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The Effect of Banking Relationships on the Firm's IPO Underpricing

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ABSTRACT

This paper investigates the effects of pre-IPO banking relationships on a firm's IPO. Using a new and unique data set, which compares the firm's pre-IPO banking relationships to the underwriters managing the firm's new issue, I test whether banking relationships established before the firm's IPO ameliorate asymmetric information problems behind high IPO underpricing. The results show that firms with a pre-IPO banking relationship with a prospective underwriter face about 17% lower underpricing than firms without such banking relationships. These results are robust to controlling for the firm's endogenous selection of the pre-IPO banking institution.

THIS PAPER INVESTIGATES whether having an established relationship with a bank that can manage IPOs, prior to a firm's IPO, affects the firm's IPO underpricing. When firms go public, the market and the firm are asymmetrically informed about the true value of the firm. Many theorists claim that this asymmetric information problem is to blame for the underpricing of IPOs.[1] A different strand of the finance literature examines the implications of lending relationships: When a bank lends to a firm, it obtains proprietary, firm-specific information that cannot be easily and credibly conveyed to others.[2]

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[1] See, for instance, Allen and Faulhaber (1989), Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), Grinblatt and Hwang (1989), Rock (1986), and Welch (1989, 1992).

[2] See, for example, Chemmanur and Fulghieri (1994a, b), Diamond (1984, 1991), James (1987), Petersen and Rajan (1994, 1995), Rajan (1992), Sharpe (1990), Stein (2002), and Stiglitz and Weiss (1981).

Thus, lending relationships may reduce asymmetric information problems between a firm and its bank.

This paper focuses on the intersection of these two literatures. It asks whether lending relationships established prior to the firm's IPO can mitigate the asymmetric information problem that first-time issuing firms face, and consequently reduce IPO underpricing.

Before the effective repeal of the Glass–Steagall Act, commercial banks with close ties to their client firms could not underwrite those firms' equity issues. This hampered the type of empirical research I propose in this paper. With the effective repeal of the Act in 1998, some commercial banks began underwriting equity issues either directly (after 1999 when the Glass–Steagall Act was formally overruled) or indirectly through their Section 20 subsidiary (between late 1997 and 1999, when the firewalls between the commercial bank and its Section 20 subsidiary tumbled). This change in regulation is the identifying event that allowed me to build a new dataset that I use to test whether firms with established relationships with banks that have underwriting abilities indeed suffer less of an asymmetric information problem when going public, and consequently face a lower IPO underpricing.[3]

It has been repeatedly shown that for most IPOs, shares start trading well below their market value, allowing huge profit opportunities to be exploited.[4] Many theorists have turned to the asymmetric information problem regarding the issuing firm's value as the cause for this anomaly. The theoretical models differ in the assumed information structure. Rock (1986) assumes that only a

[3] The Glass–Steagall Act, enacted in 1933, was officially overruled on November 12, 1999, by the Gramm–Leach–Bliley Financial Modernization Act. Though it is commonly said that the Glass—Steagall Act was *effectively repealed* by the Gramm–Leach–Bliley Act, technically, the Glass—Steagall Act was *overruled* by the Gramm–Leach–Bliley Act. The latter Act overruled the restrictions on banks affiliating with securities firms contained in Sections 20 and 32 of the Glass–Steagall Act. These restrictions essentially prohibited commercial banks, and their subsidiaries, from engaging in investment banking activities. Since 1997, before the Glass–Steagall Act was officially overruled, some commercial banks were managing debt issues for their clients through their Section 20 subsidiaries. This was permitted under a set of firewall restrictions. These restrictions were meant to hinder the flow of information between the commercial bank and its investment banking subsidiary as a way of protecting the market from potential conflicts of interest arising when commercial banks manage their clients' debt or equity issues. In 1997, a significant number of debt issues were underwritten by the Section 20 subsidiary of commercial banks, but an insignificant number of equity issues underwritten by these subsidiaries (see Gande et al. (1997), Gande, Puri, and Saunders (1999)). I observed an increasing number IPOs underwritten by the Section 20 subsidiary of the commercial bank that lent to the firm, in 1998. I did not find a significant number of commercial banks underwriting equity issues until the beginning of 2000. For more on the Glass–Steagall Act, see Puri (1996, 1999), Kroszner and Rajan (1994, 1997), Kroszner (1998), and Benzoni and Schenone (2004).

[4] These findings begin with Logue (1973), Ibboston (1975), and Ritter (1984). See also Jenkinson and Ljungqvist (1996), and Ritter and Welch (2002). There is a price run-up even before the opening of the IPO trades: Aggarwal and Conroy (2000) look at the pre-opening period (the 5 minutes before the stock is offered) for Nasdaq IPOs, and show that even between the offer price and the price of the first trade, there is a large price run-up as the market tries to discover the stock's price.

random group of investors are informed about the firm's value, but that neither the firm nor its underwriting bank, nor the remaining investors know the firm's true value; in this scenario, underpricing compensates these uninformed investors for their biased purchases of lower value firms.[5] Benveniste and Spindt (1989) and Benveniste and Wilhelm (1990) also assume that both the underwriting bank and the firm are uninformed about the firm's true value, but they further assume that there are some investors who repeatedly interact with the investment bank, who are informed about the firm's prospects. In this scenario, underpricing compensates informed investors for revealing their private information to the investment bank. Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989, 1992) assume that the issuing firm is the only informed party in the IPO. Underpricing is the costly signal that high-quality firms choose to separate themselves from low-quality firms.

In all of these models, the underwriting bank is uninformed about the firm's value. I ask in this paper: Does having a pre-IPO banking relationship with a prospective underwriter affect the firm's IPO underpricing?

If banking relationships reduce asymmetric information (between the relationship bank and the firm), and if asymmetric information between the IPO players (the firm, the underwriting bank, and the market) is behind IPO underpricing, then firms with a pre-IPO banking relationship with a potential underwriter might face less of an asymmetric information problem than an otherwise equal firm would face, and consequently might exhibit lower IPO underpricing. This hypothesis is developed further in the next section. I test this hypothesis using a new and unique dataset that I constructed, which matches the firm's pre-IPO banking institution with the firm's IPO underwriter. In particular, I can establish whether the firm's pre-IPO bank *could have managed* the firm's IPO, and further *whether it did manage it or not*. The results reveal that firms with an established banking relationship with a bank that could have taken the firm public exhibit 17% lower underpricing than firms without a banking relationship with a potential IPO underwriter. I further distinguish different types of banking relationships: Underwriting relationships, where the relationship bank underwrote the firm's prior debt issue (e.g., it managed a public or private debt placement); and lending relationships, where the bank lent its own funds to the firm (e.g., term loans and revolver loans). The reason for distinguishing between these types of relationships is that lending relationships might generate more information than underwriting relationships. Since the lending bank has a stake in the borrowing firm but the underwriting bank does not, the

[5] The investors who are informed about the value of one deal may not be informed about the value of some other deal. In this sense, it is a random group of investors who are informed about the firm's value: It is not always the same group of investors who have information about the issuing firms. This is in contrast to Benveniste and Spint (1989) and Benveniste and Wilhelm (1990) in which the group of investors who are informed about the firm's value is always the same: it is the group of the institutional investors who always hold information about issuing firms.

lending relationship bank has a stronger incentive to screen and monitor the borrower more closely, thus generating more information than would be generated by a bank that underwrote the firm's prior debt issue. Though both types of relationships established prior to the firm's IPO might help reduce asymmetric information and thus underpricing, the effects of each type of relationship need not be the same. The results are consistent with this: *Lending* relationships reduce underpricing by about 16 to 17%, while *underwriting* relationships have a much smaller impact on underpricing.

There has been empirical support for the hypothesis that asymmetric information leads to high IPO underpricing. Michaely and Shaw (1994) test Rock's model and find that in markets where uninformed investors know a priori that they do not have to compete with informed investors, IPOs are not highly underpriced. Muscarella and Vetsuypens (1989) find that underpricing is lower in issues where asymmetric information is low, such as in self-marketed IPOs and IPOs of reverse leveraged buyouts. Cornelli and Goldreich (2002, 2003), and Aggarwal, Prabhala, and Puri (2002) find evidence that investment banks compensate institutional investors for revealing information about the issuer through a higher allocation of underpriced shares, as predicted by the book-building theories.[6]

James and Wier (1990) point out that *issuing private debt claims* before issuing stock signals to the market that the firm is of high-value since only high-value firms apply for, and are granted, inside debt. The authors' hypothesis is that this signal reduces asymmetric information, thus lowering IPO underpricing. The authors look at whether the firm had a bank loan (without specifying the identity of the lender) and show that firms with inside debt at the time of the IPO, exhibit lower IPO underpricing. By contrast, my paper identifies the lender and looks at the effects of having *a pre-IPO relationship with a potential underwriter*. When James and Wier wrote their paper, commercial banks were restrained from managing equity issues by the Glass–Steagall Act. With the effective repeal of the Glass–Steagall, the bank from which the firm borrowed prior to the IPO can potentially manage the firm's issue. This allows me to test whether having an established banking relationship with a potential underwriter reduces IPO underpricing.

Regarding the consequences of lending relationships, Rajan (1992) shows that they generate valuable information, including soft data such as the firm's prior projections, its ability to meet established targets, and the reliability and competence of the firm's managers. Stein (2002) argues that the distinguishing characteristic of small-business lending is precisely that it relies on this soft data generated by the lending institution, for example, the loan officer learning that the borrowing-firm's manager is honest and hard working. Petersen and Rajan (1994) show that lending relationships reduce the asymmetric information problem between the firm and the lending bank, with the positive effect of expanding the firm's credit availability. Chemmanur and Fulghieri (1994a)

[6] Aggarwal (2003), Ljungqvist and Wilhelm (2002), and Hanley and Wilhelm (1995) also find evidence consistent with the book-building theory.

show that banks have an incentive to devote many resources to monitoring and following their borrowing-firm's activities, since doing so enables them to build a reputation for making the right decision on whether to liquidate the firm or renegotiate its loan when firms undergo financial distress.

There are other hypotheses explaining the underpricing of IPOs that do not rely on asymmetric information between players in the IPO market. For instance, the literature claiming that underpricing is the device chosen by the firm's management to attain a desired ownership structure. Since high underpricing leads to excess demand, and this leads to rationing of the newly issued shares, the management can choose to allocate shares in such a way that large ownership blocks are avoided. The consequent dispersed ownership would allow the entrenched management to keep control of the firm. See for instance, Stoughton and Zechner (1998). On the other hand, if management wants to induce better monitoring, it can choose a concentrated ownership, allocating shares in large blocks. See for instance, Brennan and Frank (1997). Asymmetric information is not relevant in either of these cases. My paper contrasts the asymmetric information hypotheses for underpricing of IPOs with the ownership and control hypotheses.

As discussed above, the identifying event for this study is the effective repeal of the Glass–Steagall Act, which enabled the commercial bank dealing with a firm to underwrite that firm's equity issue. Thus, my study begins when the Glass–Steagall Act ends: Since the Glass–Steagall Act was effectively overruled in 1998, my study begins in 1998. This means that my sample period partially overlaps with the Internet boom of 1999 and early 2000. Research by Ljungqvist and Wilhelm (2003) and Loughran and Ritter (2003) explains how and why underpricing during these years deviated significantly from historic levels.[7] The partial overlap of my sample period with the Internet boom, and the fact that during this period underpricing was significantly higher, deserves special consideration.

Ljungqvist and Wilhelm (2003) study the change in IPO pricing behavior during the Internet bubble years of 1999 and 2000. They show that the pre-IPO ownership structure of firms going public during the bubble years changed, relative to that of previous years, in such a way that the incentives of those in charge of bargaining a higher offer price with the underwriter were weaker. The authors suggest an agency explanation: Insiders bargain more for a higher offer price when their stakes in the firm are larger. The lower the insiders' stake for the Internet bubble IPOs, the lower the incentives for negotiating a higher offer price, hence the higher IPO underpricing. Using a unique dataset on insiders' stakes in the issuing firm, the authors find that underpricing was higher when insider stakes in the issuing firm were smaller and more fragmented, which they show was precisely the pre-IPO ownership structure of IPOs during the Internet bubble years.

Loughran and Ritter (2003) test the hypothesis that the issuer's objective function changed during the Internet bubble. They claim that during these

[7] See also Arosio, Giudici, and Paleari (2001) and Ofek and Richardson (2003).

years, issuers were willing to accept an underwriter who underpriced more in exchange for better analyst coverage after the IPO (the analysts hypothesis), and in exchange for the underwriter allocating shares of hot IPOs in the personal brokerage accounts of the venture capitalists and the executives of issuing firms (the corruption hypothesis). The authors find support for these hypotheses and thus for the view that, during this period, the issuing firm's objective function might have changed significantly with respect to what it was in the past.

The point of my paper is neither to study the Internet bubble years nor to study how underpricing changed during those years. My paper investigates whether having an established relationship with a bank that can manage IPOs affects the firm's subsequent IPO underpricing. To test whether information asymmetries between the issuing firm and a prospective IPO underwriter play a role in explaining IPO underpricing, it is necessary that the bank that knows the issuing firm actually can take the firm public. This was not possible until 1998, since before then the Glass–Steagall Act was binding, and commercial banks could not manage their clients' IPO. The effective repeal of the Glass–Steagall Act early in 1998 is the identifying event for this paper: Banks that lent to firms could now take these firms public. It is this change in regulatory restriction that provides an opportunity to test the proposed hypothesis. But this change in regulation overlaps with the Internet boom years, so I need to control for the different characteristics of IPOs during this period.

The results of my paper are robust to a series of checks, including controls for the Internet firms, high-tech firms, and some special characteristics of these firms. Also, I show that the results of my paper hold even if the Internet years (1999 and 2000) are excluded from the sample. Further, the particular time period of my sample offers a natural experiment setting for the hypothesis that I test: The firms in my sample chose their pre-IPO banking relationship prior to the repeal of the Glass–Steagall Act, and thus, when choosing their relationship bank, they did not account for the possibility that their choice of bank would affect their future underpricing. This means that the firm's choice of bank was exogenous. Today we would expect this choice of relationship to be endogenous, making the empirical study more difficult. This point will be further addressed in subsequent sections.

