensate the investors. At the same time, a larger divergence induces a higher reduction in borrowing costs after bank lenders know investors' valuation. Therefore, the partial adjustment theory

may imply the positive association we show. However, if the theory explains our findings, price revision should affect the reduction in post-IPO borrowing costs. This is not what we see in the data. As shown earlier, price revision has almost zero explanatory power over the positive association. Moreover, our results barely change after controlling for proxies for ex-ante uncertainty, such as underwriter quality, VC-backed or not, firm size and firm age, which are widely considered as important drivers of underpricing in favor of the winner's curse theory (Rock, 1986).

The rest of the paper proceeds as follows. Section 2 describes data and sample, and summarizes the key variables used in our analyses. Section 3 documents the significant reduction in post-IPO borrowing costs from loan markets. Section 4 presents the positive association between the post-IPO reduction in borrowing costs and IPO underpricing, and Section 5 discusses possible explanations. Finally, Section 6 concludes.

2 Data, Variables and Statistics

2.1 IPO Data and Sample Selection

We start with all non-utility and non-financial firms in the SDC Global New Issues Database that completed IPO on the NYSE, AMEX and NASDAQ stock exchanges between 1990 and 2013. Following the IPO literature, we exclude closed-end funds (including REITs), unit of offers, American depositary receipts (ADRs), and offerings with the stock price below $5. We further correct for SDC errors using information provided on Jay Ritter's website, and merge records that represent one IPO. We select IPOs between 1990 and 2013, because our loan data start in 1987 and end in 2016, while we require every IPO firm to have at least one loan within 3 years before IPO and one loan within 3 years after IPO.[2] The final sample consists of 866 IPOs.

Figure 1 shows the frequency or distribution of IPOs of our sample across years. Although we have only a subset of all IPOs, the distribution of our sample IPOs is quite like that of the universal set of IPOs (see e.g., Lowry, Michaely, and Volkova, 2017). In the figure, we also see that the proportion of IPOs with and without underpricing is relatively stable across all years.

We collect the following information for each IPO: the issue date, offer price, filing prices (low,

[2]The loan data are described in Section 2.3.

middle, high), gross proceedings, underwriter ranking, firm age in the IPO year, whether the IPO is VC-backed, and the location of the filer within the IPO wave. In particular, we obtain information on the issue date, offer price, filing prices, issue amount, and the VC-backed dummy from SDC. We supplement information on venture capital (VC) funding from VentureXpert. Underwriter name are also provided in SDC, and we complete the missing data from the Internet (Scoop.com) or SEC Form S-1, which is the initial registration statement filed for an IPO. Underwriter ranking and the firm founding year (to compute firm age) are downloaded from Jay Ritter's website.[3]

We measure IPO underpricing as the percentage return from the offer price to the first-day closing price. The offer price is available in SDC and we supplement the missing information from Scoop.com. The first-day closing price, from the Center for Research in Securities Prices (CRSP), is required to be within 5 days of the offer date in SDC; otherwise, we replace it with information in SDC or Scoop.com. For remaining missing data on the offer price and first-day closing price, we hand-collect them from the Internet (e.g., Google). Alternatively, we define IPO underpricing as the dollar amount left on the table by the issuer.

2.2 Summary Statistics for IPO Characteristics

Table 1 summarizes the key IPO characteristics. We winsorize all variables at the 1st and 99th percentiles to mitigate outlier bias. Panel A of the table includes all 866 IPOs in our full sample. On average, firms choose to go public 25.63 years after they were founded. This high average firm age is mainly due to two reasons: First, we include IPO firms that have at least one loan before IPO in DealScan, excluding a large proportion of very young firms; second, our sample also includes a few exceptionally old firms with age above 100 years. The median firm age is only 14.00 years, and one-fourth IPOs are made within 6 years after the firm was established. The IPO firms have a mean *Book Assets* of US $663.63 million. This variable is also highly right-skewed, with a few large exceptions. The median *Book Assets* is only US $158.32 million. The mean *Gross Proceedings* is US $178.69 million, about 26.78% of the mean of book assets. The median *Gross Proceedings* is US $96.41 million, more than half of the median *Book Assets*. That is, relative to

[3]Underwriter ranking is on a scale of zero to nine, where nine is the highest underwriter prestige. If the ranking or rating for that period is not available, we employ the rating in the most proximate period. If there is more than one lead underwriter, we use the rank of the bookrunner (in the SEC S-1 Filing) or the highest ranking underwriter.

current book assets, smaller firms issue more equity.

Underwriter Ranking or rating takes values 1 to 9 with an average of 8.13. The majority of lead underwriters for our sample IPOs are rated at 8 or 9. These figures are similar to Loughran and Ritter (2004). In addition, only 22% of the firms are funded by a venture capital. This proportion is low relative to Lowry, Michaely, and Volkova (2017), because we require every IPO firm to have at least one loan within 3 years before IPO, retaining relatively large firms.

In terms of pricing, around 78% of the 866 IPOs in our sample are underpriced, indicated by the dummy variable, *Underpricing_D*. The mean first-day return or *Underpricing* (%) is 13.88%. The mean underpricing in terms of dollar amount, i.e. *Underpricing* ($), is 25.35 million. *Price Revision*, defined as the percentage change in the final offer price from the midpoint of the initial filing price range, has an average of -0.59% and a median of zero. Among the 842 IPOs with non-missing data on *Price Revision*, 373 (44.30%) have positive revision, 150 (17.81%) have no revision, and the rest (37.89%) have negative revision. All above figures have similar magnitudes, compared to previous studies (e.g., Lowry, Michaely, and Volkova, 2017).

Panel B compares the two subsamples of IPOs with and without underpricing. In general, there are no remarkable differences between the two subsamples. On average, firms with underpricing are more likely VC-backed, and issue more equity in the IPO with higher offer prices. The two subsamples are similar in terms of firm size, firm age and underwriter ranking. Not reported in the table, the total amount of money left on the table by the 656 IPOs with underpricing is about US $22.06 billion.

2.3 Loan and Borrower Data

We obtain bank loan data from the Reuters Loan Pricing Corporation (LPC) DealScan database. DealScan collects loan contracts information from SEC filings, large loan syndicators, and a staff of reporters. It covers the majority of new loans made to US firms, and contains detailed information of corporate loan contracts for both public and private firms from 1987.[4] Our analyse are conducted at the facility level. We obtain the loan variables, including the all-in-spread-drawn (*AIS*), *Maturity*

[4]According to Carey and Nini (2007), Dealscan has information on 50-75% of all U.S. commercial loan volume into the early 1990s, with coverage increasing to 80-90% from 1992-2002.

in months, *Loan Amount* in million US $, loan purposes, whether the loan is secured (*Secured*), and whether the loan has financial covenant (*Covenant*). We generate dummies for loan purposes, based on the four groups of primary purposes reported in DealScan: general purposes (working capital and general corporate purpose), recapitalization (debt repayment/consolidation, recapitalization, and debtor-in-possession loans), acquisition (general or specific acquisition program and LBO loans), and others.

We focus on bank loan facilities (with non-missing *AIS*) made by the 866 IPO firms between 3 years before IPO and 3 years after IPO.[5] To merge the DealScan loan data with our sample of IPOs, we first merge DealScan and Compustat, using the link table initiated by Chava and Roberts (2008). We manually supplement the link table for the period between 2013 and 2016. Second, we use CUSIP and the fiscal year as the key words to combine the IPO data with the merged DealScan and Compustat data. We define the fiscal year of loans as the loan year if the loan is issued after June, and as the loan year minus one if it is issued before June. Because Compustat records data for public firms, accounting data before IPO are typically not available. We thus manually collect the missing accounting data from SEC Form S-1 filings, including five important variables: total assets, total debt, net income, cash, and PP&E.

Our final sample includes 4,545 loan observations in 1987-2016. There are 3,422 loans made by the 656 firms with IPO underpricing and 1,022 loans made by the 178 firms without IPO underpricing. Figure 2 shows the distribution of the number of loans across calender years. In general, the distribution of loans over time is very similar to that of IPOs shown in Figure 1.

Figure 3 shows the distribution of loans across the 24 window quarters. Our time window covers the 3 years before IPO and the 3 years after IPO, so there are in total 6 window years or 24 window quarters. The figure shows that a significant proportion of loans before IPO are made close to the IPO time, especially in the last 3 quarters before IPO. There are three possible reasons: First, some IPO firms go public within 3 years after being established and hence do not have loan records before being founded; second, some issuers borrow short-term loans just before IPO to avoid diluting firm ownership (e.g., bridge loans) or to restructure the firm (e.g. recapitalization loans); third, DealScan misses some loans before a borrower goes public. We are able to check

[5]Six firms have two IPOs in our sample. That is, among the 866 IPOs, we have 860 unique firms.

the first two reasons but not the last. In our sample, among the 866 IPOs, 103 IPOs are made within 3 years after firm foundation, while 66 (42) are made within 2 (1) years after the firm's foundation. In addition, both bridge loans and recapitalization loans are of low proportions (below 20%). Therefore, the first reason dominates.

2.4 Summary Statistics for Loan and Borrower Characteristics

Table 2 summarizes the key loan and borrower characteristics. All the variables are winsorized at the 1st and 99th percentiles. Panel A includes all 4,545 loan observations in our full sample. The reduction in borrowing costs after going public is substantial. Compared to loans before IPO, loans after IPO on average have a lower interest spread by 61.22 bps, which is about 27.98% of the average post-IPO interest spread (218.77 bps) of all firms. This drop in borrowing costs could be because increased equity from IPO improves the firm's creditworthiness and information quality, reducing agency conflicts between the firm and lenders.

Accompanying the reduction in the loan spreads, the average loan size increases by US $53.51 million or 32.53% after IPO. Going public expands firm size and hence firms' borrowing capacity, so public firms tend to borrow more. The loan maturity, however, shows no difference before and after IPO. Loans after IPO are less likely to be secured but more likely to include financial covenants. Going public improves firms' transparency and hence reduces lenders' requirement for collateral. Although a similar negative effect should be seen on financial covenants, we instead observe a significant increase in their use. This is probably because financial covenants are based on firms' financial ratios, which are more reliable and accurate after IPO, making it easier to implement financial covenants.

Panel A also summarizes borrower characteristics of the 4,545 loan observations. Consistent with increased equity from IPO, *Book Assets* significantly increases, while *Book Leverage* decreases. *Profitability* increases, but *Tangibility* has almost no difference. This lower leverage is consistent with Eckbo and Norli (2005) who show that IPO firms have lower leverage than older firms (industry and B/M matched), for about two years following the IPO. One may wonder, if firms have lower cost of debt after IPO, why they do not increase leverage. There are two possible reasons: First, although cost of debt decreases after going public, so does cost of equity, and

it is hence not clear what the post-IPO optimal leverage should be; second, the adjustments towards the optimal leverage ratio take time, while the lower leverage immediately after IPO could be non-optimal.

Panel B and C of Table 2 respectively summarize loan and borrower characteristics for the subsamples with and without underpricing. In general, the loan and firm characteristics of the two subsamples are quite similar before IPO, but they show significant differences after IPO. In particular, loans for firms with IPO underpricing have significantly lower interest spreads and larger loan amount. Remarkably, the drop in borrowing costs for firms with IPO underpricing is 66.42 bps, while this figure is only 44.39 bps for firms without IPO underpricing. The difference (22.03 bps) is significant at the 1% level and economically large. Moreover, there is a significant increase in the loan amount and firm book assets for firms with underpricing, but not for firms without underpricing. This may indicate that the increase in book assets could be largely supported by debt, consistent with Arikan and Stulz (2016) that underpricing, followed by more acquisitions, may reflect greater investment opportunities of the IPO firm.

Figure 4 shows the average loan interest spreads and their 95% confidence intervals of the two subsamples across the six window years before and after IPO. First, there is no significant difference between the two subsamples in the three years before IPO, though the 95% confidence interval for the subsample without underpricing is much larger, probably due to lower number of observations. Second, there is a significant drop of the average interest spread after IPO for both subsamples. Before IPO, all spreads are above 270 bps, but after IPO they are below 250 bps. Third, loan spreads exhibit significant post-IPO differences across the two subsamples.

3 The Benefit of Going Public from the Loan Market

Extant literature suggests that firms, following an IPO, tend to receive reduction in borrowing costs. Pagano, Panetta, and Zingales (1998), using a sample of Italy IPOs in 1982-1992, show that there is a significant drop in the cost of credit after going public. This drop could be because the reduced financial leverage after IPO improves the creditworthiness of the firm, information creation reduces lenders' cost of monitoring, and the firm's more outside financing options curtail bank's bargain power (as in Rajan, 1992). In a study of lending relationship, Schenone (2010)

compares firms' borrowing costs before and after IPO, and reports a significant reduction in loan interest spreads after going public for a sample of US IPOs in 1998-2003. Schenone (2010) shows the drop in a univariate test. A few other papers document that public firms have a lower cost of financing, but the comparison is made with private firms, not only around the IPO event (e.g., Brav, 2009; Saunders and Steffen, 2011; Gilje and Taillard, 2016). So far, there has been no comprehensive study that identifies the benefit of going public in reducing borrowing costs for U.S. IPOs in a long time period. In this section, we fill in the gap through a large sample of U.S. IPOs between 1990 and 2013.