The rest of this paper is organized as follows. Section I describes the hypothesis and the identifying strategy behind the dataset I construct to test this hypothesis. Section II describes the dataset, and reports summary statistics for the characteristics of IPOs in my sample. Section III tests whether banking relationships established prior to the firm's IPO have an effect on the issuing firm's IPO underpricing. The basic result reported in Section III.A and in Table VI reveals that firms with established *banking* relationships have 17% lower underpricing than firms *without any* banking relationship with a potential IPO underwriter. The strength of this result is tested in Sections III.A.1 and III.B: The former performs several robustness checks and the latter controls

for firms endogenously selecting their pre-IPO banking institution. Given the revealed importance of the banking relationships, I distinguish between *lending* relationships (the bank lends its own funds to the firm) and *underwriting* relationships (the bank managed the firm's private or public debt issue, thus arranging for other market participants to lend to the firm) in Section IV. Section V discusses the results, and suggests open questions for future research. Finally, Section VI concludes.

I. The Hypothesis

If the issuing firm has an established relationship with a bank that can manage its IPO, then the asymmetric information justification for IPO underpricing is no longer tenable, and we would expect the firm to have a lower underpricing when going public.

There are three cases to consider. In the first case, the issuing firm has a relationship with a bank that can take it public and it goes public with this bank; in the second case, the firm could have gone public with its relationship bank, but instead goes public with another bank; in the third case, the issuing firm could not have gone public with its relationship bank (because the bank has no underwriting abilities).

When the banking institution with which the firm has an established relationship prior to the IPO subsequently manages the firm's IPO, that underwriting bank has an information advantage useful in pricing the firm's new issue. Furthermore, if all market participants know that the underwriting institution has superior information about the firm's value, then we would expect lower IPO underpricing. Why? Because in this scenario the investment bank does not need to underprice the IPO issue to compensate informed investors for revealing their private information, as in Benveniste and Spindt (1989) and in Benveniste and Wilhelm (1990). The investment bank already owns superior information about the firm's value. Furthermore, if the underwriter has superior information about the firm, then high-value firms will not need to underprice in order to reveal their value and convince investors to pay higher prices for their shares in future offerings, as in the signaling games of Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989, 1992). Because all investors know that the bank's reputation is at stake, and further, that the underwriting house has superior information about the firm's value, then when pricing the issue, the underwriting bank will separate firms according to their type based on its superior information. Finally, uninformed investors should not claim any compensation for participating in the IPO market, as in Rock (1986). Uninformed investors know that the price set by the underwriter is fully revealing.

If the firm had a relationship with a bank that could manage its IPO but it switched banks and went public with another bank, then IPO underpricing would also be expected to be low. This is because the issuing firm had the option of going public with the bank that had private information about its

value. If the firm switched banks and went public with one that did not know the firm, then the firm's type would be revealed to the market. At this point, asymmetric information would be lower and hence so would underpricing. To illustrate this, consider a simple framework.[8] Let there be two types of firms, low-value firms valued at θ_L and high-value firms valued at θ_H, and two types of banks, the relationship bank (informed about the firm's true value) and the nonrelationship bank (the uninformed bank). The uninformed bank competes with the informed one for underwriting the firm's IPO. Take the case of the low-value firm approaching its relationship bank. This bank knows the firm is worh θ_L. If the underwriter's reputation capital is large enough, it will offer to take the firm public, selling it for its worth: θ_L. Suppose this low-value firm approached the uninformed, nonrelationship bank. This bank does not know the true value of the firm. If this bank were to offer the issuing firm anything above θ_L, then the low-value firm would go public with the uninformed bank and the bank would lose its reputation.[9] If the reputation loss for selling a firm for more than its true value is large enough, the uninformed bank will not offer the firm approaching it anything above θ_L. Thus, in equilibrium, the uninformed bank offers firms approaching it θ_L, and hence only the low-value firms switch underwriters. In sum, the uninformed bank offers a low price to all firms that approach it: High-value firms will keep their relationship bank, while low-value firms would be indifferent between the informed relationship bank and the uninformed bank.[10] Thus when the market observes a firm switching banks, it immediately understands it to be a low-value firm. Thus asymmetric information is low for firms that switch banks, and consequently underpricing should be lower for these firms. Hence, the prediction that firms with an established relationship with a bank that can take them public but switch banks are expected to exhibit lower underpricing: Their offering is priced just as it would be if the firm had gone public with its inside bank. In either case, the firm receives θ_L, that is, the price corresponding to the low-value firm.

The last case to consider is when the relationship bank cannot take the firm public. This is the case of high asymmetric information, and thus high underpricing.

In sum, if asymmetric information regarding the firm's value is to blame for IPO underpricing, and if banking relationships mitigate the asymmetric information problem between the borrowing firm and its financial institution, then firms with an established banking relationship with banks that can underwrite IPOs should exhibit lower underpricing than firms that do not have, prior to their IPO, an established relationship with a bank that can potentially take the firm public. The new dataset I introduce in this paper allows me to test this hypothesis. Table I summarizes the prediction derived from this hypothesis.

[8] Available from the author upon request.

[9] That reputation loss from selling a firm for more than its worth is large seems to be the case, see, for instance, Chemmanur and Fulghieri (1994b) among others.

[10] The low-value firm is indifferent in terms of offer price; it might prefer to switch banks if, for instance, the analyst coverage of the uninformed bank is better than that of the informed bank.

Table I
The Effect of Pre-IPO Lending Relationships: The Predictions of This Paper

	The Relationship Bank Can Underwrite IPOs		The Relationship Bank Cannot Underwrite IPOs
	Does Underwrite	Does Not Underwrite	
Asymmetric information	LOW	LOW	HIGH
Underpricing	LOW	LOW	HIGH

A. Testing the Hypothesis

To test this hypothesis, I need to distinguish between firms that *could and actually did* go public with their relationship bank, and firms that *could have gone public with the relationship bank but did not*, and finally firms that *could not* have gone public with their bank. To classify firms into these three categories, I build a new and unique dataset. The effective repeal of the Glass–Steagall Act in 1998 allows me to construct this dataset (before the Act was effectively overruled, the firm's commercial bank could not take the firm public). The novelties introduced in this unique dataset are manifold. First, I establish the relation between the firm's IPO underwriter(s) and the banking institution(s) that served the firm prior to the IPO. Information on the firm's lending institution is readily available for public firms, but not for private ones. For each one of the 1,245 firms that went public between January 1, 1998, and December 31, 2000, I search Dealscan for the identity of the firm's lender prior to the IPO date. For 398 of these firms, I am able to identify which banking institution(s) served the firm for up to 5 years prior to the firm's IPO date. For these firms, I record *all* of the banking institutions that served them in those 5 years. From SDC, I obtain a list of all the institutions that managed the IPO (the book runner, the lead manager, and all other managers). At this point, for each firm, I have a list of all banks that had served the firm prior to its IPO and a list of all the banks that managed the IPO. I then check whether *any* of the banking institutions that assisted the firm prior to its IPO *could have been* one of the firm's IPO managers. This comparison needs careful thought, since until 1999, commercial banks could lend to firms but could not manage these firms' IPO directly: Between 1998 and 1999, commercial banks could underwrite equity issues only indirectly through the bank's Section 20 subsidiary. For instance, Bankers Trust NY Corp. could lend to a firm but could not manage the firm's IPO directly; it could only do so through its Section 20 subsidiary, BT Alex Brown Inc. Another example is Citigroup Inc.; it could lend to firms but could manage their clients' IPO only through Salomon Smith Barney Inc. Therefore, to compare whether *any* of the firm's lender(s) prior to the firm's IPO could have managed the firm's equity issue, I need a complete list of all Section 20 subsidiaries that operated at the time the firm went public.

With the complete list of commercial banks, their corresponding Section 20 subsidiary, and the date in which each subsidiary was authorized to begin activities, I compare whether the firm's previous lender could have managed the firm's IPO directly or indirectly through the bank's Section 20 subsidiary (e.g., a firm going public in 1998 that had a pre-IPO loan from Bank of America could have gone public with this bank's Section 20 subsidiary, Banc of America Securities LLC, since at the time the firm went public this subsidiary was operating).

I also study how firms that could and did go public with their relationship bank differ from firms that could have gone public with that bank but did not, and how they differ from firms that could not have been taken public with their relationship bank. To do this, I look for firms' characteristics. For firms that are private, this is a difficult task, because they do not need to report their financial data in readily available documents. To gather information on firms' assets, working capital, cash, revenues, profits, operating cash flow, total debt, and net income, I study the last amended IPO prospectus filed with the SEC for each of the 398 firms for which a banking relationship was previously identified, since in this prospectus the firms must report their balance sheet, income statement, and cash flow statement for the IPO year and the years prior to their IPO. Firms that do not report an entire year of data, or that report only the pro-forma statements, are excluded from my sample at this point, reducing the sample to a final number of 306 firms. I ultimately use this dataset to test whether, when the firm's pre-IPO relationship bank is a potential underwriter, the firm's IPO underpricing is reduced.

II. Data Description

A. The Sample

My sample consists of IPOs that occurred between January 1, 1998 and December 31, 2000, in which the contract between the underwriting bank and the issuing firm is a firm commitment contract. I exclude ADRs, closed-end funds, REITS and financial institutions, private placement, rights issues, and unit issues. Further, firms in my sample have at least one bank loan recorded in Dealscan prior to the firm's IPO. Finally, I require that a full year's data be reported in the last amended prospectus filed with the SEC.[11] My final sample consists of 306 firms. To see how my sample compares to those in previous research on IPOs, I compare the average per-year IPO underpricing in my sample with the average per-year IPO underpricing in Ritter's sample.[12]

[11] I use SDC only to obtain the list of issuing firms, the offer date, whether they were venture backed or not, the list of lead underwriters, book managers, and the set of all underwriters.

[12] The source for this is "Summary Statistics on 1975–2000 IPOs with an offer price of $5 or more" on Ritter's Website: http://bear.cba.ufl.edu/ritter/killian.pdf.

Firm i's underpricing is defined as

$$\text{Underpricing}_i = \frac{(\text{First closing price}_i - \text{Offer price}_i)}{\text{Offer Price}_i} * 100, \quad (1)$$

where the first closing price is taken from CRSP.[13] The per-year underpricing in my sample of 306 firms is slightly lower than that reported by Ritter.[14] Previous empirical work on IPOs reports that underpricing is negatively correlated with firm size. Thus, this suggests that firms in my sample are large relative to the pool of all IPO firms. This is predictable, since I require firms to have a banking relationship prior to their IPO, and this may generate some selection: I gather the largest firms of the set of all IPO firms, and these are the firms that exhibit the lowest IPO underpricing. This selection will work against me in seeking the predicted result (that firms without pre-IPO banking relationships with prospective underwriters have higher underpricing than firms with such relationships), since firms in my sample are less underpriced than the average of the IPO firms. Therefore, if using my sample of larger-than-average firms, I find that the firms without banking relationships with a potential underwriter exhibit greater underpricing than firms with such relationships, I am more than likely to find the same result using the population of all IPOs, which includes the smaller (and hence more underpriced) firms.

B. Identifying the Firm–Bank Relationship

To separate the firms into three groups, I define two categorical variables: *Could* and *Did*. If *at least one* of the banks that served the firm prior to the IPO could have been the firm's IPO underwriter (or if the Section 20 subsidiary of a bank that served the firm prior to the IPO could have managed the firm's IPO), I code the categorical variable as $Could = 1$. If none of the banks that served the firm prior to the IPO could have underwritten the firm's IPO, I set $Could = 0$.

For the cases in which the firm's relationship bank could have taken the firm public ($Could = 1$), I record whether at least one of these potential underwriters actually did underwrite the client firm's IPO. If this is the case, I record $Did = 1$; and if none of the relationship banks that could have underwritten the firm's IPO actually did it, I record this as $Did = 0$. Therefore, if $Could = 1$ and $Did = 1$, the firm went public with a bank that had private information about it. If $Could = 1$ and $Did = 0$, the firm switched banks: Although it could have gone

[13] When the price at the closing of the first trading day is missing, the closing price at the second trading day is used. First- and second-day prices were missing from CRSP for five firms, and the first or second closing price was taken from TAQ.

[14] The mean underpricing in my sample of 111 IPOs in 1998 is 16.95%, while it is 20.1% in Ritter's sample of 318 IPOs that year. The mean underpricing for the 128 firms going public in 1999 that belong to my sample is 66.79, while it is 68.6% in Ritter's sample of 491 IPOs in this year. Finally, the mean underpricing for my sample of 67 IPOs in 2000 is 50.42%, while it is 55.5% in Ritter's sample of 385 IPOs that year.

public with its relationship bank, it instead went public with a bank that did not have private information about the firm. Finally, if $Could = 0$, then the firm could not have gone public with its relationship bank.[15]

The share of firms in the sample that had a relationship with a bank that could take them public and actually were taken public by that bank, $Could = 1$ and $Did = 1$, is 30.4%. The share that switched banks, $Could = 1$ and $Did = 0$, is 18.3%. The remaining 51.3% of the firms in my sample had a relationship with a bank that could not take them public, $Could = 0$. Table II compares underpricing across these three firm categories.[16]

These univariate results show that:

1. The mean underpricing for firms that, although able to go public with their relationship bank, went public with another bank (i.e., those flagged with $Could = 1$ and $Did = 0$) is 32.91% lower than the mean underpricing of firms that did not have the choice of going public with their relationship bank (i.e., those flagged with $Could = 0$). This difference is statistically significant at 1%.
2. The mean underpricing for firms that went public with their relationship bank (i.e., the $Could = 1$ and $Did = 1$ firms) is 37.08% lower than that of firms that did not have the choice of going public with their relationship bank (the $Could = 0$ firms). This difference is statistically significant at 1%.
3. Firms that could have gone public with their relationship bank but actually switched banks (i.e., the $Could = 1$ and $Did = 0$ firms) exhibit 4.17% higher mean underpricing than firms that went public with their

[15] I thank the referee for suggesting ways of constructing continuous versions of *Could* and *Did* based on the volume of underwriting activity and based on the underwriter's market share. The results obtained using these continuous versions of *Could* and *Did* are consistent with those obtained using the binary variables defined above.