3.1 The Post-IPO Reduction in Borrowing Costs: Baseline Results

To identify the benefit of going public from bank loan markets, we first run the following OLS regression at the loan facility level,

$$\log AIS = \alpha + \beta \cdot \textit{Post} + \Gamma \cdot \mathbf{X}' + FEs + \epsilon, \tag{1}$$

In Equation (1), the dependent variable is the logarithm of *AIS* ($\log$*AIS*). *Post* is a dummy variable, which equals one if the loan is issued after firm goes public. The coefficient of *Post* captures the change in borrowing costs after IPO. By expectation, β is negative. $\mathbf{X}'$ represents a set of IPO, firm and loan characteristics as control variables. Specifically, IPO controls include *Gross Proceedings* and the *VC-backed IPO* dummy showing whether the IPO is VC-backed or not. Firm controls include the natural logarithm of book assets (i.e., $\log$(*Book Assets*)), *Book leverage* defined as total liabilities scaled by total assets, *Tangibility* defined as PP&E scaled by total assets, *Profitability* defined as the ratio of net income to book assets, the *Cash-to-asset Ratio* defined as cash and short-term investments scaled by total assets, and the natural logarithm of firm age in the loan issue year (i.e., $\log$(*Firm Age*)). Loan controls include the natural logarithm of both loan amount and maturity, i.e., $\log$(*Loan Amount*) and $\log$(*Maturity*), and the two dummy variables, *Secured* and *Covenant*. These non-price features of loans are usually fixed before the syndication process, and hence commonly used as control variables (e.g., Ivashina, 2009). We also include year, industry and loan purpose fixed effects. All variables are winsorized at the 1st and 99th percentiles to reduce outlier bias. Standard errors are clustered at the firm level and corrected for heterogeneity.

Regression results are reported in Table 3. Column (1) of the table presents the most parsimonious specification, without any control but including year and industry fixed effects. Column (2) adds IPO characteristics and Column (3) also has firm controls. We further add IPO and firm controls in Column (3) and both loan controls and loan purpose fixed effects in Column (4)-(5). In the first four columns, the dependent variable is $\log$*AIS*. In the last column, the dependent variable is *AIS* to facilitate interpretation of the results. Across all columns or specifications, the *Post* dummy enters with a significantly negative coefficient, with t-values above 7.50. The economic magnitude is remarkably large. According to Column (5), loans after IPO have an average reduction in the loan spread by 39.99 bps, which is 18.35% of the average post-IPO AIS (218.77 bps) for all loans in our sample. The results show a significant post-IPO reduction in loan spreads, after considering IPO, firm and industry heterogeneity.

A few control variables show consistent signs across specifications. For example, a larger issue size or gross proceedings is associated with a lower *AIS*, possibly because issue size is a proxy for firm size and hence firms' creditworthiness, or it indicates investment opportunities of the IPO firm. Leverage is positively associated with *AIS*, while profitability is negatively. Consistent with previous studies (e.g., Ivashina, 2009), larger loans and loans with covenants have lower *AIS*, while secured loans have higher *AIS*.

3.2 Is the Post-IPO Reduction in Borrowing Costs due to High-spread Recapitalization Loans before IPO?

We document a significant drop in loan spreads after firms' going public. However, this drop may only be a coincidence, not a benefit of going public. For example, some issuers may borrow short-term loans just before IPO to avoid diluting ownership (e.g., bridge loans) or to restructure the firm (e.g., recapitalization loans), while these loans have higher spreads than common, resulting in a higher average loan spreads before IPO and thus a seemingly reduction in loan spreads following IPO.[6] Such a reduction is, however, clearly not a benefit of going public.

[6]For example, mezzanine financing, also known as bridge financing, finances the growth of expanding companies prior to an IPO. Such funding is usually made up of convertible debt or preferred shares, which are more costly than common and provide investors certain rights over the holders of common equity. For more information, see http://fundingsage.com.

To address this concern, we conduct a battery of robustness tests, shown in Table 4. Specifically, we exclude recapitalization loans in Column (1), loans issued one quarter before IPO in Column (2), loans issued 2 quarters before IPO in Column (3), loans with maturity less than one year in Column (4), and loans with maturity less than 2 years in Column (5). Except the sample of observations, all specifications are exactly the same as Column (5) of Table 3. In all five columns, the large reduction in loan spreads remains with similar levels of significance both statistically and economically, indicating that the post-IPO reduction in borrowing costs is not caused by short-term loans issued just before going public.

3.3 Does the Post-IPO Reduction in Borrowing Costs Reflect only Increased Equity from IPO? IPOs vs. SEOs

IPO increases a firm's equity. Keeping debt constant, IPO thus raises the firm's creditworthiness and hence reduces its borrowing costs. Having these in mind, one may argue that the reduction in borrowing costs after IPO mainly reflects the effect of increased equity, instead of the effect of going public or changing the public-private status. In this case, the "benefit" in reducing borrowing costs can be present for any kinds of equity issuance, not necessarily going public. This concern is alleviated as we have already controlled for key firm characteristics, such as book assets, leverage and cash holdings, which are directly linked to increased equity from IPO.

To further identify the effect of changing the public-private status on loan interest spreads, we compare the effects between IPOs and SEOs. Both IPOs and SEOs are associated with equity increase, but SEOs do not change the issuer's public-private status. Therefore, the difference between the post-issue benefit of IPOs and SEOs captures the effect of going public or changing the public-private status, which is beyond the effect of increased equity.

We start with all SEOs in the SDC Global New Issues Database, made by non-utility and non-financial firms between 1990 and 2013. We exclude those with the issue price below $5, and keep security types as "Common Shares" and "Ord/Common Shs." We further require the issuing firm to have at least one loan (with non-missing AIS) within 3 years before the SEO and one loan (with non-missing AIS) within 3 years after SEO. This results in 2,666 SEOs. Since we have only 866 IPOs in our sample, we might be picking up other firm characteristics if we simply compare IPOs

with these 2,666 SEOs. For this reason, we employ a propensity score matching (PSM) approach to construct our regression sample.

We first estimate the propensity score of a firm having an IPO (vs. a SEO) by regressing an indicator variable for IPOs on issue proceedings, book assets, leverage, profitability, tangibility and the cash-to-assets ratio, as well as industry and year fixed effects. We then match, for each IPO, a SEO based on the propensity score. The matching is done without replacement and the maximum difference in the propensity score allowed for a match is 1%. This results in a sample of 536 IPOs and 536 SEOs.

Using these IPOs as the treatment group and the matched SEOs as the control group, we run difference-in-differences (DiD) tests to compare the effects of IPOs and SEOs on the post-issue reduction in borrowing costs. The matching and regressions results are reported in Table 5. In Panel A, we show results from Logit regressions used to calculate the propensity scores, where the dependent variable is the indicator variable for IPOs that equals to one for IPOs and zero for SEOs. Columns (1) and (2) respectively show coefficients for the sample before matching (including 866 IPOs and 2,666 SEOs) and the subsample with only matched observations (including 536 IPOs and 536 SEOs). In Column (2), all the control variables are statistically insignificant after the matching. Panel B displays the distribution of propensity scores from the regression in Column (2) of Panel A. The difference between the propensity scores of IPOs and SEOs is trivial. Panel C compares the variables between IPOs and SEOs, which are used to compute the propensity scores. After matching, all the six variables exhibit no significant difference between IPOs and SEOs. The above results suggest that our matched sample satisfies the three important validity criteria of PSM (see e.g., Fang, Tian, and Tice, 2014).

Finally, Panel D reports results of the DiD tests using the 536 IPOs as the treated group and the 536 matched SEOs as the control group. Specifically, we add an interaction term, *Post*$\times$*Treated*, to the basic OLS regressions in Table 3, where *Treated* is a dummy variable that equals to one for IPOs and zero for SEOs. The dependent variable is *AIS* in Columns (1), (3) and (5), and log*AIS* in Columns (2), (4) and (6). The results in all specifications show that the reduction in loan spreads after IPOs is significantly higher than that after SEOs. In particular, according to Column (5) with all controls and fixed effects, the average reduction in borrowing costs for IPOs (28.20 bps) is over

200% higher than that for the matched SEOs (8.97 bps). This difference is statistically significant and economically large. As SEOs do not affect the firms' public-private status but increase firm equity, the results confirm that the post-IPO reduction in borrowing costs is beyond the effect of increased equity from IPO.

4 The Benefit of Going Public from the Loan Market and IPO Underpricing

4.1 Association between the Post-IPO Reduction in Borrowing Costs and IPO Underpricing: Difference-in-Differences Tests

After documenting significant benefit of going public from the loan market (i.e., the post-IPO reduction in borrowing costs), we will show in this section that this benefit is related to IPO underpricing. In particular, we construct a DiD test, using loans made by firms with underpricing as the treated group and loans made by firms without underpricing as the control group. Alternatively, we compare loans made by firms with high and low underpricing. The baseline specification is:

$$\begin{aligned} \log AIS = \alpha + \beta \cdot \textit{Post} + \gamma \cdot \textit{Post} \times \textit{Underpricing\_D} \\ + \lambda \cdot \textit{Underpricing\_D} + \Gamma \cdot \mathbf{X}' + FEs + \epsilon, \end{aligned} \tag{2}$$

Equation (2) adds to Equation (1) an interaction term between the *Post* dummy and the *Underpricing_D* dummy, which is equal to one if the IPO has positive underpricing and zero otherwise. In this way, we contrast two layers of differences: The first layer of difference is before and after IPO, and the second is with and without underpricing. The coefficient of the interaction term (γ) captures the difference in the post-IPO reduction of borrowing costs between firms with underpricing and those without. By expectation, γ is negative.

Results of the above DiD test are reported in Table 6. In all columns, we include IPO, firm and loan controls, and industry, year and loan purpose fixed effects. In Column (1), with log*AIS* as the dependent variable, the interaction term *Post* $\times$ *Underpricing_D* enters the regression with a significantly negative coefficient and a t-value of 3.08. This suggests that the post-IPO reduction in borrowing costs is significantly larger for firms with underpricing. Although casaulity needs to

be established in the following sections, we argue that this larger reduction in borrowing costs is an effect of underpricing. In Column (2), we use *AIS* as the dependent variable to facilitate interpretation. The interaction term keeps consistently significant and negative, confirming a positive association between the post-IPO reduction in borrowing costs and IPO underpricing. In terms of economic significance, the average reduction of the loan interest spread for firms with IPO underpricing (47.43 = 29.55+17.88 bps) is 29.55 bps higher than that for firms without IPO underpricing (17.88 bps). This difference is 13.56% of the average post-IPO loan spread (218.77 bps) of our sample.

Using the estimated coefficient in Column (2), we are able to estimate the aggregate cost savings that are due to the larger post-IPO reduction in loan spreads. In our sample, the total amount of new loans made after IPO by the firms with underpricing is about US $401.99 billion.[7] Almost all these loans mature after 3 years and hence are not closed in our sample period. As the firms with underpricing experience a larger reduction in the average loan spread by 29.55 bps, this larger reduction amounts to US $401.99 $\times$ 29.55$\times$ $10^{-4} = 1.19$ billion per year. On the other hand, the total amount of money left on the table, defined as the first-day price gain multiplied by the number of shares sold, is about US $22.06 billion. That is, the loss due to underpricing can be recovered within 20 years from lower borrowing costs in the loan market. The findings highlight an important trade-off in IPO pricing and provide a rationale for why issuers do not get upset about leaving money on the table in IPOs. Underpricing incurs a direct loss to the issuer in the equity market, but it brings indirect gains from other markets. The money saved from lower post-IPO borrowing costs can largely compensate the loss due to underpricing, not to mention that underpricing has other benefits, such as those from product markets (e.g., Demers and Lewellen, 2003; Chemmanur and Yan, 2009).

By definition, *Underpricing_D* equals to one for IPOs with positive underpricing, so it is quite unbalanced as the majority (three-fourth) of IPOs in our sample are underpriced. We further construct two more dummy variables, *High Underpricing*, and *Top Underpricing*. *High Underpricing* is equal to one if underpricing of the IPO is above the sample median and zero otherwise, while *Top Underpricing* is equal to one if underpricing is in the top tercile. In Columns (3)-(4), we

[7] As a comparison, the total amount of money raised from IPO by the underpriced firms is about 96.41 billion.

use the *High Underpricing* dummy to replace *Underpricing_D* and run the same DiD regression. Similarly, in Column (5)-(6) we replace *Underpricing_D* with *Top Underpricing*. Moreover, to compute the *Underpricing_D* dummy, underpricing is defined as the percentage change from the offer price to the first-day closing price. Another way to define underpricing is by the dollar amount of money left on the table. This alternative definition has no effect on *Underpricing_D* but changes *High Underpricing* and *Top Underpricing*. Columns (3)-(6) thus include also results using the alternative definition of underpricing. In particular, underpricing in Columns (3) and Column (5) is defined as percentage change (%), while it is defined using dollar amount ($) in Columns (4) and Column (6). In all the columns, the negative coefficient of the interaction term remains highly significant, though both the statistical and economic significance is some kind lower than the first two columns.

Overall, our results from the DiD tests show a significantly positive association between IPO underpricing and the benefit of going public from the loan market.Arikan and Stulz (2016) suggest that underpricing is followed by more acquisitions, reflecting greater investment opportunities of the IPO firm. The reduction in borrowing costs associated with underpricing could be the funding source of these acquisitions, so our results are consistent with Arikan and Stulz (2016).

It is worth mentioning that the positive association contradicts the argument that the post-IPO reduction in borrowing costs mainly reflects increased equity from IPO improving firm creditworthiness. To see the point, notice that if increased equity is the key driver of the post-IPO reduction in borrowing costs, we would see that larger IPO proceedings are associated with a larger reduction in post-IPO borrowing costs. The literature shows that larger IPO proceedings are negatively associated with underpricing (e.g., Beatty and Ritter, 1986; Michaely and Shaw, 1994). We thus would observe a negative association between IPO underpricing and the benefit of going public, if the effect of increased equity dominated. This is not as shown in the DiD results. Therefore, the post-IPO reduction in borrowing costs indeed reflects the benefit of going public beyond the effect of increased equity from IPO.