[16] Note that I began with 1,245 firms that went public between 1998 and 2000 and satisfied the standard requirements. Of these, there are 306 firms for which I can identify a pre-IPO banking relationship and further collect firm characteristics for the IPO year. These are the firms that belong to my sample. The remaining 939 firms belong to the complement of my sample, and it is for these firms that I have no systematic way of determining whether they had, or did not have, a banking relationship before going public. I thank the referee for pointing out that considerable uncertainty, and hence underpricing, should affect firms with no banking relationship. This is indeed a prediction of my paper. But not all firms in the complement of my sample are firms without a banking relationship prior to the IPO; they might have a small loan that Dealscan does not record, since this database only records loans over 100,000 U.S. dollars. Still, I compare the underpricing of the firms in my sample (those with clearly identified banking relationships) with those in the complement of my sample (those without identified banking relationships). The mean underpricing of firms in my sample is 45.13%, and for those in the complement of my sample it is 54.97%. The difference in underpricing is −9.85% and it is marginally significant (t-statistic on the difference is −1.58). Restricting the comparison to the set of firms with zero debt in the IPO year, the difference in the means is −19.73, and a test of the equality of the means rejects the null hypothesis at 10% (the t-statistic is −1.84 and the p-value is 0.067).

Table II
Underpricing Across the Three Firm Categories

Underpricing is measured as the first day price run-up[a]: where the first trading day closing price is taken from CRSP; where unavailable in CRSP, it is taken from TAQ. I will say that a bank *serves* the firm when the bank granted the firm a loan, or when the bank managed a public or private debt issue for the firm. Information on the identity of the firm's pre-IPO bank, and on the particular service that the bank grants the firm, has been manually collected from the Dealscan database. I define $Could = 1$ if at least one of the banks that served the firm prior to the firm's IPO could have been the firm's IPO underwriter; or if the Section 20 subsidiary of a bank that served the firm prior to the IPO could have managed the firm's IPO. If none of the banks that served the firm prior to the IPO could have underwritten the firm's IPO, then $Could = 0$. The variable $Did = 1$ when at least one of these potential underwriters actually did underwrite the client firm's IPO. If none of the relationship banks that could have underwritten the firm's IPO actually did it, I record this as $Did = 0$. Therefore, if $Could = 1$ and $Did = 1$, the firm went public with its pre-IPO relationship bank, i.e., with the bank that had private information about it. If $Could = 1$ and $Did = 0$, the firm switched banks: Although it could have gone public with its relationship bank, it instead went public with an outside bank. If $Could = 0$, then the firm could not have gone public with its relationship bank.

	$Could = 1$		
Underpricing	$Did = 1$	$Did = 0$	$Could = 0$
Mean*	25.34	29.51	62.42
(Standard deviation)	(42.18)	(66.01)	(91.70)
Min	−13.64	−32.81	−24.43
Max	229.17	357.24	697.50
Median	11.54	9.77	27.08
No. of observations	93	56	157
Sample (%)	30.39	18.30	51.31

[a]Underpricing $= \frac{\text{First day closing price} - \text{Offer Price}}{\text{Offer Price}} * 100$.

*Significantly different at the 1% level between firms for which $Could = 1 = Did$ and firms for which $Could = 0$ (columns 1 and 3). Also significantly different at 1% between firms for which $Could = 1$ and $Did = 0$ and firms for which $Could = 0$ (columns 2 and 3). Not significantly different between firms for which $Could = 1$ and $Did = 0$ and firms for which $Could = 1 = Did$ (columns 1 and 2).

relationship bank (i.e., the $Could = 1$ and $Did = 1$ firms). As predicted, this is statistically insignificant and economically small. Recall that the hypothesis of this paper predicts that what helps to reduce asymmetric information, and hence underpricing, is that the firm had a pre-IPO banking relationship with a potential underwriter, but whether the firm did or did not go public with this relationship bank has no significant effect on asymmetric information and hence on underpricing.

These monotonic relationships do not account for other firm characteristics that could also be driving the firm's IPO underpricing. The following section studies firm characteristics and how firms differ, depending on whether they have a relationship with a bank that can manage IPOs or with one that cannot manage IPOs. I will use these characteristics in the multivariate analysis.

C. Firm Characteristics

I study the financial statements reported in the last amended prospectus filed with the SEC for each of the 306 firms in my sample to gather both soft and hard data on the firms in my sample.

Previous research has indicated that uncertainty regarding the issuing firm's value has a significant effect on the firm's IPO underpricing.[17] Studying the last amended prospectus filed with the SEC reveals important firm characteristics that describe the uncertainty about the firm's future prospects not previously considered in the literature. For instance, consider the firm's description of the use of IPO proceeds. Some firms are transparent, and precisely describe their intended uses for the IPO proceeds. In contrast, other firms state that they have not assigned the IPO proceeds to any specific use and further, that the allocation of such proceeds would be left entirely to the management's discretion. The first set of firms is attempting to solve the uncertainty surrounding the firm's projects while the second group is not. I create a categorical variable *Transparency* to distinguish between these two types of firms: *Transparency* equals 1 if the firm precisely describes the uses of its IPO proceeds and equals 0 otherwise. The Appendix describes the construction of this variable in more detail.

Table III summarizes some of the hard data I collected from the firm's prospectus. Note how firms with established banking relationships with a potential underwriter are significantly different from firms without this relationship and how firms that actually go public with their relationship bank are different from firms that switch banks.

The value of total assets, total debt, leverage, short-term and long-term debt, cash, working capital, revenues, and gross profits is significantly different (at the 1% level) between firms that could and did go public with their bank and firms that could not go public with their bank (columns one and three) and between firms that could and did go public with their bank and firms that could but did not go public with their bank (columns one and two). The value of total assets, total debt, long-term debt, revenues, and gross profits is significantly different (at the 1% level) between firms that could and did not go public with their bank and firms that could not go public with their bank (columns two and three). The value of shareholders' equity, cash-flows, short-term debt, and revenues is significantly different at the 10% level between firms that could and did go public with their bank and firms that could but did not go public with their bank (columns one and two).

These summary statistics suggest that firms that could and did go public with their relationship bank are larger than firms that could have been taken public by their bank but switched banks. These, in turn, are larger than those that could not be taken public by their bank: The value of assets, revenues, cash, and working capital is higher for the firms with banking relationships that extend to their IPO.

[17] See, for instance, Ritter (1984), Beatty and Ritter (1986), Muscarella and Vetsuypens (1989), Carter and Manaster (1990), and James and Weir (1990).

Table III

Summary Statistics for Firm Characteristics at the Time of the IPO

The data have been collected from the financial statements reported in the last amended prospectus filed with the SEC, and correspond to the last complete calendar year prior to the firm's IPO. They are recorded in thousands of U.S. dollars. Firm age is measured in years between inception and IPO date. *Could* equals 1 if the firm could have gone public with its relationship bank, and 0 otherwise. *Did* equals 1 if the firm did go public with its relationship bank, and 0 otherwise.

	Could = 1		
Firm Characteristics	*Did* = 1	*Did* = 0	*Could* = 0
Total assets***	1,033,532	148,131	30,170
	(2,784,841)	(267,030)	(44,759)
Total debt***	366,416	55,974	9,069
	(763,709)	(94,962)	(19,518)
Short-term debt*	21,485	7,580	2,876
	(66,196)	(20,074)	(8,064)
Long-term debt***	345,420	49,300	5,804
	(735,569)	(97,216)	(14,867)
Working capital[a]	127,270	9,177	6,667
	(417,890)	(59,371)	(11,352)
Cash[b]	55,051	8,863	5,626
	(173,551)	(14,299)	(7,256)
Shareholders equity[c]	260,813	23,987	2,466
	(1,158,361)	(115,446)	(18,889)
Revenues**	1,035,020	153,197	39,319
	(4,247,221)	(343,221)	(79,900)
Gross profits***	249,652	40,906	12,807
	(735,018)	(70,342)	(20,143)
Net income	41,302	114	−3,120
	(311,017)	(39,016)	(10,624)
Operating cash flow*	89,382	9,760	−935
	(440,098)	(49,553)	(16,145)
$\left(\frac{\text{Profits}}{\text{Revenues}}\right)$	−2.48	0.18	0.25
	(18.63)	(1.43)	(0.98)
$\left(\frac{\text{Total debt}}{\text{Total assets}}\right)^{c}$	0.56	0.38	0.34
	(0.40)	(0.48)	(0.99)
$\left(\frac{\text{Operating cash flow}}{\text{Total assets}}\right)$	0.01	−0.10	−0.01
	(0.16)	(0.65)	(2.59)
Firm age	9.47	9.49	7.62
	(13.28)	(12.21)	(9.06)
No. of observations	93 (30.4%)	56 (18%)	157 (51.31%)

[a]Significantly different at 1% between firms in columns 1 and 2 and 1 and 3.
[b]Significantly different at 5% between columns 2 and 3. Standard deviations reported in brackets.
[c]Significantly different at 5% between firms in columns 1 and 2 and 1 and 3.
*Significantly different across all firm categories at 10%; **significantly different across all firm categories at 5%; ***significantly different across all firm categories at 1%.

D. Firms That Could Have Gone Public with Their Banks, But Did Not

In this section, I look for evidence for the claim that firms that could have gone public with their bank but do not are revealed to be lower-value firms

than those that do go public with their relationship bank.[18,19] Recall that the claim is that when a firm goes public with a non-relationship bank, though it could have gone public with a relationship bank, this reveals information to the market, which reduces asymmetric information and hence lowers underpricing; in particular, the information that is revealed is that the firm is of low value (a θ_L firm in the notation of Section I).

As will be shown in Section III.B, the results of the Heckman estimation suggest that there is no self-selection of firms into the category $Could = 1$ and $Could = 0$. Thus, the distribution of firm's value is the same for those that could have gone public with their bank ($Could = 1$) and those that could not have gone public with their bank ($Could = 0$). I claim that firms that switch banks although they could have gone public with their relationship bank ($Could = 1, Did = 0$) are revealed to be lower-value firms than those that keep their relationship bank as their IPO underwriter ($Could = 1, Did = 1$). Thus, the lower end of the distribution of firms in the class $Could = 1$ is composed of firms that switch banks ($Could = 1$ and $Did = 0$). Furthermore, since firms that could not have gone public with their relationship bank ($Could = 0$) have the same distribution as the firms that kept their bank ($Could = 1$), the valuation of firms in this class must be higher than that of firms that could but did not go public with their relationship bank ($Could = 1, Did = 0$), since we are sampling for the whole distribution and not just the lower end of the distribution. This implies the following predictions:

$$\begin{aligned}\text{Valuation}_{Could=1=Did} &> \text{Valuation}_{Could=0} \\ &> \text{Valuation}_{Could=1 \text{ and } Did=0}.\end{aligned} \tag{2}$$

I measure the firm's market value as the number of shares outstanding times the price at the end of the 14th trading day. I find that the mean and the median market value of firms that, although they could have gone public with their relationship bank, actually went public with another bank ($Could = 1$ and $Did = 0$) is below that of firms that could not have gone public with their relationship bank ($Could = 0$). Furthermore, the market value of these firms is below those of firms that kept their relationship bank as their underwriter ($Could = 1 = Did$) . This is consistent with the above predictions. I also consider the closing price on the first trading day. Table IV shows the mean and median valuations.

[18] I thank the referee for encouraging me to develop this section.

[19] Though in a different context, evidence in Farinha and Santos (2002) also suggests that firms that switch banks are lower-value firms. They show that poorly performing firms end exclusive lending relationships sooner than good firms, so that lower-value firms look for new lenders, in some cases switching banks and in others adding banks to their pool of lenders. On firms switching underwriters, see also, Krigman, Shaw, and Womak (2001).

Table IV
Mean and Median Market Value of Equity at the Close of the First and Fourteenth Trading Days

Valuation is measured as the firm's market value of equity (number of shares (in thousands) multiplied by the price at the close of the first and 14th trading days). The 1st and 14th trading day closing price is taken from CRSP; where unavailable in CRSP, it is taken from TAQ. *Could* equals 1 if the firm could have gone public with its relationship bank, and 0 otherwise. *Did* is equal to 1 if the firm did go public with its relationship bank, and 0 otherwise.

	Could = 1 = *Did*	*Could* = 0	*Could* = 1 and *Did* = 0
Panel A: Median Market Value of Equity			
First trading day	633,639.8	313,356.9	247,531.8
Fourteenth trading day	706,268.3	304,181.1	261,613.9
Panel B: Mean (Standard Deviation) Market Value of Equity			
First trading day	3,272,021	675,985.8	682,374.4
	(10,500,000)	(1,273,614)	(1,037,509)
Fourteenth trading day	3,043,529	696,139.1	657,638.6
	(9,328,449)	(1,339,787)	(990,616.6)

To further address this issue I run a regression of the type[20]

$$\text{Log}\left(\frac{\text{Market value of equity at 14th trading day}_i}{\text{Revenues at IPO year}_i}\right) = \beta_{Could}Could_i + \beta_{Did}Did_i + \beta_{\text{Firm}}\text{Firm Characteristics}_i + \beta_{\text{IPO}}\text{IPO Characteristics}_i + \beta_{\text{Controls}}\text{Controls}_i + \varepsilon_i. \quad (3)$$

The predictions consistent with the framework I propose are

1. Valuation $_{Could=0}$ > Valuation $_{Could=1 \text{ and } Did=0}$: implies $\beta_{Could} < 0$.
2. Valuation $_{Could=1=Did}$ > Valuation$_{Could=1 \text{ and } Did=0}$: implies $\beta_{Did} > 0$
3. Valuation $_{Could=1=Did}$ > Valuation$_{Could=0}$: implies $\beta_{Could} + \beta_{Did} > 0$.

The results from the estimation are reported in Table V. The first column reports the basic valuation equation, in which a flexible form for the firm's size is allowed (it includes categorical variables for the different percentiles of the distribution of total assets). As predicted, the coefficient on *Could* is negative and statistically significant ($\beta_{Could} = -0.32$, and t-statistic $= -1.66$

[20] The measure of firm value I use is similar to that advocated by Purnanandam and Swaminathan (2004) who argue that Tobin's Q and stock price multiples, such as price-to-earnings, are noisy measures of firm value for IPOs. This problem is exacerbated by the fact that earnings are negative for 57% of the firms in my sample, and the book value of equity is negative for 43% of the IPOs in my sample (this is not surprising given that many of the firms in my sample went public during the Internet bubble years).

Table V

The Impact of Pre-IPO Banking Relationships on the Firm's Market Value of Equity

This table presents OLS estimates of the following regression equation:

$$Value_i = \beta_{Could}\, Could_i + \beta_{Did}\, Did_i + \beta_{Firm}\, Firm\ Characteristics_i + \beta_{Bank}\, Underwriting\ Bank\ Characteristics_i + \varepsilon_i,$$

where

$$Value_i = \log\left(\frac{\text{Market value at } 14^{\text{th}} \text{ trading day}}{\text{Revenues at IPO year}}\right).$$

The measure of firm value is the logarithm of the ratio of the market value of equity on the 14th trading day (market price on the fourteenth trading day times the number of shares outstanding) and the firm's revenues at the IPO year. This measure is similar to that in Purnanandam and Swaminathan (2003), who argue that Tobin's Q and stock price multiples, such as price-to-earnings and market-to-book value of equity, are noisy measures of firm value for IPOs. This problem is exacerbated by the fact that earnings and the book value of equity are negative for, respectively, 57%, and 43% of the IPOs in my sample (not surprisingly given the overlap of my sample and the Internet bubble). Firm characteristics are gathered from the last amended prospectus filed with the SEC, measured in thousands, for the last year prior to the IPO. *Could* equals 1 if the firm could have gone public with its relationship bank, and 0 otherwise. *Did* is equal to 1 if the firm did go public with its relationship bank, and 0 otherwise. Each regression includes a constant. The first regression includes a flexible firm-size specification: I include categorical variables for the different percentiles of total assets (if the assets of firm i belong to the 10th percentile in the distribution of firm assets in my sample, then the 10th firm-size categorical variable for firm i is equal to 1 and the remaining categorical variables equal 0). Column two further controls for firm-size effect including both log (*Assets*) and [log (*Assets*)]^2. Column three controls for the firm's cash-flow ratio. Columns four and five control for underwriter characteristics. Column six includes industry fixed effects.

	Flex Firm Size	Size	Cash-Flow to Assets	Bank Type	Reputation	Industry FE
	(1)	(2)	(3)	(4)	(5)	(6)
Could	−0.32*	−0.33*	−0.34*	−0.34*	−0.31*	−0.36**
	(0.19)	(0.18)	(0.18)	(0.18)	(0.18)	(0.17)
Did	0.94***	0.73***	0.84***	0.84***	0.80***	0.79***
	(0.30)	(0.27)	(0.27)	(0.27)	(0.27)	(0.24)
Log (*Assets*)		1.77***	2.11***	2.09***	1.90***	1.74***
		(0.34)	(0.45)	(0.45)	(0.44)	(0.39)

$[\text{Log}\,(Assets)]^2$		−0.06***	−0.07***	−0.07***	−0.07***	−0.07***
		(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Internet stock		0.45**	0.39*	0.40*	0.34	0.34
		(0.22)	(0.22)	(0.22)	(0.22)	(0.21)
$\text{Log}\left(\frac{\text{IPO proceeds}}{\text{Total assets}}\right)$	0.95***	1.40***	1.40***	1.39***	1.31***	1.22***
	(0.20)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
$\text{Log}\left(\frac{\text{Shares offered}}{\text{Total outstanding shares after IPO}}\right)$	−1.37***	−1.15***	−1.10***	−1.09***	−0.98***	−1.08***
	(0.17)	(0.17)	(0.17)	(0.17)	(0.19)	(0.17)
$\text{Log}\left(\frac{\text{Cash flows}}{\text{Total assets}}\right)$			0.13**	0.13**	0.13**	0.15***
			(0.05)	(0.06)	(0.05)	(0.05)
Subsidiary or investment bank				0.14		
				(0.31)		
Underwriter reputation					0.03*	0.02*
					(0.01)	(0.01)
IPO year 1998	−0.42***	−0.10	−0.12	−0.12	−0.11	−0.21
	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.14)
F-test: $\beta_{Could} + \beta_{Did} = 0$	4.11**	2.09[a]	3.00*	3.02*	3.07*	3.08*
Observations	301	301	296	296	296	296
R^2	0.54	0.57	0.58	0.58	0.59	0.67
Adjusted R^2	0.52	0.56	0.56	0.56	0.57	0.65

[a]Significant at less than 15%.
*Significant at 10%; **significant at 5%; ***significant at 1%. Robust standard errors in parentheses.

and p-value $= 0.097$), implying that firms that could have gone public with their relationship bank but instead switched banks are on average of lower value than those that could not have gone public with their bank. The coefficient on *Did* is positive and significant ($\beta_{Did} = 0.94$, and t-statistic $= 3.16$ and p-value $= 0.002$), suggesting that firms that did go public with their relationship bank are of higher value than those that could but did not go public with their bank. Finally, firms that could and did go public with their bank are valued more than those that could not have gone public with their bank ($\beta_{Could} + \beta_{Did} > 0$ and significantly different from zero at the 5% level).

The results reported in the second through sixth columns of Table V are consistent with the above findings. They also indicate that larger firms are valued more (the coefficient on the Log(*Assets*) is positive and significant), but this size effect occurs at a decreasing rate (the coefficient on $[\text{Log}(Assets)]^2$ is negative). Notice also that, not surprisingly, Internet stocks have a higher market value of equity than non-Internet stocks, which is expected, given that the sample period overlaps with the Internet bubble of 1999–2000. Further, firms able to raise higher proceeds, and firms with higher cash flow ratios, are valued more.

These robustness checks confirm that the market value of equity for firms that kept their pre-IPO bank as their IPO underwriter is higher than that of firms that could not have gone public with their bank ($\beta_{Could} + \beta_{Did} > 0$). In turn, the latter group of firms, i.e., those that could not use their relationship bank as underwriters, have a higher market value of equity than firms that could have gone public with their relationship bank, but actually went public with another bank ($\beta_{Could} < 0$).

With this evidence in support of the hypothesis presented in Section I, I now turn to the question of whether pre-IPO banking relationships with potential underwriters result in lower IPO underpricing for the issuing firms.

III. The Impact of the Firm's Pre-IPO Banking Relationship on Its IPO Underpricing

The univariate results presented in Table II do not control for firm and market characteristics (other than the relationship variable) that affect the firm's IPO underpricing. The results in this section account for these controls using the variables introduced in Table III.

A. *Multivariate Analysis*

I estimate a regression of the form:

$$\begin{aligned}\text{Underpricing}_i = {} & \beta_0 + \beta_{Could} Could_i \\ & + \beta_{Did} Did_i + \beta_{Firm} \text{Firm Characteristics}_i \\ & + \beta_{\text{IPO}} \text{IPO Characteristics}_i + \beta_{\text{Controls}} \text{Controls}_i + \varepsilon_i. \end{aligned} \tag{4}$$

The empirical predictions stated in Table I translate into the following:

1. $\beta_{Could} < 0$: Having a pre-IPO relationship with a prospective underwriter reduces asymmetric information and hence reduces underpricing, regardless of whether the bank does or does not underwrite the IPO. Therefore, if a firm could have gone public with its bank, underpricing is expected to be lower.
2. $\beta_{Did} \leq 0$: Underpricing for firms that could have gone public with their pre-IPO relationship bank and actually did go public with this bank is *not* expected to be higher than the underpricing of firms that could have gone public with their bank but actually went public with another bank, that is, actually going public with the relationship bank is not expected to increase underpricing.
3. β_{Did} economically insignificant: Whether the firm did or did not go public with the prospective underwriter has no effect on underpricing. Information is revealed about firms that could have gone public with their relationship bank regardless of who actually underwrote the equity issue. As long as information is revealed, asymmetric information is reduced, and consequently underpricing is expected to be lower.

The results from estimating the above equation are reported in Table VI.

The first column of Table VI reports the basic regression. The results show that having a relationship with a bank that can manage IPOs does significantly lower IPO underpricing: The coefficient on *Could* is negative, and statistically and economically significant ($\beta_{Could} = -17.34$, t-statistic $= -1.99$, and p-value $= 0.048$). As predicted, whether the relationship bank actually took the firm public or not, does not have a significant effect on underpricing ($\beta_{Did} = 1.20$ and statistically insignificant: t-statistic $= 0.12$ and p-value $= 0.905$). *Ceteris paribus*, the underpricing for firms with a banking relationship with a potential IPO underwriter is about 17% lower than the underpricing of firms without a relationship with a prospective underwriter. Thus, having a relationship with a potential underwriter can significantly reduce underpricing. To understand the economic significance of this result, consider the median firm in the category of firms that could not have gone public with their relationship bank. This firm had an underpricing 17% higher than that of an ex ante similar firm, but one that could have gone public with its relationship bank. This higher underpricing amounts to almost 65% of the median firm's working capital.[21] Since

[21] To better understand the economic significance of these results, consider the following. Underpricing is about 17% higher for firms that could not ($Could = 0$) have gone public with their relationship bank. In terms of lost IPO proceeds, the cost of not having this type of pre-IPO relationship, for firms in the category $Could = 0$, is $6{,}375K$, which amounts to 87.97% of the median-sized firm's revenue, and 64.68% of this firm's working capital. The following explains this results:

1. The median book value of assets of firms in the category $Could = 0$ (for the year prior to the IPO) is $18{,}062K$. The IPO proceeds of this median-sized firm are $37{,}500K$.

Table VI

The Impact of Pre-IPO Lending Relationships on the Firm's Cost of Equity in an IPO

This table presents OLS estimates of the following regression equation:

$$Underpricing_i = \beta_{Could}\, Could_i + \beta_{Did}\, Did_i + \beta_{Firm}\, Firm\ Characteristics_i + \beta_{IPO}\, IPO\ Characteristics_i + \varepsilon_i .$$

The dependent variable is underpricing. In addition to the variables reported, each regression includes year fixed effects, a standardized measure of the offer price, and an intercept. *Could* equals 1 if the firm could have gone public with its relationship bank, and 0 otherwise. *Did* is equal to 1 if the firm did go public with its relationship bank, and 0 otherwise. Firm characteristics are gathered from the last amended prospectus filed with the SEC, measured in thousands, for the last year prior to the IPO. Columns 1 and 2 report the basic results. To further control for firm size, in column 3 I use a flexible firm-size specification: I replace log(*Assets*) by categorical variables for the different percentiles of total assets (if the assets of firm i belong to the tenth percentile in the distribution of firm assets in my sample, then the 10th firm-size categorical variable for firm i is equal to 1 and the remaining categorical variables equal 0). Column 4 includes industry fixed-effects based on the first of the four digits in the SIC codes. Column 5 controls for firm transparency: *Transparency* is a categorical variable describing how precise the firm is at describing the use of its IPO proceeds (equals 1 if the firm is precise and 0 otherwise; see the Appendix). Column 6 includes a binary variable equal to 1 if the IPO is venture backed and equals 0 otherwise. Column 7 includes a price-revision measure: $\frac{\text{Offer Price} - \text{Mean Filing Price}}{\text{Mean Filing Price}}$.

	Basic	Basic II	Size	Industry F.E.	Transparent	VC Backed	Pct. Differ Mean
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Asymmetric information							
Could	−17.34**	−16.80**	−18.48**	−15.63*	−15.85*	−15.92*	−16.12*
	(8.72)	(7.43)	(8.91)	(9.23)	(8.75)	(8.66)	(8.79)
Did	1.20		−3.00	−1.86	0.34	3.97	1.34
	(10.04)		(10.13)	(10.54)	(10.03)	(10.01)	(10.04)
Firm uncertainty							
Transparent					−11.19		
					(6.99)		

Firm characteristics							
log(Assets)	−10.34***	−10.25***		−10.50***	−10.47***	−10.07***	−9.77***
	(2.55)	(2.44)		(2.64)	(2.54)	(2.52)	(2.59)
$\left(\frac{\text{Total debt}}{\text{Total assets}}\right)$	−8.86**	−8.80**	−11.14**	−8.75**	−8.30**	−8.20**	−8.38**
	(4.04)	(4.01)	(4.14)	(4.17)	(4.05)	(4.01)	(4.06)
$\left(\frac{\text{Cash}}{\text{Total assets}}\right)$	38.32**	38.46**	44.85***	36.81**	33.28**	26.06	37.03**
	(15.66)	(15.59)	(16.03)	(15.97)	(15.93)	(16.26)	(15.69)
Firm age (years at IPO)	−0.62**	−0.63**	−0.64**	−0.65**	−0.61**	−0.51*	−0.59**
	(0.29)	(0.29)	(0.30)	(0.30)	(0.29)	(0.29)	(0.29)
IPO characteristics							
$\left(\frac{\text{IPO proceeds}}{\text{Total assets}}\right)$	−0.08*	−0.08*	−0.05	−0.08*	−0.07*	−0.06	−0.07*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
$100 * \left(\frac{\text{Shares sold existing shareholders}}{\text{Shares sold}}\right)$	−0.20	−0.20	−0.23*	−0.21	−0.20	−0.20	−0.20
	(0.13)	(0.13)	(0.14)	(0.14)	(0.13)	(0.13)	(0.13)
Venture backed IPO						19.44**	
						(7.73)	
$100 * \left(\frac{\text{Offer price} - \text{Mean filing price}}{\text{Mean filing price}}\right)$							0.14
							(0.13)
Nasdaq	16.94*	16.79*	23.15**	17.13*	14.89	10.83	16.37*
	(8.98)	(8.88)	(9.35)	(9.31)	(9.04)	(9.22)	(8.99)
Flexible firm size	No	No	Yes	No	No	No	No
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	303	303	303	303	303	303	303
R^2	0.42	0.43	0.43	0.43	0.43	0.43	0.42
Adjusted R^2	0.39	0.39	0.39	0.38	0.39	0.40	0.39
F-test all coefficients = 0	13.89***	14.93***	10.22***	9.16***	13.25***	13.65***	13.11***

*Significant at 10%; **significant at 5%; ***significant at 1%. Robust standard errors in parentheses.