4.2 Non-linearity of the Association between the Post-IPO Reduction in Borrowing Costs and IPO Underpricing

The DiD tests in the previous section compare firms with IPO underpricing and those without by including the interaction term between the *Underpricing_D* dummy and the *Post* dummy. We also compare firms with high and low underpricing. The results confirm a positive association between the post-IPO reduction in borrowing costs and IPO underpricing. One natural question follows: Does the reduction in borrowing costs continuously increases with the level of underpricing?

To answer this question, we replace *Underpricing_D* in Equation (2) with the continuous variable, *Underpricing*. Results are reported in Columns (1) and (2) of Table 7, which respectively replicate the first two columns of Table 6. The coefficient of the interaction term, *Post* $\times$ *Underpricing*, captures the marginal reduction in post-IPO borrowing costs if the firm experiences a one unit increase of underpricing. This coefficient is negative and statistically significant at the 10% level, confirming that the post-IPO reduction in borrowing costs continuously increases with the level of underpricing. In untabulated results, we winsorize the *Underpricing* variable at the 90th percentile or even the 80th percentile, the coefficient of *Post* $\times$ *Underpricing* becomes highly significant at the 1% level. This indicates that the effect of extremely high underpricing is limited, and we thus think that the effect of underpricing could be non-linear.

To examine the non-linearity of the positive association, in Columns (3) and (4), we add the squared term of underpricing, $Underpricing^2$, and one more interaction term, *Post* $\times$ $Underpricing^2$. Now the coefficient of *Post* $\times$ *Underpricing* is more significant with t-values about 2.50. The economical magnitude is also tripled, confirming a non-linear effect of underpricing. Also note that *Post* $\times$ $Underpricing^2$ has a significantly positive coefficient, indicating a decreasing and convex relationship between underpricing and the post-IPO reduction in borrowing costs. To sum up, the results suggest that higher underpricing raises the benefit of going public from the loan market, but this effect decreases as underpricing increases.

4.3 Effects on the Post-IPO Reduction in Borrowing Costs: Underpricing vs. Price Revision

We document a positive association between underpricing and the post-IPO reduction in borrowing costs. There is little reason to believe that an IPO firm's post-IPO borrowing costs have impact on underpricing, so we interpret the larger reduction in borrowing costs as a result of underpricing. For this interpretation, however, we need to establish causality. As the first step, we need exclude the possibility that some unobserved variables drive both IPO underpricing and the benefit of going public from the loan market, resulting in their positive association. One such variable is price revision, defined as the change from the midpoint of initial filing price to final offer price.

The positive association may suggest that underpricing brings to banks new and positive information concerning the value of the IPO firm, as a surprise, inducing banks to lower lending rates to the underpriced IPO firm. If this is the full story for our findings, there is actually little to say about the effect of underpricing, because the reduction in borrowing costs is indeed a result of bank's updated higher valuation over the IPO firm. Had the firm not underpriced, we would still observe high post-IPO reduction in loan spreads as long as the post-IPO firm stock price is beyond banks' expectation.

To check whether underpricing only means a positive surprise to lenders and hence results in the positive association documented in the previous sections, we compare the effects of underpricing and price revision. Price revision, as the change from the initial filing price to final offer price, largely explains underpricing in the literature. A higher price revision is followed by a higher underpricing (e.g., Hanley, 1993; Lowry and Schwert, 2004). Banks observe price revision when the offer price is finalized, typically on the last day before IPO or in the morning of the IPO day. Underpricing, on the other hand, becomes public information when the first-day trading closes. There is only a less-than-one-day time difference between the two pieces of information being revealed. This short time difference is negligible for banks regarding determining loan prices after IPO. Therefore, if underpricing is a surprise to banks, so should be price revision.

We then run the DiD tests in Table 6, but replace underpricing with price revision. Results are shown in Table 8. In all columns, the dependent variable is $\log AIS$. We keep the first column in Ta-

ble 6 as Column (1) of the current table to facilitate comparison. Column (2) replicates Column (1) but replaces *Underpricing_D* with *Price Revision_D*, which is equal to one if the IPO experiences a positive price revision, and zero otherwise. The coefficient of the interaction term, *Post*×*Price Revision_D*, captures the relationship between price revision and the post-IPO reduction in loan spreads. Surprisingly, we find that price revision has almost zero explanatory power over the post-IPO reduction in borrowing costs, both statistically and economically. In Column (3), we run a horse race between underpricing and price revision, by including two interaction terms, *Post*×*Price Revision_D* and *Post*×*Underpricing_D*. The coefficient of *Post*×*Underpricing_D* maintains the same levels of statistical and economic significance, while *Post*×*Price Revision_D* remains insignificant. Results in the first three columns suggest that underpricing plays a unique role in driving the post-IPO reduction in borrowing costs and, more importantly, this role is beyond a positive shock to bank lenders concerning the IPO firm's value.

In the last three columns of Table 8, we compare the effects of underpricing and price revision with a non-linear model. Specifically, Column (4) is the same as Column (3) in Table 7. Column (5) tests the non-linear association between price revision and the post-IPO reduction in loan spreads. Finally, Column (6) runs a horse race between underpricing and price revision in the same non-linear model. The significant positive and convex relationship exists only between underpricing and the reduction in loan spreads. These results confirm the unique role of underpricing in driving issuers' post-IPO borrowing costs.

4.4 Controlling for Other Important Factors That Affect IPO Underpricing

In addition to price revision, the empirical literature has identified a long list of factors that affect IPO underpricing, such as underwriter quality (e.g., Beatty and Welch, 1996; Loughran and Ritter, 2004), VC-backed or not (e.g., Lee and Wahal, 2004), firm age (e.g., Ritter, 1984; Ljungqvist and Wilhelm, 2003), firm size (e.g., Ritter, 1984), and issue size or gross proceedings (e.g., Beatty and Ritter, 1986).[8] The positive association between the benefit of going public and underpricing could be driven by these factors, instead of IPO underpricing. To examine

[8]Many of these factors are proxies for ex-ante uncertainty or information asymmetry, which are important drivers of IPO underpricing especially in information-based theory of IPO underpricing (e.g., Rock, 1986; Beatty and Ritter, 1986; Allen and Faulhaber, 1989; Welch, 1989; Benveniste and Spindt, 1989, etc.).

this possibility, we further control these factors in the DiD test of Section 4.1. Specifically, we add to Equation (2) an interaction term between the *Post* dummy and one of the above factors, *Post*×*Other Factor*. If one factor affects the post-IPO loan interest spread, we should see that they enter the regression with a significant coefficient. The coefficient of *Post*×*Underpricing_D* still captures the difference in the post-IPO reduction of borrowing costs between firms with underpricing and those without. We expect that this coefficient remains significantly negative even if we control for these factors.

Results are reported in Table 9. In Columns (1)-(6), we respectively add to Equation (2) the interaction term between *Post* and *Underwriter Ranking*, *VC-backed IPO*, log(*Gross Proceedings*), log(*Book Assets*), log(*Sales*) and *IPO Age*. Definitions of these variables are summarized in Appendix I. Column (7) has all the interaction terms in the same regression. In all seven columns, we include *Post*×*Price Revision_D* as a control, and the dependent variable is log*AIS*. We see that the coefficient of *Post*×*Underpricing_D* keeps significantly negative at the 1% level, suggesting that controlling for these factors does not affect the positive association between IPO underpricing and the benefit of going public from the loan market. This economic magnitude remains at the same level except that it is slightly smaller when all factors are included in Column (7).

It is interesting that the coefficients of the interaction terms between the *Post* dummy and the above factors show little significance. In an unreported Probit regression using our sample of IPOs, we regress the *Underpricing_D* dummy on price revision and the above other factors, and industry and year fixed effects. We obtain a Pseudo R^2 of 0.194 and a Wald χ^2 of 136.65. Price revision is highly significant and itself has an R^2 of 0.082. Although the factors have significant explanatory power over IPO underpricing, they seem to have little explanatory power over the post-IPO reduction in borrowing costs.

The results confirm that the positive association between the benefit of going public and IPO underpricing is not driven by the important factors that, documented in the literature, affect underpricing. As we will discuss later, the results also suggest that our findings cannot be explained by some information-based theories, such as the partial adjustment theory (Benveniste and Spindt, 1989) or the winner's curse theory (Rock, 1986), which rely on many of the above factors for empirical support.

4.5 Evidence from Exogenous Variations of IPO Underpricing

In Section 4.1 to 4.4, we show that the post-IPO reduction in borrowing costs is larger for firms with IPO underpricing. We interpret this larger reduction as a result of underpricing. To establish causality, we show that our results are not affected by the important factors that, documented in the literature, affect underpricing. However, there could still be some unobserved variables that drive both IPO underpricing and the benefit of going public from the loan market, resulting in their positive association. To further address the omitted variable concern, we employ exogenous variations in IPO underpricing. The idea is that we try to identify the part of variations in IPO underpricing that is exogenous to the long-term post-IPO borrowing costs.

The literature documents that an IPO firm's first-day return (i.e., underpricing) is positively related to recent market movements, such as the Nasdaq returns prior to IPO (e.g., Loughran and Ritter, 2002; Hanley and Hoberg, 2012; Loughran and McDonald, 2013). We verify this positive relation using a Probit model with the 866 IPO observations. We include *Underpricing_D* as the dependent variable and the 3-week Nasdaq return prior to IPO as the main independent variable, controlling the VC-backed dummy, issue size or gross proceedings, and industry and IPO year fixed effects. We obtain a significantly positive coefficient of the 3-week Nasdaq return, with a t-value of 1.97. The economic magnitude is seizable. An increase in the Nasdaq return from the 25th to 75th percentile (-1.44% to 3.60%) raises the probability of this IPO being underpriced by 4% (from 0.82 to 0.85). We also use 1-, 2- or 4-week Nasdaq return prior to IPO and obtain similar results.

Although the short-term Nasdaq return prior to IPO predicts IPO underpricing, there is little reason to believe that such short-term market movements affect the IPO firm's borrowing costs in the next three years without through the channel of underpricing. After all, the stock market movements in the following years after IPO can be quite different from the short-term movements. Therefore, the Nasdaq return can be used as an instrument for underpricing. However, because the model to predict the probability of underpricing is a non-linear Probit model, we cannot directly use the predicted probability to replace underpricing and run the second stage OLS regression of loan spreads. The residuals produced in a nonlinear model might be correlated with the fitted values and covariates, in which case the second-stage is called "forbidden regressions" (Angrist

and Pischke, 2008). As an alternative, we use the nonlinear fitted value from the above Probit model as an instrument to conduct the standard 2SLS analysis. That is, we use the probability of underpricing caused by exogenous changes in short-term market returns to predict *Underpricing_D* and *Post*×*Underpricing_D* in the first stage:

$$\begin{aligned} \textit{Underpricing\_D} = \alpha + \beta \cdot \textit{Post} + \gamma \cdot \textit{Post} \times Pr\textit{(Underpricing)} \\ + \lambda \cdot Pr\textit{(Underpricing)} + \Gamma \cdot \mathbf{X}' + \textit{FEs} + \epsilon, \end{aligned} \tag{3}$$

$$\begin{aligned} \textit{Post} \times \textit{Underpricing\_D} = \alpha + \beta \cdot \textit{Post} + \gamma \cdot \textit{Post} \times Pr\textit{(Underpricing)} \\ + \lambda \cdot Pr\textit{(Underpricing)} + \Gamma \cdot \mathbf{X}' + \textit{FEs} + \epsilon, \end{aligned} \tag{4}$$

Pr*(Underpricing)* denotes the probability of underpricing predicted through a Probit model in which the 3-week Nasdaq return prior to IPO is the main explanatory variable. In the second stage, we estimate the relationship between underpricing and post-IPO reduction in borrowing costs using the following specification:

$$\begin{aligned} \log AIS = \alpha + \beta \cdot \textit{Post} + \gamma \cdot \textit{Post} \times \widehat{\textit{Underpricing\_D}} \\ + \lambda \cdot \widehat{\textit{Underpricing\_D}} + \Gamma \cdot \mathbf{X}' + \textit{FEs} + \epsilon, \end{aligned} \tag{5}$$

$\widehat{\textit{Underpricing\_D}}$ and $\textit{Post} \times \widehat{\textit{Underpricing\_D}}$ are the predicted values from our first-stage estimation specified in Equation (3) and Equation (4). A negative coefficient of the interaction term $\textit{Post} \times \widehat{\textit{Underpricing\_D}}$ would verify the causal effect of underpricing on the reduction in borrowing costs after going public.

Results for the 2SLS analyses are shown in Table 10. Columns (1) and (2) demonstrate our first-stage estimation, where the instrumental variables Pr*(Underpricing)* and *Post* × Pr*(Underpricing)* are predicted using the 3-week Nasdaq return prior to IPO. We can see that the coefficients on the instruments are both highly significant with t-values larger than 15. The F-statistics are 216.56 and 335.09 respectively, suggesting that the instruments are strong and unlikely to be biased toward the OLS estimates (Bound, Jaeger, and Baker, 1995). Column (3) shows results of the second-stage estimation, where the dependent variable is log*AIS*. We see a significantly negative coefficient of *Post* × *Underpricing_D*, confirming the positive effect of IPO underpricing on the benefit of going public from the loan market.

Finally, Columns (4) to (6) respectively replicate the regressions in Columns (1) to (3), but replace the 3-week Nasdaq return with 1-week Nasdaq return prior to IPO to calculate our instruments (probability of underpricing caused by short-term market movements). Results remain with the same significance levels. To sum up, our two-stage analyses using exogenous variations of IPO underpricing verify the causal effect of underpricing on the post-IPO reduction in loan spreads.