Did is statistically indistinguishable from zero, I exclude the variable *Did* in the second column of Table VI to improve the precision of the estimation. The economic result remains valid: Firms with an established relationship with a bank that can manage their IPO face a lower IPO underpricing.

The controls for observable firm characteristics are: Firm size (measured by Log(*Assets*)), firm's age at the time of the IPO, its cash-to-assets ratio (at the IPO year), and its debt-to-assets ratio (at the IPO year). As in previous research, I find that larger firms are less underpriced. To further control for firm size, I replace Log(*Assets*) by categorical variables that equal 1 if the firm's assets fall into a particular size decile and 0 otherwise: For example, if the assets of firm i fall in the 10th percentile of the distribution of total assets, then the *10th-percentile* categorical variable for firm i equals one and all other categorical variables equal zero. This specification allows for a more flexible size control. The results are reported in the third column of Table VI, and they confirm the earlier finding of this paper. Consistent with previous research, I also find that younger firms are more underpriced than older ones.[22]

A new and interesting result reported in Table VI shows that firms with higher cash-to-assets ratios have significantly higher underpricing. Firms go public because they need the cash to fund their investment projects. If the firm has a high cash-to-assets ratio, then investors may grow wary about the reasons why the firm is going public. Is the firm going public to fund good investment projects or do the firm's managers want to sell the firm? Do managers believe they can sell overvalued equity? The positive coefficient on the cash-to-assets ratio indicates that investors view issues of firms with high cash-to-assets ratio as particularly risky, and thus demand a higher discount for purchasing these shares.

The results in Table VI also show that more leveraged firms are less underpriced. This is consistent with the results in James and Weir (1990) that having private debt claims before issuing stock can reduce a firm's IPO underpricing, since the existence of inside debt signals to the market that the firm is of high value (only high-value firms apply and are granted inside debt, and this signal reduces asymmetric information and thus lowers IPO underpricing).

2. Firms that could not go public with their relationship bank face 17% higher underpricing compared to firms with a relationship with a potential underwriter. The underpricing cost (the lost IPO proceeds) of not having a relationship with a prospective underwriter is the total dollar amount equivalent to 17% of the firm's underpricing. This is 17% of 37,500K, which amounts to 6,375K.
3. These lost proceeds from not having a relationship with a prospective underwriter are equivalent to 87.97% of the firm's revenue in the year prior to the IPO (revenues for the median-sized firm prior to the IPO were 7,247K). As a percentage of working capital, the cost of not having a relationship with a potential underwriter is 64.68% (working capital of the median-sized firm in the $Could = 0$ category is 9,856K).

[22] See, for example, Carter and Manaster (1990) and Ritter (1984). Further, Petersen and Rajan (1994) emphasize that the effect of the firm's reputation may not increase linearly with the age of the firm. It is reasonable to believe that the change in the firm's reputation smooths over time: As a firm grows older, the effect of an additional year declines. To see whether this affects my results, I replace the age of the firm with the logarithm of one plus the age of the firm. This does not change the results.

I control for IPO characteristics using the ratio of IPO proceeds to total assets, a categorical variable for the exchange where the issue starts trading, and year-fixed effects. As expected, issues that start trading on NASDAQ are relatively more underpriced compared to issues trading on the NYSE or the AMEX market. Beatty and Ritter (1986) claim that smaller offerings are more speculative than larger offerings, and consistent with this, they find that firms with lower IPO proceeds exhibit higher IPO underpricing. The results reported here are consistent with this earlier finding.

A.1. Robustness of the Results

This section tests the robustness of the above results. It is possible that the sign and magnitude of the effect of having a relationship with a potential underwriter is driven by firm, underwriter, and/or lending bank characteristics. As I now show, my results continue to hold after controlling for these characteristics.

A.1.1. Unobservable Firm Characteristics. The firms in my sample went public between 1998 and 2000. During this period, many high-technology start-ups went public. These firms are relatively intensive in the use of human capital and may lack the physical capital needed for collateral. Thus, it is possible that these high-technology firms did not have relationships with banks, particularly with banks that could take them public.[23] Further, high-technology firms have been shown to have a degree of underpricing significantly higher than that of other firms. This combination could be the driving force behind the coefficient on *Could*. To control for this, the fourth column of Table VI includes industry-fixed effects (based on the first of the four-digit SIC code). The economic results do not change significantly when these control variables are included. In particular, the coefficient on the variable of interest, *Could*, is negative and statistically significant (t-statistic $= -1.69$ and p-value $= 0.092$), although the magnitude of the coefficient on *Could* is slightly diminished ($\beta_{Could} = -15.63$). Again, there is no significant effect on the firm's IPO underpricing depending on whether the firm did or did not go public with its relationship bank.

As previously noted, firm uncertainty is highly correlated with underpricing. Further, it could be that more opaque firms keep away from the loan market and therefore do not establish banking relationships, and in particular with potential underwriters. If this were the case, then firm uncertainty could be driving the result on *Could*. The fifth column in Table VI includes the transparency measure previously discussed. Even after controlling for firm transparency, having a relationship with a potential IPO underwriter reduces the firm's underpricing by approximately 15% (both economically and statistically

[23] Still, more than 22% of the high-technology firms in my sample had a relationship with a bank that could have taken the firm public. Of these, more than 45% of them went public with their bank.

significant). The results also show that, as expected, the coefficient on firm transparency is negative: Firms that inform the market about their future investment projects can reduce underpricing by 11.2% (t-statistic= -1.60 and p-value= 0.110).

A.1.2. Venture Backed IPOs and IPOs with High Pre-IPO Price Revisions. I further test the results for robustness to controls for whether the IPO was venture backed or not, and to the inclusion of a price-revision measure. The results are reported in the last two columns of Table VI.

Gompers and Lerner (1999) show that venture-backed IPOs in which the venture capital firm is associated with the underwriting bank exhibit greater underpricing. Megginson and Weiss (1991) instead find that venture-backed IPOs exhibit significantly lower underpricing. In the sixth column of Table VI, I included a categorical variable *Venture* equal to 1 for venture-backed IPOs, and 0 otherwise. Underpricing is significantly higher for venture-backed IPOs: Perhaps venture-backed IPOs are riskier and the higher underpricing is capturing this. Note that the coefficient on *Could* is -15.92, significantly different from 0 and of about the same magnitude as in previous results (t-statistic $= 1.84$ and p-value $= 0.067$); and the coefficient on *Did* is, as before, economically small and statistically insignificant.

Hanley (1993) finds that underpricing is positively correlated with the magnitude of price revision from the initial mid-filing price to the final offer price. Hanley and Wilhelm (1995) use the percent deviation of the actual offer price from the mean of the price range filed in the prospectus to measure the institutional investor's interest in the offering (the higher the percent increase, the higher the institutional interest in the issue). Since institutional investors are better informed, they understand which issues are underpriced and will show more interest in these issues. Therefore, institutional interest in an IPO is expected to be positively correlated with underpricing. This price revision also could be considered a measure of the information released after the firm filed with the SEC: If no new information was released between the filing date and the IPO date, then the price revision is expected to be small. I include the following price-revision measure in the underpricing regression equation, $Price\ Revision = \frac{\text{Offer Price} - \text{Mean Filing Price}}{\text{Mean Filing Price}} * 100$. The results, reported in the last column of Table V, show that the main result of this paper is robust to this control: *Could* is economically and statistically significant ($\beta_{Could} = -16.12$, t-statistic $= -1.83$ and p-value $= 0.068$), and *Did* is as before, economically small and statistically insignificant ($\beta_{Did} = 1.34$, t-statistic $= 0.13$ and p-value $= 0.894$). The coefficient on the *Price Revision* is economically and statistically insignificant.

A.1.3. Controlling for the Internet Bubble Period. Table VII considers further robustness checks to account for the Internet bubble period.

First, I code a categorical variable *High-Tech* equal to 1 if the business description in the firm's prospectus indicated that the issuing firm was a high-technology firm. For instance, when the firm's business description was "Provider Internet System Solutions" or "Provider Cellular Phone Services" the

Table VII

The Impact of Pre-IPO Lending Relationships on the Firm's IPO Underpricing: Controlling for the Internet Bubble

This table presents OLS estimates of the following regression equation:

$$Underpricing_i = \beta_{Could}\, Could_i + \beta_{Did}\, Did_i + \beta_{Firm}\, Firm\ Characteristics_i + \beta_{IPO}\, IPO\ Characteristics_i + \beta_{Internet}\, Internet\ Bubble\ Controls_i + \varepsilon_i.$$

The dependent variable is underpricing. In addition to the variables reported, each regression includes year fixed effects, a standardized measure of the offer price, and an intercept. Firm characteristics are gathered from the last amended prospectus filed with the SEC, measured in thousands, for the last year prior to the IPO. *Could* equals 1 if the firm could have gone public with its relationship bank, and 0 otherwise. *Did* is equal to 1 if the firm did go public with its relationship bank, and 0 otherwise. I defined the variable High-Tech in column one as a binary variable equal to 1 if the business description in the firm's last amended prospectus indicated that the issuing firm is a high-tech firm; and 0 otherwise. The variables *High-Tech* and *Internet Stock* in columns two and three are categorical variables taking the value 1 if the stock is defined by Ritter's as a high-tech or Internet stock in: http://bear.cba.ufl.edu/ritter/List%20of%20Internet%20IPOs.xls. To further control for the Internet bubble years, the above regression is run excluding the Internet boom years (1999 and 2000) from the sample, and the results are reported in column 4.

	High Tech	Both Internet and High-Tech	Internet and High-Tech; Exclude *Did*	Include IPOs in 1998 Only
	(1)	(2)	(3)	(4)
Asymmetric information				
Could	−18.02**	−15.23*	−14.89**	−12.31**
	(8.74)	(8.68)	(7.37)	(6.29)
Did	1.29	0.75		3.28
	(10.04)	(10.00)		(7.22)
Firm characteristics				
Log(*assets*)	−10.75***	−8.91***	−8.86***	−7.20***
	(2.57)	(2.56)	(2.46)	(2.10)
$\left(\frac{\text{Total debt}}{\text{Total assets}}\right)$	−8.71**	−7.92**	−7.89**	−5.11**
	(4.04)	(4.01)	(3.97)	(2.09)
$\left(\frac{\text{Cash}}{\text{Total assets}}\right)$	40.31**	26.30	26.37*	6.37
	(15.76)	(16.01)	(15.95)	(15.03)
High-tech stock	−9.76	15.64**	15.70**	
	(9.01)	(7.59)	(7.53)	
Internet stock		14.46*	14.40*	
		(8.23)	(8.18)	
Firm age (years at IPO)	−0.64**	−0.50*	−0.51*	
	(0.29)	(0.29)	(0.29)	
IPO characteristics				
$\left(\frac{\text{IPO proceeds}}{\text{Total assets}}\right)$	−0.08**	−0.05	−0.05	−0.03
	(0.04)	(0.04)	(0.04)	(0.02)
$100 * \left(\frac{\text{Shares sold selling shareholders}}{\text{Shares sold}}\right)$	−0.21	−0.16	−0.16	−0.13
	(0.13)	(0.13)	(0.13)	(0.12)
Nasdaq	17.26*	10.42	10.32	6.70
	(8.98)	(9.22)	(9.10)	(5.72)
Time fixed effects	Yes	Yes	Yes	No
Observations	303	303	303	111
R^2	0.42	0.44	0.44	0.32
Adjusted R^2	0.39	0.41	0.41	0.24
F-test all coefficients = 0	13.10***	13.08***	13.94***	3.82***

*Significant at 10%; **significant at 5%; ***significant at 1%. Robust standard errors in parentheses.

categorical variable for technology was set to 1. If the business description was "Construction" it was set to 0. Including this categorical variable in the regression equation does not significantly change the coefficient on *Could* and *Did*. The results are reported in the first column of Table VII ($\beta_{Could} = -18.02$, t-statistic $= -2.06$ and p-value $= 0.040$; and $\beta_{Did} = 1.29$, t-statistic $= 0.13$ and p-value $= 0.898$).

To further control for the Internet bubble period, I drop the above mentioned *High-Tech* variable and create two new binary variables: *High-Tech* and *Internet Stock*. The first categorical variable, *High-Tech,* equals 1 if the stock is identified as a high tech stock by Loughran and Ritter (2003) and Ljungqvist and Wilhelm (2003), and 0 otherwise. Similarly, the binary variable *Internet Stock* takes the value of 1 if the above authors identify the stock as an Internet stock, and 0 otherwise.[24] The second column of Table VII includes both the *High-Tech* and the *Internet Stock* binary variables. The results indicate that the Internet firms and firms in high-tech sectors exhibit greater underpricing than firms in other sectors. This is consistent with the previous research by Loughran and Ritter, and Ljungqvist and Wilhelm. Including these variables does not change the economic results of my paper: Firms with banking relationships with potential underwriters exhibit lower underpricing by more than 15% ($\beta_{Could} = -15.23$ with t-statistic $= 1.75$ and p-value $= 0.081$), and this is statistically significant. Whether the firm went public with its relationship bank or not does not affect its underpricing ($\beta_{Did} = 0.75$ with t-statistic $= 0.07$ and p-value $= 0.940$). Given that in all these regressions the coefficient on *Did* is, as predicted, economically small and statistically indistinguishable from 0, I exclude this variable in the third column of Table VII. As expected, this improves the precision of the results.