5 Why Does Underpricing Reduce Post-IPO Borrowing Costs? Explanations and Discussions

What are the possible explanations for the positive association between underpricing and the post-IPO reduction in borrowing costs, as we document in the previous sections? First to say, the findings seem to have nothing to do with the behavioural explanations, which entail certain irrationality of issuers or investors (e.g., Loughran and Ritter, 2002). The findings are not directly linked to either the agency-related explanations that rely mostly on the presence of agency of underwriters (e.g., Reuter, 2006; Ritter and Zhang, 2007), or the control-based theory that emphasizes ownership change after going public (e.g., Brennan and Franks, 1997; Stoughton and Zechner, 1998). The most possible explanations are information-based. In this section, we will discuss some of the information-based explanations and, in particular, we show that our results are consistent with the marketing role of underpricing.

5.1 The Marketing Role of Underpricing

The literature proposes the marketing role of underpricing (e.g., Demers and Lewellen, 2003; Chemmanur and Yan, 2009). In playing such a role, underpricing attracts market attention and media coverage, and hence affects the post-IPO borrowing costs through a few possible channels.

First, underpricing attracts market attention, and hence substitutes advertisements, enhancing firms' competitive advantages in product markets. Empirically, Demers and Lewellen (2003) find that greater underpricing of internet firms is associated with a post-IPO increase in website traffic and media exposure. This increased publicity generates advertising and marketing benefits in the company's product markets. A more recent paper by Chemmanur and Yan (2009) verify that product market advertising and underpricing are indeed substitutes. If underpricing has a function to

advertise the firm's brand and products, it directly helps the firm to fight with competitors, expand market, and boost sales. In this case, it is not a surprise to see the larger drop in borrowing costs for underpriced firms. One caveat here is that there should be an optimal level of underpricing that trades off the advertising benefit of underpricing and its cost by leaving money on the table. This echoes with the finding in Section 4.2: The effect of underpricing is non-linear; as underpricing increases, its effect shrinks. At optimum, the marginal benefit of underpricing, in terms of substituting advertisements, is equal to the marginal benefit of direct advertisements. Henceforth, we call this channel the *advertisement channel* of the marketing role of underpricing.

Second, underpricing attracts attention and analyst coverage, which reduces information asymmetry and hence relaxes firm's financial constraints. Cliff and Denis (2004) show that underpricing raises post-IPO analyst coverage from highly ranked analysts, while Billett, Garfinkel, and Yu (2017) show that an increase in asymmetric information due to reductions in analyst coverage causes lower sales growth of the firm relative to industry peers. Collectively, underpricing promotes information creation and hence transparency of the issuing firm, which in turn reduces its cost of external finance and improves firm performance. We hence observe the positive association between underpricing and the post-IPO reduction in issuers' borrowing costs. In the following, we call this channel the *analyst coverage channel*.

Third, underpricing attracts attention and raises investors' familiarity with the firm, and subsequently raises the firm's investor base. A larger investor base raises firms' stock liquidity, which improves corporate governance (for example, through takeover threats) and reduces cost of capital. According to the **?** model, greater investor recognition can lead to higher firm value. As supportive evidence, Aggarwal, Krigman, and Womack (2002) show that underpricing attracts media attention, and raises investors' demand for the IPO stock. Grullon, Kanatas, and Weston (2004) show that firms with greater advertising expenditures and hence greater visibility have a broader investor base and better liquidity of their common stock, suggesting that the investors' degree of familiarity with a firm may affect its cost of capital. More recently, **?** indeed find that firms with higher liquidity in the capital market pay lower spreads for the loans they obtain. We henceforth call this channel the *liquidity channel*.

All the above three channels point to a positive association between underpricing and the is-

suer's post-IPO reduction in borrowing costs. It is not easy to distinguish the three channels empirically, as all the benefits arrive due to the same reason: more market attention. However, the positive association should be more pronounced for information-opaque firms, for whom the marginal benefit of market attention is higher. To see whether this is the case, we examine the cross-sectional difference of the positive association, considering young firms (vs. old firms) and high-tech firms (vs. non-high-tech firms), which are arguably more information-opaque (e.g., Michaely and Shaw, 1994). That is, we run the regression, specified in Equation (2), using subsamples with only young firms or high-tech firms. Young firms are those with a firm age belong to the top tercile of our sample, and old firms are those belong to the bottom tercile. We define high-tech firms according to the Greater Cincinnati Chamber of Commerce (GCCC) High Technology Database.[9]

Results are reported in Table 11. In the first two columns, we compare young and old firms. *Young* firms are defined as those with firm age belong to the lowest tercile of our sample, and *Old* firms are defined as those with age belong to the highest tercile. Columns (1) and (2) both replicate Column (1) of Table 6, respectively with loans made by young and old firms. The association between IPO underpricing and the benefit of going public (captured by the coefficient of the interaction term, *Post* $\times$ *Underpricing_D*) is significant for young firms in Column (1) but not for old firms in Column (2). The difference is statistically significant with a p-value of 0.08 and economically large (18.2 bps). That is, younger firms see a more pronounced effect of underpricing. Columns (3)-(4) compare high-tech and non-high-tech firms. Again, only high-tech firms show a significantly positive association. The difference is economically large (13.1 bps), though statistically insignificant (p-value = 0.16). We hence draw a conclusion that information opaqueness enlarges the marketing benefit of underpricing.

5.2 The Traditional Signaling Theory

The traditional signaling theory takes underpricing as a signal of firm quality (e.g., Allen and Faulhaber, 1989; Grinblatt and Hwang, 1989; Welch, 1989; Chemmanur, 1993). Specifically, underpricing sorts good and bad firms in the following way. Good firms choose costly underpricing

[9]Specifically, high-tech firms are defined as those in industries with the following SIC codes: 2087, 3851, 3999, 5045, 7389, 229, 261, 267, 281-4, 286-9, 299, 335-6, 348-9, 351, 353-9, 361-7, 369, 371-6, 379, 381-2, 384, 386, 737, 871, 873-4, 899, 30, and 48.

while recover the cost by selling additional equity in subsequent SEOs. Bad firms, however, cannot mimic, because there is sizeable probability that the market detects firm quality after IPO, preventing bad firms from recovering the loss from underpricing. Signaling through underpricing is costly for the issuer, but if successful, it may allow the firm to issue equity on better terms at a later date (i.e. SEOs). Empirical research has explored the benefit of going public from follow-up SEOs, but fails in finding consistent evidence (e.g., Jegadeesh, Weinstein, and Welch, 1993; Michaely and Shaw, 1994; Welch, 1996).

Our evidence from the loan market seems to be consistent with the signaling theory, but there is one important question to be answered: Why would firms use underpricing as a signal of firm quality to lenders (to lower cost of debt), but not to external equity investors (to obtain higher valuation in follow-up SEOs)? Our conjecture is that the signal could be sent to both debt and equity markets, but the evidence from SEOs is not as significant as that from loans due to two possible reasons. First, many IPO firms have DealScan loans both before and after IPO, making it easy to compare the cost of loans before and after IPO. However, the price of equity (e.g. in an offering) is available only after IPO. Second, debt financing is the dominating source of external financing for business firms (e.g., Myers, 1984; Allen, Chui, and Maddaloni, 2004). In terms of both frequency and volume, SEOs are made not as many as debt issuance. For example, within three years after IPO, the 864 IPO firms in our sample issue 2,336 new loans with a total amount of US $502 billion. As a comparison, these firms conduct 760 SEOs with a total amount of US $147 billion in the same period. The lower frequency and volume of SEOs, relative to debt issuance, make it difficult to find supporting evidence from SEOs only.[10]

However, it is difficult for the traditional signaling theory to completely explain our results. In the theory, underpricing is only a signal of firm value and, by itself, does not create direct value (such as saving firm costs or raising cash flows). To compensate the issuer's loss due to underpricing, information asymmetry between the IPO firm and investors should be persistent

[10]Our sample of IPOs is constrained by loans in DealScan - each IPO firm has at least one loan within 3 years before IPO and one loan within 3 years after IPO. It is possible that the sample reflects certain self-selection of IPO firms and is hence not representative. To address this concern, we consider the universe of IPOs in 1990-2013. For all these 6,852 IPO firms, the total amount of loans made within 3 years after IPO is US $930 billion (5,563 loans), while the total amount of equity issuance through SEOs is US $350 billion (2,343 SEOs). If we consider 10 years after IPO, the two figures are 2,310 and 540 respectively. Although DealScan does not include all loans made by these firms (while SDC does include almost all SEOs), we still see a significantly larger loan issuance than equity issuance.

after IPO for the signaling to generate sufficient benefits. That is, without underpricing as a signal, firm types are largely undetected by the stock market even in a long periods after firms go public. If this is the case, consider the same firm that did the same IPO but just underpriced it less. That would give the firm more cash and liquidity, and allow the firm to be more competitive than the one underpriced more, if underpricing did not create direct value. It is thus not convincing to argue that this more competitive firm would have a higher cost of debt in the 3-year or even longer period after IPO, because going public largely improves information transparency. As Ritter and Welch (2002) point out, "On theoretical grounds, however, it is unclear why underpricing is a more efficient signal than, say, advertising."

Therefore, to be consistent with our findings, underpricing should by itself create value, not only being a signal. One such value could come from its marketing or advertising role. Different from signaling, in playing the marketing or advertising role, underpricing saves advertisement costs. This direct value created reduces firms' borrowing costs, even if underpricing does not signal firm quality.

5.3 Other Information-based Theories

Other information-based theories may also potentially explain our results. According to the partial adjustment theory (Benveniste and Spindt, 1989), underpricing is used to compensate institutional investors to reveal their private information concerning the valuation of the IPO firm. According to the theory, a higher valuation of institutional investors, above that of the IPO firm (and hence bank lenders), entails higher IPO underpricing. At the same time, this higher valuation of investors induces a larger reduction in borrowing costs after bank lenders know investors' valuation. The partial adjustment theory may thus imply a positive association between IPO underpricing and the post-IPO reduction in borrowing costs. If the partial adjustment theory explains our findings, price revision (or partially adjusting the offer price) should affect the post-IPO reduction in borrowing costs. However, this is not what we see in the data. As shown earlier, price revision has almost zero explanatory power on the positive association between underpricing and the post-IPO reduction in borrowing costs.

Price revision largely explains underpricing, consistent with the issuer partially adjusting the

offer price towards the market price during the IPO process. If the partial adjustment theory explains our findings, price revision should, like underpricing, affect the post-IPO reduction in borrowing costs. This is, however, not what we see in the data. As shown earlier, price revision has almost zero explanatory power on the positive association between underpricing and the post-IPO reduction in borrowing costs.

According to the winner's curse theory (Rock, 1986), higher information asymmetry among investors concerning the valuation of the IPO firm raises IPO underpricing. This information asymmetry should, arguably, be higher for more information-opaque firms, which obtain higher benefit of going public in terms of information creation and hence higher reduction in post-IPO borrowing costs. The winner's curse theory could thus also imply the positive association we document. However, our findings barely change after controlling for proxies for ex-ante uncertainty or information asymmetry, such as underwriter quality, VC-backed or not, firm size and firm age. This makes it less likely that the winner's curse theory explains our results.

Our results barely change after controlling for proxies for ex-ante uncertainty or information asymmetry, such as underwriter quality, VC-backed or not, firm size and firm age, which are widely considered as important drivers of underpricing in favor of the winner's curse theory (e.g., Beatty and Welch, 1996; Loughran and Ritter, 2004; Lee and Wahal, 2004; Ljungqvist and Wilhelm, 2003; Ritter, 1984; Beatty and Ritter, 1986).

6 Conclusion

In this paper, we link IPO underpricing to the benefit of going public from the bank loan market. We show that IPO underpricing is associated with larger reduction in loan interest spreads of the IPO firm after going public. This association holds after controlling for IPO, firm and loan characteristics, year and industry fixed effects, and a list of factors (price revision, underwriter quality, VC-backed or not, firm age, firm size and issue size) that, documented in the literature, are important drivers of IPO underpricing.

Our findings are consistent with the marketing role of underpricing. In playing such a role, underpricing attracts market attention and media coverage, and hence benefits the IPO firm through creating advertising benefits, reducing information asymmetry or boasting the issuer's stock liq-

uidity. The value created directly by underpricing reduces the the issuer's post-IPO borrowing costs. That is, the loss in the IPO market due to underpricing is compensated by the benefit of lower borrowing costs in the bank loan market. As the first study linking IPO underpricing to bank loan markets, we shed new light on the underpricing puzzle as complementary to extant studies.

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Appendix I: Variable Definitions

AIS: All-in-spread-drawn, which is the interest spread above LIBOR plus annualized upfront fees, in terms of basis points. Data source: *DealScan*.

Book Assets: Total book assets in millions of 2010 U.S. dollars. Data source: *Compustat* plus manually collected from *SEC Form S-1*.

Book Leverage: Total liabilities scaled by total assets, i.e., (dlc + dltt)/at. Data source: *Compustat* plus manually collected from *SEC Form S-1*.

Cash-to-Assets Ratio: Cash and short-term investments scaled by total assets, i.e., che/at. Data source: *Compustat* plus manually collected from *SEC Form S-1*.

Covenant: Dummy variable that equals one if a loan has financial covenants, and zero otherwise. Data source: *DealScan*.

High Underpricing: Dummy variable that equals one if underpricing meets one of the following two criteria: (1) first day return in percentage is above median; (2) first day return in dollar amount (first day return $\times$ IPO proceedings) is above median. When the variable is reported in the tables, the column headers indicate how it is created. Data source: *SDC*, *CRSP* plus manually collected.

High-tech Firms: Firms that belong to industries with the following SIC codes: 2087, 3851, 3999, 5045, 7389, 229, 261, 267, 281-4, 286-9, 299, 335-6, 348-9, 351, 353-9, 361-7, 369, 371-6, 379, 381-2, 384, 386, 737, 871, 873-4, 899, 30, and 48. Data source: *Greater Cincinnati Chamber of Commerce (GCCC) High Technology Database*.

IPO Age: Firm age in the IPO issue year. Data source: *Jay Ritter's website*.