To further show that my results are not driven by the Internet boom period, I run the regressions excluding from the sample those firms going public during the Internet boom years (1999 and 2000). This reduces the sample to 111 firms. The results are reported in the last column of Table VII, and they are consistent with my previous findings: Firms with established relationships with prospective IPO underwriters suffer significantly lower underpricing relative to firms that could not have gone public with their relationship bank ($\beta_{Could} = -12.31$, t-statistic $= -1.96$ and p-value $= 0.053$). Whether the firm went public with this bank or not has negligible effects on underpricing.

Thus, the results of the basic regression equation are robust to firm characteristics. I now test whether these results are also robust to bank characteristics.

[24] Loughran and Ritter (2003) identify tech stocks as those with SIC codes 3571, 3572, 3575, 3577, 3578, 3661, 3663, 3669, 3674, 3812, 3823, 3825, 3826, 3827, 3829, 3841, 3845, 4812, 4813, 4899, 7370, 7371, 7372, 7373, 7375, 7378, and 7379. The following tickers correspond to firms not classified as technology stocks, although their business description seems to indicate they are indeed tech stocks. I therefore re-code them as tech stocks: ECLG, ASDS, VCLK, ATON, OPUS, JFAX, BNBN, and HHNT. Internet stocks were classified as in http://bear.cba.ufl.edu/ritter/List%20of%20Internet%20IPOs.xls.

A.1.4. Unobservable Bank Characteristics. In this section, I consider special characteristics of the underwriting bank. It could be that relationship banks that take their firms public are such that, on average, they underprice less than other banks. It could also be that in an attempt to gain market share, the banks entering the underwriting business may have been less prone to the abuses and the corruption of banks well established in the underwriting business (Loughran and Ritter (2003)) and hence underpriced less. This section tests the robustness of the results to different characteristics of the underwriting bank. I run a regression of the type

$$\begin{aligned}\text{Underpricing}_i = {} & \beta_0 + \beta_{Could}\, Could_i + \beta_{Did}\, Did_i \\ & + \beta_{\text{Firm}}\, \text{Firm Characteristics}_i \\ & + \beta_{\text{IPO}}\, \text{IPO Characteristics}_i \\ & + \beta_{\text{Underwriter}}\, \text{Underwriter Characteristics}_i \\ & + \beta_{\text{Controls}} \text{Controls}_i + \varepsilon_i. \end{aligned} \tag{5}$$

The predications for *Could* and *Did* are the same as those outlined at the beginning of Section III.A.

Table VIII includes several control variables for the underwriters' characteristics. The first column of Table VIII includes a measure of the underwriter's reputation (estimated by the underwriter's market share on each year).[25] As in previous findings, firms going public with more reputable underwriters exhibit significantly lower underpricing.[26] The magnitude and sign of the variables of interest *Could* and *Did* are robust to this control. The coefficient on *Could* equals -17.08 (t-statistic $= -1.96$ and p-value $= 0.051$) suggesting that, as in the basic case, underpricing for firms with a banking relationship with potential underwriters is about 17% lower than for firms without this relationship.

The second column includes underwriter fixed effects. If there are some banks more likely to underprice more on average, or banks more likely to fall prey to a corruption hypothesis, then including underwriters' fixed effect should control for this effect. The results of this paper are robust to this control. The third column controls for the type of underwriting bank: commercial bank, investment bank, Section 20 subsidiary, and other nondepository institutions. It could be that commercial banks with Section 20 subsidiaries trying to penetrate the underwriting business behave in a more transparent way, and are at least

[25] The underwriter reputation measure used here is similar to that introduced by Megginson and Weiss (1991). Other measures of underwriter reputation used in the literature are: A discrete underwriter reputation ranking taking values between 0 and 3 as described in Johnson and Miller (1988); and a discrete underwriter reputation ranking taking values between 0 and 9 as described in Carter and Manaster (1990). Carter, Dark, and Singh (1998) show that all these three measures of underwriter reputation are highly correlated with the one which I use (see Carter, Dark, and Singh, 1998, Table III).

[26] Beatty and Ritter (1986), Carter and Manaster (1990), Michaely and Shaw (1994), and Hanley and Wilhelm (1995).

Table VIII

The Impact of Pre-IPO Lending Relationships on the Firm's IPO Underpricing Bank Characteristics

This table presents OLS estimates of the following regression equation:

$$Underpricing_i = \beta_{Could}\, Could_i + \beta_{Did}\, Did_i + \beta_{Firm}\, Firm\ Characteristics_i + \beta_{IPO}\, IPO\ Characteristics_i + \beta_{Underwriter}\, Underwriting\ Bank\ Characteristics_i + \varepsilon_i .$$

The dependent variable is underpricing. In addition to the variables reported, each regression includes year fixed effects, a standardized measure of the offer price, and an intercept. *Could* equals 1 if the firm could have gone public with its relationship bank, and 0 otherwise. *Did* is equal to 1 if the firm did go public with its relationship bank, and 0 otherwise. Firm characteristics are gathered from the last amended prospectus filed with the SEC, measured in thousands, for the last year prior to the IPO. Column 1 controls for the reputation of the IPO lead manager. The reputation of firm *i*'s IPO underwriter is measured as the underwriter's market share during the year firm *i* went public. Column 2 includes book-manager fixed effects. Column 3 includes the following underwriter classification categorical variables: commercial = 1 if the lead underwriter is a commercial bank, and 0 otherwise; Investment Bank = 1 if the lead underwriter is an investment bank, and 0 otherwise; Subsidiary = 1 if the lead underwriter is a Section 20 (or a Section 4(k)(4)(E)) subsidiary, and 0 otherwise; Other = 1 for all other non-depository institutions, and 0 otherwise. Column 4 includes all the above controls. Column 5 excludes the variable *Did*.

	Underwriter Reputation (1)	Underwriter F.E. (2)	Underwriter Type (3)	All Controls (4)	All, But *Did* (5)
Could	−17.08*	−21.19**	−17.60**	−20.35**	−18.33**
	(8.71)	(9.88)	(8.83)	(9.99)	(8.51)
Did	0.08	4.10	2.47	4.15	
	(10.03)	(10.60)	(10.17)	(10.67)	
Firm characteristics					
Log(*Assets*)	−11.19***	−13.03***	−10.55***	−13.53***	−13.23***
	(2.60)	(2.82)	(2.59)	(2.93)	(2.82)
$\left(\frac{\text{Total debt}}{\text{Total assets}}\right)$	−8.79**	−6.67	−8.49**	−6.77	−6.60
	(4.03)	(4.24)	(4.07)	(4.27)	(4.24)
$\left(\frac{\text{Cash}}{\text{Total assets}}\right)$	32.88**	32.94*	39.91**	29.73*	30.18*
	(16.12)	(17.45)	(15.82)	(17.97)	(17.90)
Firm age (years at IPO)	−0.58**	−0.46	−0.61**	−0.45	−0.46
	(0.29)	(0.31)	(0.29)	(0.31)	(0.31)

IPO characteristics					
$\left(\frac{\text{IPO proceeds}}{\text{Total assets}}\right)$	−0.07*	−0.09**	−0.08**	−0.09**	−0.09**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
$100 * \left(\frac{\text{Shares sold selling shareholders}}{\text{Shares sold}}\right)$	−0.18	−0.15	−0.19	−0.16	−0.15
	(0.13)	(0.14)	(0.13)	(0.14)	(0.14)
Nasdaq	17.11*	19.27*	17.34*	19.17*	18.79*
	(8.98)	(9.92)	(9.13)	(10.26)	(10.19)
Underwriter characteristics					
Reputation	−1.46*			−1.00	−1.01
	(0.83)			(1.49)	(1.49)
Subsidiary			−9.52	−20.41	−20.55
			(19.58)	(39.12)	(39.05)
Commercial			−12.51	−14.35	−14.95
			(27.77)	(49.93)	(49.82)
Investment bank			−2.53	−13.56	−13.79
			(19.40)	(33.88)	(33.81)
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Underwriter fixed effects	No	Yes	No	Yes	Yes
Observations	303	303	303	303	303
R^2	0.43	0.51	0.42	0.52	0.52
Adjusted R^2	0.39	0.40	0.39	0.39	0.39
F-test all coefficients = 0	12.51***	4.44***	11.58***	4.12***	4.20***

*Significant at 10%; **significant at 5%; ***significant at 1%. Robust standard errors in parentheses.

potentially less prone to fall into the corruption scheme mentioned by Loughran and Ritter (2003). Thus, it is important to specifically control for whether the underwriting bank is a commercial bank, an investment bank, or a Section 20 subsidiary, or some other nondepository institution. A detailed explanation of how this classification was done appears in Section B of the Appendix, together with the percentage of firms taken public by each bank type (Table AII, Panel A) and the level of underpricing by these banks (Table AII, Panel B). As reported in the third column of Table VIII, including these controls does not change the significance of my main result: Banking relationships can still reduce underpricing by about 17%. The fourth column of Table VIII includes all of these controls. Again, the results are robust to this. Finally, since *Did* is, as predicted, economically small and statistically insignificant, I exclude this variable in the last column of Table VIII and the precision of the results improves.

A.1.5. Boutique Banking. I now consider some special characteristics of the lending banks: In particular, the fact that they can market themselves as special debt providers for the Internet and high-tech firms.[27]

Most of the high-tech and Internet firms borrow from banks, such as Silicon Valley Bank, that specifically market themselves to serve firms in these sectors. In fact, about 24% of the high-tech firms in my sample borrow from Silicon Valley Bank.[28] To control for this particular lender, I include in the regression equation a categorical variable, *Silicon-Lender*, equal to 1 if the lender is Silicon Valley Bank, and 0 otherwise. Notice that during the sample period under study in this paper, Silicon Valley Bank could not have underwritten its client firm's IPO, since it did not have a securities underwriting branch (a Section 20 subsidiary), nor did it engage in underwriting activities directly after the repeal of the Glass–Steagall Act. Therefore, if *Silicon-Lender* equals 1, then it must necessarily be the case that $Could = 0$ and $Did = 0$. This means that *Could* and *Did* are collinear with the *Silicon-Lender* categorical variable. Thus the precision of the regression that includes *Could*, *Did*, and *Silicon-Lender* would be significantly undermined. Therefore when including *Silicon-Lender* in the basic regression, I need to drop *Did*. Table IX reports this result. The first two columns repeat the basic regressions reported in Table VI to ease the comparison. The third column includes the *Silicon-Lender* categorical variable. Including this variable does not change the economic result of this paper: Firms with a pre-IPO banking relationship exhibit lower underpricing than

[27] I thank the referee for encouraging me to write this section.

[28] Silicon Valley Bank could not underwrite the IPO of its borrowers. Because many of the high-tech and Internet stocks that went public between 1998 and 2000 borrowed from Silicon Valley Bank years before their IPO, this suggests that firms in this sector selected banking relationships that served their immediate funding needs without considering that this bank would be unable to take the firm public in the case that it decided to go public. This is consistent with the results from the Heckman estimation below, which shows that firms were not self-selecting in the banking relationships that would yield the lower IPO underpricing.

Table IX

The Impact of Pre-IPO Lending Relationships on the Firm's IPO Underpricing Controlling for the Internet Bubble: Boutique Bank

This table presents OLS estimates of the following regression equation:

$$Underpricing_i = \beta_{Could}\, Could_i + \beta_{Did}\, Did_i + \beta_{Firm}\, Firm\ Characteristics_i + \beta_{IPO}\, IPO\ Characteristics_i + \beta_{Boutique\ Banking}\, Boutique\ Banking_i + \varepsilon_i.$$

The dependent variable is underpricing. In addition to the variables reported, each regression includes year fixed effects, a standardized measure of the offer price, and an intercept. *Could* equals 1 if the firm could have gone public with its relationship bank, and 0 otherwise. *Did* is equal to 1 if the firm did go public with its relationship bank, and 0 otherwise. Firm characteristics are gathered from the last amended prospectus filed with the SEC, measured in thousands, for the last year prior to the IPO. Columns 1 and 2 report the basic regression equations to ease comparison. Column 3 includes a categorical variable, *Silicon Valley Lender,* equal to 1 if the firm's lender is Silicon Valley Bank. Column 4 includes a binary variable *Bank Serving Internet Stocks* equal to 1 if this lending bank served more than one Internet firm. Column 5 includes a binary variable *Bank Serving Tech Stocks* equal to 1 if this lending bank served more than eight Internet firm. Column 6 includes the *Boutique Banks* categorical variable, which equals 1 if the bank lent to more than 5% of the tech-stocks and Internet stocks in my sample (these banks are Silicon Valley Bank, Chase Manhattan Bank, and Imperial Bank).

	Basic I	Basic II	Silicon Valley	Serves Internet	Serves Tech	Boutique Banks
	(1)	(2)	(3)	(4)	(5)	(6)
Could	−17.34**	−16.80**	−13.27*	−15.40*	−17.09*	−16.56*
	(8.72)	(7.43)	(7.67)	(8.74)	(8.70)	(8.82)
Did	1.20			2.09	−0.06	1.47
	(10.04)			(10.00)	(10.04)	(10.06)
Boutique banking						
Silicon Valley lender			17.22*			
			(9.87)			
Bank serving Internet stocks				14.22*		
				(7.32)		
Bank serving tech-stocks					11.01	
					(6.70)	
Boutique banks						4.85
						(7.69)

(*continued*)

Table IX—*Continued*

	Basic I (1)	Basic II (2)	Silicon Valley (3)	Serves Internet (4)	Serves Tech (5)	Boutique Banks (6)
Firm characteristics						
Log(*assets*)	−10.34***	−10.25***	−10.04***	−10.18***	−10.12***	−10.39***
	(2.55)	(2.44)	(2.43)	(2.53)	(2.54)	(2.55)
$\left(\frac{\text{Total debt}}{\text{Total assets}}\right)$	−8.86**	−8.80**	−8.50**	−9.34**	−9.19**	−8.99**
	(4.04)	(4.01)	(4.00)	(4.03)	(4.03)	(4.05)
$\left(\frac{\text{Cash}}{\text{Total assets}}\right)$	38.32**	38.46**	31.41*	30.43*	32.59**	36.21**
	(15.66)	(15.59)	(16.05)	(16.10)	(16.00)	(16.03)
Firm age (years at IPO)	−0.62**	−0.63**	−0.61**	−0.55*	−0.59**	−0.61**
	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)
IPO Characteristics						
$\left(\frac{\text{IPO proceeds}}{\text{Total assets}}\right)$	−0.08*	−0.08*	−0.07*	−0.07*	−0.08*	−0.07*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
$100 * \left(\frac{\text{Shares sold selling shareholders}}{\text{Shares sold}}\right)$	−0.20	−0.20	−0.20	−0.18	−0.19	−0.20
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
Nasdaq	16.94*	16.79*	16.56*	17.53*	16.63*	17.17*
	(8.98)	(8.88)	(8.85)	(8.94)	(8.95)	(8.99)
Observations	303	303	303	303	303	303
R^2	0.42	0.42	0.43	0.43	0.43	0.42
Adjusted R^2	0.39	0.39	0.40	0.40	0.39	0.39
F-test all coefficients = 0	13.89***	14.93***	4.23***	13.38***	3.26***	13.01***

*Significant at 10%; **significant at 5%; ***significant at 1%. Robust standard errors in parentheses.

firms without a relationship with a prospective underwriter ($\beta_{Could} = -13.27\%$, t-statistic $= -1.73$ and p-value $= 0.085$).

To further address this issue, I select all high-tech firms as defined by Loughran and Ritter (2003) and Ljungqvist and Wilhelm (2003) and check the identity of their lending bank. If the lending bank served more than 5% of the firms in the high-technology sector within my sample, I code the lender as a bank serving high-tech firms. I use this to define a binary variable, called *Bank Serving Tech*, equal to 1 if the lending bank belongs to this category, and 0 otherwise. Similarly, I create a categorical variable, *Bank Serving Internet Stocks*, equal to 1 for banks serving Internet stocks, and 0 otherwise. Some of the banks that frequently served Internet stocks and high-tech stocks were banks that could take their clients public; e.g., Chase Manhattan served about 6% of the Internet and high-tech firms in my sample. Thus, *Bank Serving Tech* and *Bank Serving Internet Stocks* are not collinear with *Could* and *Did*; therefore, in the regression equation I can include these control variables together with the relationship variables, *Could* and *Did*. The fourth column of Table IX shows that when including the control variable *Bank Serving Internet Stocks*, the coefficient on *Could* is -15.40; although smaller in magnitude relative to the basic case, it is still economically and statistically significant (t-statistic $= -1.76$ and p-value $= 0.079$). Further, whether the bank took the firm public or not is again economically small and statistically indistinguishable from 0. The results also show that firms borrowing from these specialized banks have higher average underpricing (the coefficient on *Bank Serving Internet Stocks* equals 14.22, with a t-statistic $= 1.94$ and p-value $= 0.053$). The fifth column includes the variable *Bank Serving Tech*. Again, the economic results of this paper are robust to this control. Finally, the last column of Table IX includes a binary variable, *Boutique Bank*, which equals 1 if the bank lent to more than 5% of the tech stocks and Internet stocks, and 0 otherwise.[29] After controlling for boutique banks, the effect of *Could* is still economically and statistically significant: Relationships with potential underwriters lower underpricing by over 16% ($\beta_{Could} = -16.56$ with t-statistic $= -1.88$ and p-value $= 0.062$).

The economic results of this paper are robust to lender characteristics, and do not allow us to reject the hypothesis of this paper: That underpricing for firms with pre-IPO banking relationships with a potential IPO underwriter is lower than that for firms without such relationships.

A.1.6. The Role of the Lead Syndicate Lender. The loans identified in Dealscan, and used here to define the pre-IPO banking relationship variables *Could* and *Did*, are large commercial loans, or lines of credit, to one borrower provided by a single lender or a syndicate of lenders. In a syndicated loan there is a group of banks involved, and the information each syndicate member has about the borrower may differ. The lead lender presumably has more information about the quality of the borrower than other signatories to the loan.

Since it is possible that not all banks in the syndicate have the same information about the borrower, and since I am interested in capturing the degree

[29] *Boutique Bank* equals 1 for Silicon Valley Bank, Chase Manhattan Bank, and Imperial Bank.

of information the pre-IPO bank has regarding the issuing firm, I redefine the variables *Could* and *Did* in the following way: I code *Could Lead* equal to 1 if at least one of the lead syndicate lender(s) could have underwritten the firm's IPO; and *Could Lead* equal to 0 otherwise. I code *Did Lead* equal to 1 if at least one of the lead syndicate members that could underwrite the IPO actually underwrote the firm's issue; and *Did Lead* equal to 0 otherwise. I then run the previous regressions replacing *Could* and *Did* with *Could Lead* and *Did Lead.* The results are shown in Table X.

The first column controls for firm characteristics, the second for bank characteristics, the third includes a categorical variable equal to 1 if the loan was a syndicated loan, and finally the last column includes all these controls. Again, the results are consistent with those found in Tables VI to IX: Firms with pre-IPO banking relationships with prospective underwriters exhibit significantly lower IPO underpricing.

The question that arises now is whether the results are driven by firms self-selecting into the category $Could = 1$ or $Could = 0$. I address this issue in the following section.

B. Controlling for Firm Selection

Consider the firm's choice of banking relationship prior to its IPO. Whether the firm establishes a relationship with a bank that can underwrite IPOs or with a bank that cannot underwrite IPOs is, possibly, not a random choice.

On one hand it is possible that, at the time of establishing their pre-IPO banking relationship, firms self-selected into the categories $Could = 1$ or $Could = 0$ depending on their belief regarding under which category they would face the lowest IPO underpricing in the event they decide to go public in the future. Suppose that, prior to the IPO, the firm's manager believes that future IPO underpricing will be lower if, at the IPO date, the firm has an established relationship with a bank that can manage IPOs. In this case, the manager will choose to establish a relationship with a bank that has underwriting capabilities and hence could eventually manage the firm's IPO. Conversely, prior to the IPO, the manager might choose a relationship bank that does not have underwriting abilities when she believes that future underpricing will be lower under this condition.

On the other hand, given the time period examined in this paper, it is possible that when the firms in my sample selected their pre-IPO banking relationship, they did not predict that the choice of bank at this earlier date could eventually affect the firm's IPO underpricing, since they did not expect that the Glass–Steagall Act would be overruled by the time they went public. Hence, it is possible that for firms in my sample, their choice of pre-IPO bank (and therefore, whether the firm belong to the $Could = 1$ and $Could = 0$ category) is in fact exogenous.

Table X

The Impact of Pre-IPO Lending Relationships on the Firm's IPO Underpricing Redefining the Relationship: Could the Lead Syndicate Lender Manage the IPO? Did It Do It?

This table presents OLS estimates of the following regression equation:

$$Underpricing_i = \beta_{CouldLead}\, CouldLead_i + \beta_{DidLead}\, DidLead_i + \beta_{Firm}\, Firm\ Characteristics_i + \beta_{IPO}\, IPO\ Characteristics_i + \beta_{Bank}\, Underwriting\ bank\ characteristics_i + \varepsilon_i.$$

The dependent variable is underpricing. In addition to the variables reported, each regression includes year fixed effects, a standardized measure of the offer price, and an intercept. *Could Lead* equals 1 if at least one of the lead syndicate lender(s) could have underwritten the firm's IPO; and 0 otherwise. The variable *Did Lead* equals 1 if at least one of the lead syndicate members that could underwrite the IPO actually underwrote the firm's issue; and 0 otherwise. To control for firm size I use a flexible firm-size specification: I include categorical variables for the different percentiles of total assets (if the assets of firm i belong to the 10th percentile in the distribution of firm assets in my sample, then the 10th firm-size categorical variable for firm i is equal to 1 and the remaining categorical variables equal 0). Column 1 includes controls for firm characteristics. Firm characteristics are gathered from the last amended prospectus filed with the SEC, measured in thousands, for the last year prior to the IPO. Transparency is a categorical variable describing how precise the firm is at describing the use of its IPO proceeds (equals 1 if the firm is precise and 0 otherwise; see the Appendix). Column 2 includes controls for the characteristics of the underwriting bank: $Subsidiary = 1$ if the lead underwriter is a Section 20 (or a Section 4(k)(4)(E)) subsidiary, and 0 otherwise; and Reputation of firm *i's* IPO underwriter is measured as the underwriter's market share during the year firm i went public. Column 3 includes a binary variable *Syndicated loan* equal to 1 if the pre-IPO loan is a syndicated loan (as opposed to a sole lender loan). Column 4 includes all the above mentioned controls.

	Firm Controls	Bank Controls	Syndication	All
	(1)	(2)	(3)	(4)
Asymmetric information				
Could Lead	−18.38**	−18.97**	−17.69*	−17.10*
	(9.41)	(9.64)	(9.60)	(9.64)
Did Lead	3.30	1.92	1.51	2.33
	(10.06)	(10.28)	(10.19)	(10.21)
Firm uncertainty				
Transparent	−19.18***			−19.27**
	(7.84)			(7.90)
Firm characteristics				
$\left(\frac{\text{Total debt}}{\text{Total assets}}\right)$	−6.56	−7.69*	−7.66*	−6.63
	(4.55)	(4.61)	(4.58)	(4.58)
$\left(\frac{\text{Cash}}{\text{Total assets}}\right)$	38.19**	42.59**	42.48**	35.13***
	(18.04)	(18.51)	(18.14)	(18.55)
Firm age (years at IPO)	−0.33	−0.39	−0.44	−0.35
	(0.33)	(0.34)	(0.33)	(0.34)
Bank characteristics				
Reputation		−1.31		−1.53
		(2.24)		(2.22)
Subsidiary		−1.20		2.39
		(25.48)		(25.32)
Syndicated loan			−13.08	−12.87
			(13.02)	(13.01)

(*continued*)

Table X—*Continued*

	Firm Controls (1)	Bank Controls (2)	Syndication (3)	All (4)
IPO characteristics				
$\left(\frac{\text{IPO proceeds}}{\text{Total assets}}\right)$	−0.04	−0.05	−0.05	−0.04
	(0.04)	(0.04)	(0.04)	(0.04)
$100 * \left(\frac{\text{Shares sold selling shareholders}}{\text{Sharessold}}\right)$	−0.17	−0.17	−0.18	−0.18
	(0.15)	(0.15)	(0.15)	(0.15)
Nasdaq	19.00*	23.65**	23.21**	18.60*
	(10.74)	(10.80)	(10.69)	(10.87)
Bank fixed effects	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Flexible firm size	Yes	Yes	Yes	Yes
Observations	302	302	302	302
R^2	0.52	0.51	0.51	0.52
Adjusted R^2	0.39	0.37	0.37	0.38
F-test all coefficients = 0	3.92***	3.61***	3.77***	3.68***

*Significant at 10%; **significant at 5%; ***significant at 1%. Robust standard errors in parentheses.

If the selection of firms in the $Could = 1$ and $Could = 0$ categories is *not* random, and I do not control for self-selection, then the results would be biased: Firm characteristics that are unobservable to the market, and that determine a firm's choice of bank, could be correlated with the firm's unobservable characteristics that affect its IPO underpricing. To settle this debate and guarantee that my results are unbiased, I control for self-selection in the firm's choice of bank. I do this using a Heckman two-step estimation.[30]

Intuitively, this is what happens when the firm's choice of bank is not random. Some of the characteristics behind the manager's belief and the choice of bank are observable by the market (for example, firm size), but others are unobservable by the market (for example, the value of the firm's prospects, the quality of the management, or the value of the firm's new projects). When a firm's choice of bank is not random, the market-unobservable firm characteristics behind the choice of relationship bank can be correlated with the market-unobservable firm characteristics affecting IPO underpricing. For instance, the value of the firm's management and the value of upcoming projects are market-unobservable characteristics that can determine both the firm's choice of pre-IPO relationship bank as well as the firm's IPO price (and hence underpricing). The correlation between market unobservable firm characteristics influencing both the choice of bank and the IPO underpricing can lead to biased results when regressing underpricing on the variables capturing this choice of bank. Note that once the firm chooses a relationship bank, the market observes this

[30] I repeat the analysis using a maximum likelihood treatment effect model and obtain similar results. These are available from the author upon request.

choice and can use it to infer the manager's private information regarding the firm's characteristics. In this way, the market can update its beliefs about the firm's unobservable characteristics and incorporate the updated beliefs into the firm's valuation on its first trading day (which affects IPO underpricing). The Heckman two-step procedure allows for the incorporation of this updated information, thus controlling for the firm's self-selection.

B.1. The Firm's Choice of Bank—The Selection Equation

Firm i's choice of bank depends on firm characteristics, some of which are observable by the market but others are unobservable by the market. Let I_i be observable firm characteristics that determine i's choice of bank; for instance, these may be the firm's credit rating, its total assets and leverage at the time of establishing the banking relationship, the amount the firm borrowed from the bank, the cost of the loan, any up-front fees the firm has to pay for the loan, and whether the loan was secured or not. These characteristics affect the firm's choice of bank but presumably not its future IPO underpricing.

The firm's choice of bank is observable and is recorded by the variable, *Could*, which describes the selection equation. I will use $Could_i \equiv C_i$ for brevity.

$$C_i = \begin{cases} 1 & \text{if firm } i \text{ establishes a relation with a bank that can manage IPOs: } \gamma' I_i \geq \varepsilon_i \\ 0 & \text{if firm } i \text{ establishes a relation with a bank that } \textit{cannot} \text{ manage IPOs: } \gamma' I_i < \varepsilon_i, \end{cases} \tag{6}$$

where ε_i are the firm characteristics, known by the firm but not by the market, that affect the firm's choice of bank (for instance, the value of the firm's management and the value of its projects) and that might also affect the firm's IPO underpricing at a later stage. Once the firm's choice of bank is revealed, the market updates its beliefs regarding these unobservable firm characteristics.