Gross Proceedings: Principle amount raised in IPO in millions of 2010 U.S. dollars, also called issue size. Data source: *SDC*.

Issue Size: Principle amount raised in IPO in millions of 2010 U.S. dollars, also called Gross Proceedings. Data source: *SDC*.

Loan Amount: Loan facility amount in millions of 2010 U.S. dollars. Data source: *DealScan*.

log(*Book Assets*): The natural logarithm of total book assets in millions of 2010 U.S. dollars. Data source: *Compustat* plus manually collected from *SEC Form S-1*.

log(*Firm Age*): The natural logarithm of one plus firm age in the current year, which is defined as the years elapsed since the founding year. Data source: *Jay Ritter's website*.

log(*Loan Amount*): The natural logarithm of the loan facility amount in millions of 2010 U.S. dollars. Data source: *DealScan*.

log(*Maturity*): The natural logarithm of the loan maturity measured in months. Data source: *DealScan*.

log(*Gross Proceedings*): The natural logarithm of principle amount raised in IPO in millions of 2010 U.S. dollars. Data source: *SDC*.

Maturity: Loan maturity measured in months. Data source: *DealScan*.

Offer Price: The price at which the IPO is first sold to the public. Data source: *SDC* plus manually collected.

Post: Dummy variable that equals one if a loan is issued after firm goes public.

Pre-issue 1-week Nasdaq Return: The 1-week (5 trading days) Nasdaq return prior to the IPO issue date. Data source: *CRSP*.

Pre-issue 3-week Nasdaq Return: The 3-week (15 trading days) Nasdaq return prior to the IPO issue date. Data source: *CRSP*.

Price Revision: Percentage difference between offer price and midpoint of filing price. Data source: *SDC* plus manually collected.

Price Revision_D: Dummy variable that equals one if the IPO adjusts its offer price upwards from the midpoint filing price. Data source: *SDC* plus manually collected.

Price Revision^2: Squared term of price revision, which is defined as the percentage difference between offer price and midpoint of filing price, i.e., *Price Revision*$\times$*Price Revision*. Data source: *SDC* plus manually collected.

Profitability: The ratio of net income to book value of assets, i.e., ni/at. Data source: *Compustat* plus manually collected from *SEC Form S-1*.

Secured: Dummy variable equal to one if loan is secured with collateral. Data source: *DealScan*.

Tangibility: PP&E (property, plant, and equipment) scaled by total assets, i.e., ppent/at. Data source: *Compustat* plus manually collected from *SEC Form S-1*.

Top Underpricing: Dummy variable that equals one if IPO underpricing in percentage is in the top tercile. Data source: *SDC*, *CRSP* plus manually collected.

Underpricing (%): Percentage return from offer price to first day close price. Data source: *SDC*, *CRSP* plus manually collected.

Underpricing ($): Dollar amount left on the table in an IPO, i.e., (first-day closing price $-$ offer price) $\times$ the number of shares offered. Data source: *SDC*, *CRSP* plus manually collected.

Underpricing^2: Squared term of underpricing , which is defined as the percentage return from offer price to first day close price, i.e., *Underpricing*$\times$*Underpricing*. Data source: *SDC*, *CRSP* plus manually collected.

Underpricing_D: Dummy variable that equals one for positive IPO underpricing. Data source: *SDC*, *CRSP* plus manually collected.

Underwriter Ranking: A ranking of the lead underwriter on a scale of zero to nine, where nine is the highest underwriter prestige. If the rating for specific period is not available, we employ the rating in the most proximate period. Data source: *Jay Ritter's website* plus manually collected.

VC-backed IPO: An indicator equal to one if the firm was funded by a venture capital firm at the time of the IPO filing. Data source: *SDC* plus *VentureXpert*.

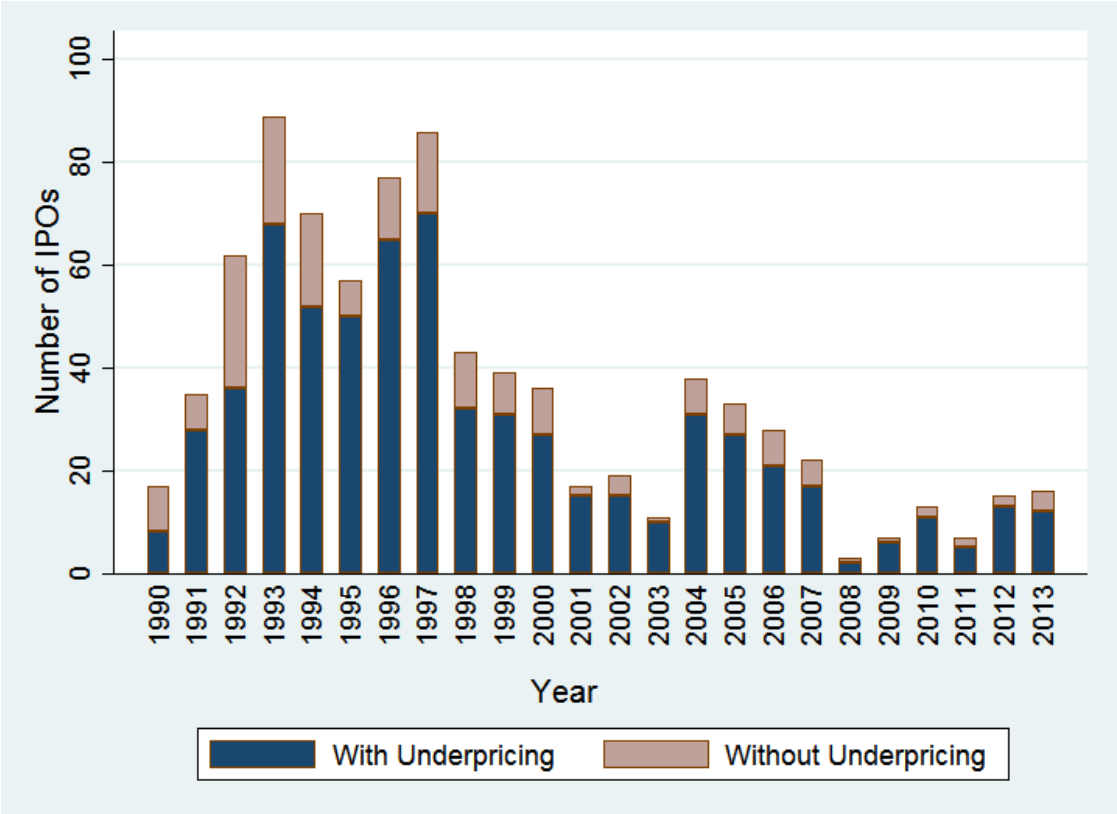

Figure 1: The Number of IPOs over Years

This figure shows the number of IPOs in our sample over years, which in total consists of 866 IPOs. To construct the sample, we start with all non-utility and non-financial firms in the SDC Global New Issues Database, which complete IPO on the NYSE, AMEX and NASDAQ stock exchanges between 1990 and 2013. We then exclude REITs, units, ADRs, and offerings with the stock price below $5, and further require every firm to have at least one loan (with non-missing all-in-spread-drawn in DealScan) within 3 years before IPO and one loan (with non-missing all-in-spread-drawn in DealScan) within 3 years after IPO.

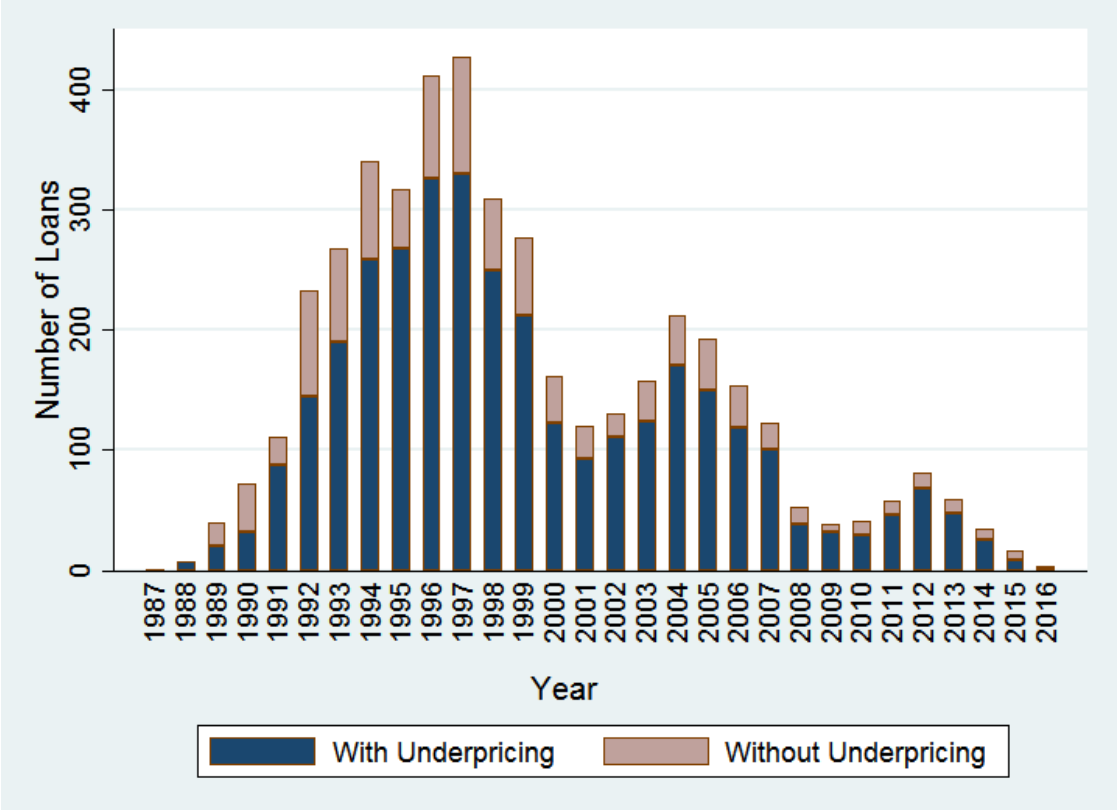

Figure 2: The Number of Loans over Calender Years

This figure presents the distribution of the number of loans in our sample form 1987 to 2016. The full sample consists of 4,545 unique bank loans, each of which is made by an IPO firm between 3 years before IPO and 3 years after IPO. We require the firms to be non-utility and non-financial firms, which complete IPO on the NYSE, AMEX and NASDAQ stock exchanges between 1990 and 2013. We also exclude REITs, units, ADRs, and offerings with the stock price below $5, and require every firm to have at least one loan (with non-missing all-in-spread-drawn in DealScan) within 3 years before IPO and one loan (with non-missing all-in-spread-drawn in DealScan) within 3 years after IPO.

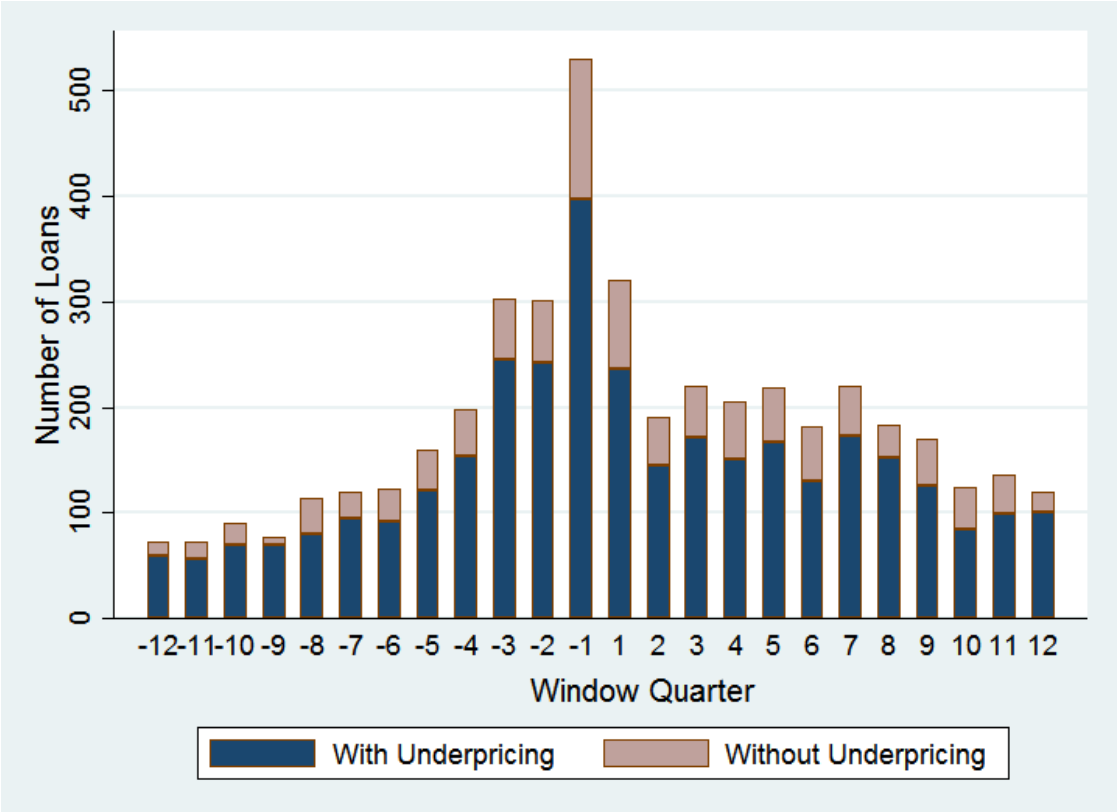

Figure 3: The Number of Loans over Window Quarters

This figure shows the distribution of the number of loans in our sample across the 24 quarters between 3 years before IPO and 3 years after IPO. The full sample consists of 4,545 bank loans in 1987-2016 made by 866 IPO firms. We require the firm to be non-utility and non-financial firms, which complete IPO on the NYSE, AMEX and NASDAQ stock exchanges between 1990 and 2013. We also exclude REITs, units, ADRs, and offerings with the stock price below $5, and require every firm to have at least one loan (with non-missing all-in-spread-drawn in DealScan) within 3 years before IPO and one loan (with non-missing all-in-spread-drawn in DealScan) within 3 years after IPO.

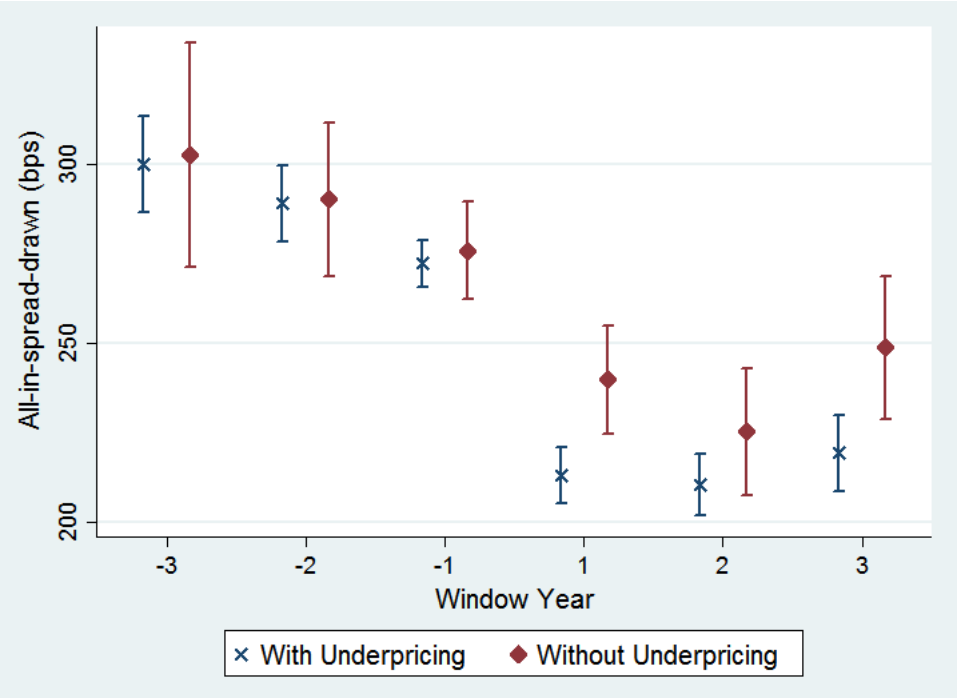

Figure 4: Loan Spread Before and After IPO

This figure shows the average loan interest spread (AIS) of the bank loans in our sample across the six window years before and after IPO. The full sample consists of 4,545 unique bank loans between 1987 and 2016, each of which is issued by an IPO firm between 3 years before IPO and 3 years after IPO. We compare two subsamples: loans issued by IPO firms with (positive) underpricing and loans issued by IPO firms without underpricing.

Table 1: Summary Statistics for IPOs

This table reports summary statistics for key IPO variables for the 866 IPOs in our full sample and two subsamples split by underpricing. To construct the full sample, we start with all non-utility and non-financial firms in SDC Global New Issues Database, which completed IPO on the NYSE, AMEX and NASDAQ stock exchanges between 1990 and 2013. We then exclude REITs, units, ADRs, and offerings with the stock price below $5. We further require every firm to have at least one loan (with non-missing all-in-spread-drawn in DealScan) within 3 years before IPO and one loan (with non-missing all-in-spread-drawn in DealScan) within 3 years after IPO. Panel A, and B report statistics for key IPO variables for the full sample, the subsample with underpricing and the subsample without underpricing respectively. All variables are winsorized at the 1^{st} and 99^{th} percentiles, and are summarized in Appendix I. All dollar amounts are in 2010 real dollars.

Panel A: Full Sample

Variables	N	Mean	SD	p1	p25	p50	p75	p99
Gross Proceedings (US $ million)	866	178.69	243.96	11.29	47.23	96.41	200.00	1,529
VC-backed IPO (dummy)	866	0.22	0.41	0.00	0.00	0.00	0.00	1.00
Underwriter Ranking	865	8.13	1.35	2.00	8.00	9.00	9.00	9.00
Offer Price ($)	850	14.92	5.04	6.00	11.50	14.38	18.00	33.00
Book Assets (US $ million)	840	663.63	1,595	4.77	47.31	158.32	488.68	10,718
Firm Age in the IPO Year (years)	849	25.63	27.85	0.00	6.00	14.00	33.00	104.00
Underpricing (%)	843	13.88	20.22	-11.61	0.86	8.00	19.23	111.30
Underpricing (US $ million)	843	25.35	62.70	-20.63	0.57	6.66	24.10	466.49
Underpricing_D (dummy)	843	0.78	0.42	0.00	1.00	1.00	1.00	1.00
Price Revision (%)	842	-0.59	12.36	-35.00	-7.14	0.00	7.14	27.27

Panel B: Subsamples with Underpricing and without Underpricing

	With Underpricing				Without Underpricing				Diff.
Variables	N	Mean	p50	SD	N	Mean	p50	SD	
Gross Proceedings	656	186.41	97.96	261.08	187	149.79	84.06	178.03	-36.62*
VC-backed IPO	656	0.24	0.00	0.43	187	0.16	0.00	0.37	- 0.08**
Underwriter Ranking	655	8.13	9.00	1.31	187	8.05	8.88	1.53	- 0.08
Offer Price	656	15.32	15.00	5.01	187	13.29	13.00	4.39	- 2.03***
Book Assets	643	646.56	146.39	1,559	175	615.39	167.38	1,523	21.40
Firm Age	650	25.19	14.00	27.27	185	27.29	15.00	29.99	2.10
Underpricing (%)	656	18.47	12.52	20.67	187	-2.24	0.00	3.28	—
Underpricing ($)	656	33.53	11.28	68.86	187	-3.37	0.00	5.84	—
Price Revision (%)	654	1.44	3.08	11.89	186	-7.46	-6.25	11.21	—

	With Pre-IPO Loans				Without Pre-IPO Loans				Diff.
Variables	N	Mean	p50	SD	N	Mean	p50	SD	
IPO Characteristics									
Gross Proceedings	1,542	143.50	75.85	186.62	3,314	97.21	55.62	142.49	46.29***
VC-backed IPO	1,542	0.34	0.00	0.47	3,314	0.49	0.00	0.50	- 0.15***
Underwriter Ranking	1,406	7.95	8.00	1.50	3,044	7.37	8.00	2.03	0.58***
Offer Price	1,515	14.17	14.00	4.88	3,281	12.73	12.00	4.81	1.44***
Firm Age	1,516	21.71	11.00	25.85	3,245	16.12	8.00	22.55	5.58***
Underpricing (%)	1,505	19.39	9.09	35.64	3,253	22.63	9.09	42.33	- 3.25***
Underpricing (million $)	1,505	27.12	6.30	63.08	3,253	24.22	3.90	60.42	2.89
Price Revision (%)	1,507	0.130	0.00	1,308	3,266	0.413	0.00	1,350	- 0.28
Firm Characteristics									
Total Assets	1,280	427.18	89.95	1,000	2,745	206.25	33.30	670.89	220.9***
EBIT	786	30.87	8.50	80.30	1,638	10.75	2.40	56.30	20.12***
ROA	643	10.27	7.12	10.22	1,137	13.38	9.51	13.80	-3.11***
Current Ratio	597	2.47	1.80	2.48	1,357	3.25	2.20	3.37	-0.77***

Table 2: Loan and Borrower Characteristics: Pre- and Post-IPO

This table compares the key loan and borrower characteristics for the 4,545 observations in our full sample. Each of the loans is issued by an IPO firm between 3 years before IPO and 3 years after IPO. Panel A, B and C are respectively for the full sample, the subsample with underpricing and the subsample without underpricing. The last column reports the pre- and post-IPO difference in means of the loan characteristics. All variables are winsorized at the 1^{st} and 99^{th} percentiles, and are summarized in Appendix I. All dollar amounts are in 2010 real dollars. *,**, and *** indicate that differences in means are statistically significant at the 10%, 5%, and 1% levels, respectively.

	Pre-IPO				Post-IPO				Diff.
	N	Mean	Median	SD	N	Mean	Median	SD	
Panel A: Full Sample (obs: 4,545)									
AIS (bps)	2,190	279.99	275.00	115.30	2,355	218.77	200.00	109.03	-61.22***
Maturity (month)	2,094	51.97	60.00	25.86	2,267	52.57	60.00	23.73	0.60
Loan Amount ($ million)	2,190	164.49	56.79	462.84	2,355	218.00	99.03	371.61	53.51***
Secured (dummy)	1,806	0.93	1.00	0.25	1,974	0.90	1.00	0.29	-0.03***
Covenant (dummy)	2,190	0.45	0.00	0.50	2,355	0.60	1.00	0.49	0.15***
Book Assets ($ million)	2,012	984.65	276.61	2,222	2,281	1,279	482.37	2,382	294***
Book Leverage	1,988	0.52	0.51	0.33	2,292	0.39	0.39	0.26	-0.13***
Cash-to-Assets Ratio	1,976	0.08	0.03	0.13	2,288	0.09	0.03	0.13	0.01**
Profitability	1,944	0.00	0.02	0.15	2,249	0.02	0.03	0.13	0.01***
Tangibility	1,940	0.33	0.26	0.25	2,284	0.33	0.25	0.25	-0.01
Panel B: Subsample with Underpricing (obs: 3,422)									
AIS (bps)	1,671	280.15	275.00	111.86	1,751	213.72	200.00	105.87	-66.42***
Maturity (month)	1,598	51.55	60.00	26.27	1,691	51.84	60.00	23.96	0.29
Loan Amount ($ million)	1,671	164.84	54.87	505.29	1,751	229.58	101.14	406.69	64.74***
Secured (dummy)	1,374	0.94	1.00	0.24	1,464	0.90	1.00	0.30	-0.03***
Covenant (dummy)	1,671	0.47	0.00	0.50	1,751	0.62	1.00	0.49	0.15***
Book Assets ($ million)	1,552	963	251.12	2,158	1,705	1,299	486.78	2,426	336***
Book Leverage	1,535	0.51	0.49	0.32	1,709	0.37	0.37	0.26	-0.13***
Cash-to-Assets Ratio	1,521	0.09	0.03	0.13	1,706	0.09	0.04	0.14	0.01*
Profitability	1,500	0.01	0.02	0.15	1,677	0.02	0.04	0.13	0.01**
Tangibility	1,493	0.33	0.26	0.25	1,703	0.32	0.24	0.25	-0.01
Panel C: Subsample without Underpricing (obs: 1,022).									
AIS (bps)	466	282.59	275.00	123.88	556	238.19	225.00	115.11	-44.39***
Maturity (month)	444	51.77	59.00	24.21	531	54.24	60.00	22.74	2.47
Loan Amount ($ million)	466	149.29	57.37	269.45	556	173.39	84.62	236.94	24.10
Secured (dummy)	388	0.92	1.00	0.28	472	0.93	1.00	0.26	0.01
Covenant (dummy)	466	0.43	0.00	0.50	556	0.54	1.00	0.50	0.11***
Book Assets ($ million)	419	1,006	319.76	2,393	531	1,185	424.77	2,235	179
Book Leverage	412	0.58	0.55	0.35	538	0.43	0.45	0.25	-0.15***
Cash-to-Assets Ratio	414	0.06	0.02	0.10	537	0.07	0.03	0.11	0.01
Profitability	403	-0.00	0.01	0.15	527	0.02	0.03	0.11	0.02**
Tangibility	407	0.34	0.26	0.26	538	0.35	0.25	0.28	0.01

Table 3: Post-IPO Reduction in Borrowing Costs

This table examines the benefit of going public in terms of reducing borrowing costs in bank loan markets. The sample consists of 4,545 unique bank loans in 1987-2016, each of which is issued by an IPO firm between 3 years before IPO and 3 years after IPO. The dependent variable is the logarithm of all-in-spread-drawn (AIS), log*AIS*, in the first four columns, and *AIS* in the last column, indicated by column headers. *Post* is a dummy variable that equals to one if the loan is issued after the firm goes public. We add industry and year fixed effects, and a list of control variables that include IPO, firm and loan characteristics. All variables are winsorized at the 1^{st} and 99^{th} percentiles, and are summarized in Appendix I. The model is estimated using OLS. Standard errors are clustered at the firm level to correct for heterogeneity and t-values are presented in parentheses. *, **, and *** indicate that the coefficient is statistically significant at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Y-Variable	log*AIS*	log*AIS*	log*AIS*	log*AIS*	*AIS*
Post	**-0.277*** **	**-0.308*** **	**-0.200*** **	**-0.167*** **	**-39.987*** **
	(-13.59)	**(-15.45)**	**(-8.72)**	**(-7.58)**	**(-8.18)**
VC-backed IPO		0.090***	0.060*	0.051*	10.906
		(2.91)	(1.84)	(1.74)	(1.63)
log(Gross Proceedings)		-0.178***	-0.151***	-0.076***	-14.809***
		(-9.02)	(-6.70)	(-4.13)	(-3.37)
log(Book Assets)			-0.040***	0.013	3.784
			(-2.76)	(0.87)	(1.08)
Book Leverage			0.435***	0.264***	50.819***
			(7.76)	(5.56)	(4.43)
Tangibility			-0.028	-0.018	-7.527
			(-0.43)	(-0.32)	(-0.62)
Profitability			-0.247	-0.237**	-91.683***
			(-1.54)	(-2.53)	(-4.30)
Cash-to-assets Ratio			0.115	0.092	3.239
			(1.28)	(1.16)	(0.18)
log(Firm Age)			-0.040***	-0.021*	-4.985**
			(-3.32)	(-1.95)	(-2.04)
log(Loan Amount)				-0.083***	-17.333***
				(-8.36)	(-7.59)
log(Maturity)				0.033*	3.686
				(1.76)	(0.90)
Secured				0.557***	71.606***
				(11.59)	(8.95)
Covenant				-0.086***	-26.822***
				(-3.13)	(-4.00)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Loan Purpose FE	No	No	No	Yes	Yes
N	4,545	4,545	3,996	3,258	3,258
adj. R^2	0.174	0.260	0.328	0.431	0.373

Table 4: Is the Post-IPO Reduction in Loan Spreads due to High-spread Loans just before IPO?

This table examines whether the benefit of going public in terms of reducing borrowing costs in bank loan markets is due to high-spread recapitalization loans issued before IPO. The sample starts with 4,545 unique bank loans in 1987-2016, each of which is issued by an IPO firm between 3 years before IPO and 3 years after IPO. We then exclude recapitalization loans in Column (1), loans issued 1 quarter before IPO in Column (2), and loans issued 2 quarters before IPO in Column (3). In Column (4) and Column (5), we drop loans with maturity less then 1 year and 2 years respectively. The dependent variable is the logarithm of all-in-spread-drawn (AIS), log*AIS*. *Post* is a dummy variable that equals to one if the loan is issued after the firm goes public. In all columns, we add industry and year fixed effects, and a list of control variables that include IPO, firm and loan characteristics. All variables are winsorized at the 1^{st} and 99^{th} percentiles, and are summarized in Appendix I. The model is estimated using OLS. Standard errors are clustered at the firm level to correct for heterogeneity and t-values are presented in parentheses. *, **, and *** indicate that the coefficient is statistically significant at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Sample	Excluding Recap. Loans	Excluding 1 quarter before IPO	Excluding 2 quarters before IPO	Maturity >=1 year	Maturity >=2 years
Y-variable	log*AIS*	log*AIS*	log*AIS*	log*AIS*	log*AIS*
Post	**-0.168*** **	**-0.202*** **	**-0.215*** **	**-0.162*** **	**-0.172*** **
	(-7.15)	**(-8.15)**	**(-8.39)**	**(-7.21)**	**(-7.81)**
VC-backed IPO	0.060**	0.044	0.042	0.047	0.040
	(2.07)	(1.41)	(1.31)	(1.55)	(1.21)
log(Gross Proceedings)	-0.082***	-0.079***	-0.087***	-0.072***	-0.071***
	(-4.36)	(-4.10)	(-4.09)	(-3.89)	(-3.90)
log(Book Assets)	0.009	0.014	0.009	0.010	0.020
	(0.56)	(0.92)	(0.58)	(0.66)	(1.29)
Book Leverage	0.259***	0.236***	0.214***	0.272***	0.280***
	(5.09)	(4.56)	(4.06)	(5.50)	(5.91)
Tangibility	-0.041	-0.073	-0.078	-0.010	-0.027
	(-0.69)	(-1.18)	(-1.22)	(-0.17)	(-0.47)
Profitability	-0.252***	-0.278***	-0.286***	-0.281***	-0.393***
	(-2.63)	(-2.80)	(-2.89)	(-2.65)	(-3.87)
Cash-to-assets Ratio	0.061	0.048	0.048	0.111	0.104
	(0.73)	(0.56)	(0.52)	(1.33)	(1.05)
log(Firm Age)	-0.023**	-0.020*	-0.016	-0.019*	-0.022**
	(-1.99)	(-1.75)	(-1.27)	(-1.73)	(-2.00)
log(Loan Amount)	-0.081***	-0.081***	-0.076***	-0.084***	-0.080***
	(-7.80)	(-7.94)	(-7.14)	(-8.18)	(-7.67)
log(Maturity)	0.038*	0.049**	0.040*	0.058**	0.073**
	(1.91)	(2.36)	(1.84)	(2.44)	(2.21)
Secured	0.559***	0.551***	0.545***	0.564***	0.592***
	(11.13)	(10.65)	(10.54)	(11.42)	(12.23)
Covenant	-0.086***	-0.080***	-0.081***	-0.082***	-0.068**
	(-3.03)	(-2.75)	(-2.65)	(-2.92)	(-2.37)
All Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	3,030	2,804	2,537	3,129	2,771
adj. R^2	0.432	0.445	0.451	0.435	0.440

Table 5: Is the post-IPO Reduction in Borrowing Costs Mainly due to Increased Equity from IPO? A Comparison between IPOs and SEOs

This table compares the difference in the post-issue reduction in borrowing costs between IPOs and SEOs. For each IPO in our sample, we match a SEO through a propensity score matching approach. We use six variables (book assets, leverage, tangibility, profitability, cash-to-assets ratio, and the issue proceedings), in addition to year and industry fixed effects, to compute the propensity scores. In Panel A, we report results from Logit regressions used to calculate the propensity scores for the matching procedure, where the dependent (dummy) variable is set to one for IPOs and zero for SEOs. Columns (1) and (2) respectively show coefficients for the sample before matching (866 IPOs and 2,666 SEOs) and the matched sample (536 IPOs and 536 SEOs). Panel B displays the distribution of propensity scores from the regression in Column (2) of Panel A. Panel C compares the variables used to compute the propensity scores between IPOs and SEOs, while Panel D compares the changes in AIS for loans issued by firms within 3 years before and 3 years after IPO or SEO. We show the statistics for our full sample and our matched sample separately. Finally, Panel E shows results of DiD tests using loans issued by the matched IPO and SEO firms. The dependent variable is *AIS* in Columns (1), (3) and (5), and log*AIS* in Columns (2), (4) and (6). We add an interaction term, *Post*×*Treated*, to regressions of Table 3. *Treated* is a dummy variable that equals to one for IPOs and zero for SEOs. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix I.

Panel A: Pre- and Post-Match Logit Regressions

	(1) Pre-Match	(2) Post-Match
log(Book Assets)	-1.560***	0.047
	(-20.65)	(0.48)
Book Leverage	2.388***	-0.336
	(8.65)	(-0.95)
Tangibility	0.281	0.115
	(0.93)	(0.28)
Profitability	0.203	-0.219
	(0.44)	(-0.36)
Cash-to-assets Ratio	0.485	0.314
	(1.37)	(0.71)
log(Gross Proceedings)	1.637***	-0.033
	(17.80)	(-0.27)
Industry FE	Yes	Yes
Year FE	Yes	Yes
N	3,532	1,072
pseudo R^2	0.288	0.027

Panel B: Estimated Propensity Score Distributions

	Mean	SD	p1	p25	p50	p75	p99
IPOs	0.367	0.203	0.031	0.215	0.339	0.514	0.855
SEOs	0.367	0.203	0.031	0.215	0.339	0.514	0.855
Difference	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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Panel C: Difference in Matching Variables

	IPOs			SEOs			Diff.	t-value
	Mean	SD	N	Mean	SD	N		
log(Book Assets)	5.916	1.481	536	5.924	1.266	536	-0.008	0.091
Leverage	0.282	0.233	536	0.289	0.239	536	-0.007	0.497
Tangibility	0.311	0.254	536	0.322	0.247	536	-0.011	0.731
Profitability	0.022	0.097	536	0.026	0.138	536	-0.004	0.522
Cash-to-assets Ratio	0.145	0.186	536	0.136	0.167	536	0.009	0.838
log(Gross Proceedings)	4.626	1.094	536	4.639	0.991	536	-0.013	0.208

Panel D: Pre-event AIS vs. Post-event AIS

		Pre-			Post-			Diff.
		N	Mean	SD	N	Mean	SD	
Full Sample	IPO	2,190	279.99	115.30	2,355	218.77	109.03	-61.22***
	SEO	8,429	226.49	130.35	8,025	207.56	132.56	-18.92***
Matched Sample	IPO	1,361	280.43	117.36	1,446	218.08	113.51	-62.35***
	SEO	1,303	244.21	132.29	1,200	216.83	127.71	-27.38***

Panel E: DiD Regressions (Treated: IPOs; Control: SEOs)

	(1)	(2)	(3)	(4)	(5)	(6)
Y-variable	*AIS*	log*AIS*	*AIS*	log*AIS*	*AIS*	log*AIS*
Post×Treated	**-31.627*** **	**-0.135*** **	**-21.040*** **	**-0.081** **	**-19.229** **	**-0.084** **
	(-3.87)	**(-3.56)**	**(-2.64)**	**(-2.16)**	**(-2.36)**	**(-2.37)**
Post	-26.948***	-0.149***	-11.621*	-0.054*	-8.969	-0.039
	(-4.03)	(-4.60)	(-1.87)	(-1.81)	(-1.35)	(-1.38)
Treated	33.633***	0.183***	23.185***	0.127***	19.977***	0.105***
	(5.01)	(5.66)	(3.61)	(4.11)	(3.14)	(3.84)
Firm Controls	No	No	Yes	Yes	Yes	Yes
Loan Controls	No	No	No	No	Yes	Yes
Year&Industry FE	No	No	No	No	Yes	Yes
N	5,310	5,310	5,006	5,006	4,001	4,001
adj. R^2	0.184	0.190	0.320	0.351	0.386	0.445

Table 6: DiD Tests: The Post-IPO Reduction in Borrowing Costs and IPO Underpricing

This table examines the relationship between the benefit of going public and IPO underpricing. The sample consists of 4,545 unique bank loans in 1987-2016, each of which is issued by an IPO firm between 3 years before IPO and 3 years after IPO. We run the following DiD regression:

$$\log AIS = \alpha + \beta \cdot \textit{Post} + \gamma \cdot \textit{Post} \times \textit{Underpricing\_D} + \lambda \cdot \textit{Underpricing\_D} + \Gamma \cdot \mathbf{X}' + FEs + \epsilon$$

The dependent variable is the loan interest spread, either log*AIS* or *AIS*, indicated by column headers. *Post* is a dummy variable that equals to one if the loan is issued after the firm goes public. *Underpricing_D* is a dummy that equals to one if the IPO is underpriced. In Column (1) to Column (2), we examine the differences in borrowing costs for firms with underpricing and firms without underpricing, captured by the coefficient of the interaction term, *Post*×*Underpricing_D*. In Columns (3)-(4), we compare the differences in borrowing costs for firms with high underpricing and low underpricing, where *High Underpricing* is a dummy variable that equals one if the firm's IPO underpricing is above the sample median. In Columns (5)-(6), we test the differences in borrowing costs for firms in the top one-third underpricing and bottom two-thirds underpricing, where *Top Underpricing* is a dummy variable that equals one if the firm's IPO underpricing is in the top tercile. In all columns, underpricing is defined by either the percentage change (indicated by column header, %) of the first-day closing price relative to the offer price or the dollar amount of money left on the table (indicated by column header, $). For the dummy *Underpricing_D*, both definitions of underpricing generate the same results. We include industry, year and loan purpose fixed effects, and a list of IPO, firm and loan characteristics as controls. All variables are winsorized at the 1^{st} and 99^{th} percentiles, and are summarized in Appendix I. The model is estimated using OLS. Standard errors are clustered at the firm level to correct for heterogeneity and t-values are presented in parentheses. *, **, and *** indicate that the coefficient is statistically significant at the 10%, 5%, and 1% levels, respectively.

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	(1)	(2)	(3)	(4)	(5)	(6)
Underpricing defined in	% or $		%	$	%	$
Y-variable	log*AIS*	*AIS*	log*AIS*	log*AIS*	log*AIS*	*AIS*
Post×Underpricing_D	**-0.150*** **	**-29.554*** **				
	(-3.08)	**(-2.80)**				
Underpricing_D	0.045	8.794				
	(1.11)	(1.01)				
Post×High Underpricing			**-0.100** **	**-0.139*** **		
			(-2.53)	**(-3.56)**		
High Underpricing			0.049	0.084**		
			(1.58)	(2.54)		
Post×Top Underpricing					**-0.093** **	**-0.114*** **
					(-2.31)	**(-2.79)**
Top Underpricing					0.060**	0.054
					(1.99)	(1.59)
Post	-0.054	-17.881*	-0.121***	-0.100***	-0.140***	-0.131***
	(-1.25)	(-1.91)	(-4.00)	(-3.37)	(-5.37)	(-5.16)
VC-backed IPO	0.057*	12.713*	0.052*	0.047	0.050*	0.051*
	(1.95)	(1.91)	(1.78)	(1.59)	(1.68)	(1.71)
log(Gross Proceedings)	-0.072***	-13.530***	-0.077***	-0.077***	-0.078***	-0.073***
	(-3.92)	(-3.08)	(-4.09)	(-4.01)	(-4.17)	(-3.62)
log(Book Assets)	0.010	2.921	0.013	0.013	0.014	0.011
	(0.67)	(0.85)	(0.89)	(0.86)	(0.92)	(0.77)
Book Leverage	0.258***	49.492***	0.260***	0.266***	0.261***	0.261***
	(5.47)	(4.26)	(5.47)	(5.65)	(5.47)	(5.48)
Tangibility	-0.012	-6.197	-0.011	-0.004	-0.012	-0.009
	(-0.20)	(-0.51)	(-0.19)	(-0.07)	(-0.22)	(-0.16)
Profitability	-0.231**	-89.367***	-0.239**	-0.224**	-0.236**	-0.235**
	(-2.48)	(-4.22)	(-2.57)	(-2.41)	(-2.51)	(-2.50)
Cash-to-assets Ratio	0.092	2.614	0.088	0.092	0.087	0.087
	(1.14)	(0.14)	(1.10)	(1.14)	(1.08)	(1.08)
log(Firm Age)	-0.020*	-5.041**	-0.021**	-0.021**	-0.021*	-0.021**
	(-1.94)	(-2.10)	(-1.97)	(-2.00)	(-1.92)	(-2.01)
log(Loan Amount)	-0.081***	-16.757***	-0.081***	-0.083***	-0.082***	-0.083***
	(-8.12)	(-7.32)	(-8.12)	(-8.26)	(-8.18)	(-8.23)
log(Maturity)	0.033*	3.489	0.034*	0.033*	0.035*	0.035*
	(1.74)	(0.85)	(1.80)	(1.74)	(1.88)	(1.84)
Secured	0.548***	70.308***	0.550***	0.552***	0.549***	0.549***
	(11.32)	(8.80)	(11.27)	(11.38)	(11.26)	(11.29)
Covenant	-0.087***	-27.365***	-0.086***	-0.085***	-0.089***	-0.084***
	(-3.22)	(-4.12)	(-3.14)	(-3.18)	(-3.24)	(-3.14)
All Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	3,211	3,211	3,211	3,211	3,211	3,211
adj. R^2	0.431	0.374	0.429	0.431	0.429	0.429

Table 7: Non-linear Association between the Post-IPO Reduction in Borrowing Costs and IPO Underpricing

This table investigates the non-linear association between the post-IPO reduction in borrowing costs and IPO underpricing. The sample consists of 4,552 unique bank loans in 1987-2016, each of which is issued by an IPO firm between 3 years before IPO and 3 years after IPO. The dependent variable is the logarithm of all-in-spread-drawn (AIS), log*AIS* in Column (1) and Column(3), and *AIS* in Column (2) and Column (4), indicated by column headers. *Post* is a dummy variable that equals to one if the loan is issued after the firm goes public. In Column (1) and Column (2), we examine the linear relationship between the reduction in AIS after firm goes public and IPO underpricing using an interaction term *Post*×*Underpricing*, where *Underpricing* is a continuous variable measuring the percentage change in first-day closing price relative to offer price; In Column (3) and Column (4), we additionally add the squared term of underpricing, *Underpricing*^{2} and the interaction between *Post* and *Underpricing*^{2}, *Post*×*Underpricing*^{2}. In all columns, we control for IPO, firm and loan characteristics, as well as industry and year fixed effects. All variables are winsorized at the 1^{st} and 99^{th} percentiles, and are summarized in Appendix I. The model is estimated using OLS. Standard errors are clustered at the firm level to correct for heterogeneity and t-values are presented in parentheses. *, **, and *** indicate that the coefficient is statistically significant at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Y-Variable	log*AIS*	*AIS*	log*AIS*	*AIS*
Post×Underpricing	**-0.002***	**-0.402***	**-0.006*****	**-1.209****
	(-1.71)	**(-1.75)**	**(-2.60)**	**(-2.49)**
Underpricing	0.002**	0.345*	0.004**	0.891**
	(1.99)	(1.70)	(2.24)	(2.20)
Post×Underpricing^2			0.000**	0.013**
			(2.27)	(2.30)
Underpricing^2			-0.000*	-0.008*
			(-1.85)	(-1.88)
Post	-0.148***	-35.726***	-0.128***	-31.739***
	(-5.77)	(-6.29)	(-4.60)	(-5.08)
Other Controls	Yes	Yes	Yes	Yes
All Fixed Effects	Yes	Yes	Yes	Yes
N	3,211	3,211	3,211	3,211
adj. R^2	0.428	0.372	0.429	0.373

Table 8: Effects on the Post-IPO Reduction in Borrowing Costs: Underpricing vs. Price Revision

This table compares the differences between the effects of underpricing and price revision on the post-IPO reduction in borrowing costs. The dependent variable is the logarithm of all-in-spread-drawn (AIS), log*AIS*. *Post* is a dummy variable that equals one if the loan is issued after the firm goes public. *Underpricing_D* is a dummy that equals to one if the IPO firm has a positive underpricing, defined as the percentage change of the first-day closing price relative the offer price. *Price Revision_D* is a dummy that equals to one if the IPO adjusts its offer price upwards from the midpoint filing price. In Columns (1) to (3), we examine the linear relationship between underpricing or price revision on the reduction in borrowing costs; while in Columns (4) to (6), we compare the differences in the nonlinear relationship of the two (underpricing and price revision) on post-IPO AIS reduction by adding *Post*×*Underpricing*^{2} and *Post*×*Price Revision*^{2}. We also include industry, year and loan purpose fixed effects, and a list of IPO, firm and loan characteristics. All variables are defined in Appendix I. The model is estimated using OLS. Standard errors are clustered at the firm level to correct for heterogeneity and t-values are presented in parentheses. *, **, and *** indicate that the coefficient is statistically significant at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Y-Variable	log*AIS*	log*AIS*	log*AIS*	log*AIS*	log*AIS*	log*AIS*
Post×Underpricing_D	**-0.150*** **		**-0.171*** **			
	(-3.08)		**(-3.34)**			
Underpricing_D	0.045		0.044			
	(1.11)		(1.05)			
Post×Price Revision_D		**0.000**	**0.051**			
		(0.01)	**(1.27)**			
Price Revision_D		0.021	0.008			
		(0.66)	(0.26)			
Post×Underpricing				**-0.006*** **		**-0.006** **
				(-2.60)		**(-2.50)**
Underpricing				0.004**		0.005**
				(2.24)		(2.39)
Post×Underpricing^2				0.000**		0.000**
				(2.27)		(2.26)
Underpricing^2				-0.000*		-0.000**
				(-1.85)		(-2.05)
Post×Price Revision					**-0.001**	**0.001**
					(-0.95)	**(0.40)**
Price Revision					0.001	-0.001
					(0.50)	(-0.73)
Post×Price Revision^2					-0.000	-0.000
					(-0.79)	(-0.15)
Price Revision^2					0.000	0.000
					(1.62)	(0.80)
Post	-0.054	-0.171***	-0.060	-0.128***	-0.164***	-0.120***
	(-1.25)	(-6.20)	(-1.38)	(-4.60)	(-6.94)	(-3.90)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
All Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	3,211	3,213	3,208	3,211	3,213	3,208
adj. R^2	0.431	0.426	0.431	0.429	0.427	0.428

Table 9: Controlling Other Factors that Affect Underpricing

This table reports robustness analyses for the regressions in Table 6. The dependent variable is the logarithm of all-in-spread-drawn (AIS), log*AIS*. *Post* is a dummy variable that equals one if the loan is issued after the firm goes public. *Underpricing_D* is a dummy that equals to one if the IPO firm has a positive underpricing, defined as the percentage change of the first-day closing price relative the offer price. *Price Revision_D* is a dummy that equals to one if the IPO adjusts its offer price upwards from the midpoint filing price. In addition to the interaction terms between *Post* and the underpricing and price revision dummies, we include the interaction terms between *Post* and *Underwriter Ranking* in Column (1), *VC-backed IPO* in Column (2), log*(*Gross Proceedings) in Column (3), log(*Book Assets*) in Column (4), log(*Sales*) in Column (5), *IPO Age* in Column (6), and all these factors in Columns (7). These factors are important drivers of IPO underpricing, documented in the literature. The individual terms of the interaction terms are included, but not reported. We also include industry, year and loan purpose fixed effects, and a list of IPO, firm and loan characteristics. All variables are defined in Appendix I. The model is estimated using OLS. Standard errors are clustered at the firm level to correct for heterogeneity and t-values are presented in parentheses. *, **, and *** indicate that the coefficient is statistically significant at the 10%, 5%, and 1% levels, respectively.

Y-Variable	(1) log*AIS*	(2) log*AIS*	(3) log*AIS*	(4) log*AIS*	(5) log*AIS*	(6) log*AIS*	(7) log*AIS*
Post× Underpricing_D	**-0.171*** **	**-0.171*** **	**-0.171*** **	**-0.171*** **	**-0.158*** **	**-0.171*** **	**-0.156*** **
	(-3.34)	**(-3.34)**	**(-3.34)**	**(-3.34)**	**(-3.13)**	**(-3.37)**	**(-3.05)**
Post× Underwriter Ranking	-0.029**						-0.038**
	(-1.98)						(-2.16)
Post× VC-backed IPO		0.004					-0.009
		(0.09)					(-0.20)
Post× log(Gross Proceedings)			-0.006				-0.003
			(-0.33)				(-0.10)
Post× log(Book Assets)				0.001			0.061**
				(0.09)			(2.00)
Post× log(Sale)					-0.016		-0.050**
					(-1.22)		(-1.99)
Post× IPO Age						-0.028	-0.013
						(-1.47)	(-0.63)
Post× Price Revision_D	0.058	0.051	0.053	0.051	0.044	0.050	0.049
	(1.42)	(1.26)	(1.29)	(1.27)	(1.09)	(1.25)	(1.18)
Post	0.177	-0.060	-0.031	-0.066	0.030	0.039	0.249*
	(1.44)	(-1.39)	(-0.36)	(-0.82)	(0.35)	(0.54)	(1.89)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3,202	3,208	3,208	3,208	3,197	3,208	3,191
adj. R^2	0.432	0.431	0.431	0.431	0.435	0.432	0.437

Table 10: Two-stage Analyses: Evidence from Exogenous Variations of IPO Underpricing

This table examines the relationship between the benefit of going public and IPO underpricing through two-stage least square estimations. The instrumental variable for Column (1) to (3) is Pr*(Underpricing)* , the fitted value estimated from a Probit model regressing *Underpricing_D* on the 3-week Nasdaq return before IPO. We further use its interaction with *Post*, *Post* $\times$ Pr(*Underpricing*) as our instrument for *Post* $\times$ *Underpricing_D*. In Column (1) to (2), we report the first-stage regressions, where the dependent variable is *Underpricing_D* and *Post* $\times$ *Underpricing_D* respectively. In both columns, we report the F-statistics at the bottom and include the same control variables as in the corresponding second-stage regressions. Column (3) presents our second-stage estimation, where the dependent variable is the logarithm of all-in-spread-drawn (AIS), log*(AIS)*. The independent variables include the instrumented *Underpricing_D* and instrumented *Post* $\times$ *Underpricing_D*, as well as a set of control variables specified in Equation (5). Columns (4) to 6) replicate Columns (1) to (3), but replace 3-week Nasdaq return with 1-week Nasdaq return prior to IPO to calculate our instruments. All variables are winsorized at the 1^{st} and 99^{th} percentiles, and are summarized in Appendix I. Standard errors are clustered at the firm level to correct for heterogeneity and t-values are presented in parentheses. *, **, and *** indicate that the coefficient is statistically significant at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Pre-issue Return used	3-week Nasdaq return			1-week Nasdaq return		
	1st Stage		2nd Stage	1st Stage		2nd Stage
Y-Variable	Underpricing_D	Post×Underpricing_D	log*AIS*	Underpricing_D	Post×Underpricing_D	log*AIS*
Pr(Underpricing)	**0.944*** **	0.027		**0.933*** **	-0.030	
	(15.44)	(0.60)		**(15.02)**	(-0.64)	
Post×Pr(Underpricing)	-0.027	**1.060*** **		0.033	**1.057*** **	
	(-0.60)	**(19.99)**		(0.46)	**(19.76)**	
Underpricing			0.117*			0.086
			(1.74)			(1.26)
Post×Underpricing			**-0.169** **			**-0.163** **
			(-2.34)			**(-2.24)**
Post	-0.069	-0.075*	-0.039	-0.068	-0.071*	-0.044
	(-1.22)	(-1.76)	(-0.68)	(-1.19)	(-1.65)	(-0.76)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
All Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	2,922	2,922	2,922	2,922	2,922	2,922
1st Stage F-Stat.	216.56	335.09		205.49	327.25	
2nd Stage Wald χ^2			385.11			366.89
p-value of χ^2			0.00			0.00

Table 11: Cross-sectional Analyses

This table examines the cross-sectional difference of the association between the benefit of going public and IPO underpricing. The full sample consists of 4,552 unique bank loans in 1987-2016, each of which is issued by an IPO firm between 3 years before IPO and 3 years after IPO. The dependent variable is log*AIS*. *Post* is a dummy variable that equals to one if the loan is issued after the firm goes public. *Underpricing_D* is a dummy that equals to one if the IPO firm has a positive underpricing, defined as the percentage change of the first-day closing price relative the offer price. Columns (1) and (2) use subsamples with *Young* and *Old* firms respectively, indicated by column headers. We define young firms as those with a firm age belong to the top tercile of our sample, and old firms as those with a firm age belong to the bottom tercile of our sample. Columns (3) and (4) use subsamples with high-tech and non-high-tech firms respectively. We define high-tech firms as those in industries with the following SIC codes: 2087, 3851, 3999, 5045, 7389, 229, 261, 267, 281-4, 286-9, 299, 335-6, 348-9, 351, 353-9, 361-7, 369, 371-6, 379, 381-2, 384, 386, 737, 871, 873-4, 899, 30, and 48. We include industry, year and loan purpose fixed effects, and a list of IPO, firm and loan characteristics as controls. All variables are defined in Appendix I. The model is estimated using OLS. Standard errors are clustered at the firm level to correct for heterogeneity and t-values are presented in parentheses. *, **, and *** indicate that the coefficient is statistically significant at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
	Firm Age at IPO		High-tech Firms	
	Young	Old	Yes	No
Post×Underpricing_D	**-0.228*** **	**-0.046**	**-0.211*** **	**-0.080**
	(-2.96)	**(-0.59)**	**(-2.83)**	**(-1.32)**
Post	-0.043	-0.137*	-0.048	-0.080
	(-0.60)	(-1.90)	(-0.74)	(-1.45)
Underpricing_D	0.024	-0.015	0.129**	-0.058
	(0.33)	(-0.28)	(2.01)	(-1.17)
Difference	0.182*		0.131	
p-value (Wald-test)	0.080		0.161	
Other Controls	Yes	Yes	Yes	Yes
All Fixed Effects	Yes	Yes	Yes	Yes
N	1126	1061	1275	1950
adj. R^2	0.419	0.530	0.461	0.422