B.1.1. Observable Variables Affecting the Choice of Bank Prior to the IPO Date. Some of the variables in I_i are instrumental variables: They affect the firm's choice of bank but not the firm's future IPO underpricing, such as the length of the loan, the amount borrowed, the cost of the loan (measured by the AISD: all-in-spread-drawn), any up-front fees the firm must pay for the loan, whether the loan was secured or not, and whether the firm was rated at the time the loan was taken. I collect these loan characteristics using Dealscan. Unfortunately, debt rating is missing for many firms; therefore I control for whether the pre-IPO loan is rated or not. The set of variables $I_i$could also include variables affecting both the firm's choice of banking institution prior to the IPO and the firm's IPO underpricing (e.g., the industry to which the firm belongs). I gather firm characteristics for the time at which the relationship was established from the firm's last amended prospectus filed with the SEC, since in this prospectus

most of the firms report their balance sheets for years prior to the IPO. Using these balance sheets, I record for each of the 306 firms in my sample the value of the firm's total assets and total debt at the relationship date.

B.2. The Firm's IPO Underpricing—The Regression Equations

The following two regression equations describe the firm's underpricing:

$$\begin{aligned} \text{Underpricing}_{1i} &= \beta' X_i + v_{1i} \Leftrightarrow \gamma' I_i \geq \varepsilon_i \Leftrightarrow C_i = 1 \\ \text{Underpricing}_{2i} &= \beta' X_i + v_{2i} \Leftrightarrow \gamma' I_i < \varepsilon_i \Leftrightarrow C_i = 0, \end{aligned} \tag{7}$$

where X_i are firm characteristics affecting IPO underpricing. Some of the variables in X_i do not affect the firm's prior choice of bank (for instance, firm transparency, leverage, assets, sales, and cash flows for the year closest to the IPO year, the fraction of the shares sold by existing shareholders, etc.).

In the regression equations (7), v_{1i} and v_{2i} are firm characteristics that are private information of the firm, hence unknown to the market, that affect the firm's underpricing (e.g., the value of the management). Some of this private information that affects underpricing can be correlated with the private information behind the firm's choice of pre-IPO bank; therefore ε_i is potentially correlated with both v_{1i} and with v_{2i}. OLS estimates of β would be biased, since X_i is correlated with ε_i, and ε_i is correlated with both v_{1i} and with v_{2i}, so X_i is potentially correlated with v_{1i} and v_{2i}. Therefore, the expected value of the error terms in equation (7), $E(v_{1i} \mid X_i, \gamma' I_i \geq \varepsilon_i)$ and $E(v_{2i} \mid X_i, \gamma' I_i < \varepsilon_i)$, are different from zero. The idea behind the Heckman procedure is to estimate these expectations (the market's updated beliefs regarding the market unobservable firm characteristics), replace them in the regression equations (7), and estimate these equations using OLS. Under certain standard assumptions on the error terms, the market's updated beliefs regarding the unobservable firm characteristics are

$$\begin{aligned} E(v_{1i} \mid X_i, C_i = 1) &= E(v_{1i} \mid X_i, \gamma' I_i \geq \varepsilon_i) = -\sigma_{1\varepsilon} \frac{\phi(\gamma' I_i)}{\Phi(\gamma' I_i)} \\ E(v_{2i} \mid X_i, C_i = 0) &= E(v_{2i} \mid X_i, \gamma' I_i < \varepsilon_i) = \sigma_{2\varepsilon} \frac{\phi(\gamma' I_i)}{1 - \Phi(\gamma' I_i)}. \end{aligned} \tag{8}$$

B.3. Heckman Two-step Estimation

In the first step, I estimate the selection equation (6), using a probit maximum likelihood method, and find estimates $\hat{\gamma}$. In the second step, I use the estimates $\hat{\gamma}$ to find the market's updated beliefs regarding the firm's unknown characteristics given its choice of bank: $\hat{E}(v_{1i} \mid \hat{\gamma}' I_i \geq \varepsilon_i)$ and $\hat{E}(v_{2i} \mid \hat{\gamma}' I_i \geq \varepsilon_i)$. Given these updated beliefs, the regression equations (7) can be summarized as,

$$\text{Underpricing}_i = \beta' X_i + \sigma_{2\varepsilon}\left[\frac{\phi(\hat{\gamma}' I_i)}{1-\Phi(\hat{\gamma}' I_i)} * (1-C_i)\right] - \sigma_{1\varepsilon}\left[\frac{\phi(\hat{\gamma}' I_i)}{\Phi(\hat{\gamma}' I_i)} * C_i\right] + \xi_i, \quad (9)$$

where $E(\xi_i) = 0$, for $i = 1, 2$. Now the underpricing equations can be estimated consistently using OLS.

B.4. Results Controlling for Endogenous Selection

The results of the probit estimation of the selection equation show that it is more likely that bigger, more leveraged firms, borrowing large amounts, and borrowing from a syndicate of banks, establish a relationship with a potential underwriter (the probability of choosing a bank with underwriting abilities does not significantly depend on whether the loan has been rated, or whether this is the first loan the firm takes).[31]

Table XI shows the results on the estimation of the following regression equation:

$$\begin{aligned}\text{Underpricing}_i = {} & \beta_0 + \beta_{Could}\, Could_i + \beta_{Did}\, Did_i \\ & + \beta_{\text{Firm}}\, \text{Firm Characteristics}_i \\ & + \beta_{\text{IPO}}\, \text{IPO Characteristics}_i \\ & + \beta_{\text{Controls}} \text{Controls}_i \\ & + (1-C_i)\sigma_{2\varepsilon}\left[\frac{\phi(\hat{\gamma}' I_i)}{1-\Phi(\hat{\gamma}' I_i)}\right] - C_i \sigma_{1\varepsilon}\left[\frac{\phi(\hat{\gamma}' I_i)}{\Phi(\hat{\gamma}' I_i)}\right] + \xi_i. \end{aligned} \quad (10)$$

Controlling for firm selection reinforces the result that firms with an established relationship with a potential underwriter exhibit substantially lower IPO underpricing than firms without a relationship with a potential underwriter. The first column of Table XI reports the basic regression. Having a relationship with a bank that can potentially manage IPOs reduces the firm's cost of capital by over 43%, which is both economically and statistically significant. Furthermore, going public with the relationship bank is, as predicted, both economically and statistically insignificant. The results concerning the firm's cash-to-assets ratio, leverage ratio, and age are consistent with the findings in Tables VI to X. The second column tests the robustness of this result to industry fixed effects, the third one controls for the underwriter's type, and the last column tests the robustness of the result to underwriter fixed effects. The results of this paper are robust to these controls (in all the regressions above $\beta_{Could} < 0$, both economically and statistically significant). Note that the results on the endogeneity correction terms ($\frac{\phi(\hat{\gamma}' I_i)}{\Phi(\hat{\gamma}' I_i)}$ and $\frac{\phi(\hat{\gamma}' I_i)}{1-\Phi(\hat{\gamma}' I_i)}$) are not robust to all specifications. This suggests that firms did not select into the categories of $Could = 1$ and $Could = 0$. Why didn't firms self-select into the banking relationship that would produce the lowest underpricing for them when going

[31] Results are omitted for brevity. They are available from the author upon request.

Table XI

Controlling for Self Selection: The Regression Equation

This table presents estimates for the second step in the two-step Heckman estimation. The regression equation estimated is:

$$Underpricing_i = \beta' X_i + \sigma_{2\varepsilon}\left[\frac{\phi(\hat{\gamma}' I_i)}{1-\Phi(\hat{\gamma}' I_i)} * (1 - C_i)\right] - \sigma_{1\varepsilon}\left[\frac{\phi(\hat{\gamma}' I_i)}{\Phi(\hat{\gamma}' I_i)} * C_i\right] + \xi_i.$$

The dependent variable is underpricing. In addition to the variables reported each regression also includes year fixed effects, a standardized measure of the offer price, and a constant term. C_i equals 1 if firm i could have gone public with its relationship bank, and 0 otherwise (i.e., $C_i = Could_i$ in the previous regressions). X denotes a matrix of firm, IPO and underwriting bank characteristics described below. Column 1 reports the basic regression. Firm characteristics are gathered from the last amended prospectus filed with the SEC, measured in thousands, for the last year prior to the IPO. *Subsidiary* = 1 if the lead underwriter is a Section 20 (or a Section 4(k)(4)(E)) subsidiary, and 0 otherwise. Column 2 includes industry fixed-effects based on the first of the four digits in the SIC codes. Column 3 controls for the underwriter's classification: *Subsidiary* = 1 if the lead underwriter is a Section 20 (or a Section 4(k)(4)(E)) subsidiary, and 0 otherwise. Column 4 reports results when book-runner fixed effects are used. The endogeneity correction terms are $\frac{\phi(\hat{\gamma}' I_i)}{1-\Phi(\hat{\gamma}' I_i)}$ and $\frac{\phi(\hat{\gamma}' I_i)}{\Phi(\hat{\gamma}' I_i)}$.

	Basic (1)	Industry FE (2)	Bank Type (3)	Underwriter FE (4)
Asymmetric information				
Could	−43.69***	−41.79**	−42.61***	−46.80***
	(15.56)	(17.03)	(17.56)	(18.81)
Did	3.68	−1.75	4.81	6.87
	(11.68)	(12.03)	(10.92)	(11.22)
Firm characteristics				
Log(*assets*)	−7.08**	−7.48**	−7.31**	−9.48**
	(3.43)	(3.49)	(3.43)	(3.95)
$\left(\frac{\text{Total debt}}{\text{Total assets}}\right)$	−8.84**	−8.85**	−8.42**	−6.91
	(4.20)	(4.34)	(4.21)	(4.55)
$\left(\frac{\text{Cash}}{\text{Total assets}}\right)$	33.62**	31.45*	34.70**	28.40
	(16.35)	(16.67)	(16.35)	(18.86)
Firm age (years at IPO)	−0.32	−0.41	−0.28	−0.13
	(0.37)	(0.38)	(0.37)	(0.40)
IPO characteristics				
$\left(\frac{\text{IPO proceeds}}{\text{Total assets}}\right)$	−0.05	−0.05	−0.06	−0.06
	(0.04)	(0.04)	(0.04)	(0.05)
Nasdaq	10.21	10.65	10.38	10.80
	(10.23)	(10.76)	(10.22)	(11.74)
Subsidiary			−9.00	−3.64
			(6.98)	(22.18)
Endogeneity correction				
$\left(\frac{\phi(\hat{\gamma}' Z)}{\Phi(\hat{\gamma}' Z)}\right)$	20.16*	18.80	18.90**	22.80*
	(12.08)	(12.03)	(12.90)	(15.85)
$\left(\frac{\phi(\hat{\gamma}' Z)}{1-\Phi(\hat{\gamma}' Z)}\right)$	−24.94*	−28.49	−25.46	−22.78***
	(13.08)	(11.58)	(11.32)	(15.04)
Year fixed effects	Yes	Yes	Yes	Yes
Book-runner fixed effect	No	No	No	Yes
Observations	276	276	276	276
R^2	0.447	0.461	0.451	0.543
Adjusted R^2	0.411	0.407	0.412	0.410
F-test all coefficients = 0	12.28***	8.54***	11.72***	4.08***

*Significant at 10%; **significant at 5%; ***significant at 1%. Bootstrapped standard errors in parentheses.

public? When these firms set up their banking relationships, they did not know that the Glass–Steagall Act would be overruled at the time of their IPO, and hence could not predict that their choice of bank could affect their future IPO underpricing. This dataset records relationships established up to 5 years prior to the firm's IPO date, which means the earliest relationship in the sample was chosen in January 1993. At that time, the issuing firms could not have predicted that the Glass–Steagall Act would be overruled at their future IPO date.

After controlling for firm self-selection, we still cannot reject the hypothesis that having a previously established relationship with a bank that can manage IPOs does in fact lower the firm's IPO underpricing.

IV. The Nature of the Relationship

The categorical variables *Could* and *Did* record whether the underwriting bank has dealt with the issuing firm prior to the IPO. But they do not control for the nature of the banking relationship. In this section, I distinguish between lending relationships (the bank lends its own funds to the firm) and underwriting relationships (the bank managed the firm's private or public debt issue, thus arranging for institutional investors and/or the market to lend their funds to the firm).

To distinguish between these types of relationships, I create a categorical variable, *Loan*, to flag lending relationships. Specifically, *Loan* equals 1 if the bank with which the firm has a relationship actually lent some of its own funds to the firm, and 0 otherwise. In this case, I will say there is a lending relationship. When *Loan* equals 0, the bank managed the firm's earlier public or private debt issue, and the relationship is of the underwriting type. These types of relationships are potentially very different. When the bank underwrites the firm's prior debt issue, it is not lending its own funds to the firm, but arranging for others to do so. Thus, once the bank fulfills its due diligence and sells the issue, its interaction with the firm is finished. In contrast, when the bank lends its own funds to the firm, it is in the interest of the bank to continue following and monitoring the firm closely (at least until the firm paid back the loan it owes the bank). Therefore, it is likely that the bank acquires more information about the firm following a lending relationship ($Loan = 1$) than following an underwriting relationship ($Loan = 0$).

The percentage of firms in my sample that had a bank loan is 92.43%; the remaining 7.57% had a debt issue underwritten by the relationship bank. Of those firms that borrowed from the bank, 44.52% could have gone public with their relationship bank, and of these, 57.14% actually did go public with their bank. All the firms that had an underwriting relationship could have gone public with their bank (banks that have debt underwriting abilities also have equity underwriting abilities), and 91.30% of these firms actually went public with their bank.[32]

[32] For the subsample of firms for which the bank underwrote a debt issue, the percentage of firms for which the bank underwrote the firm's *private* placement of debt is 87.50%; for the remaining 12.50% the bank underwrote a *public* debt issue. I lack identification power to consider these categories separately, so I group the two as having an underwriting relationship.

Table XII

Does the Nature of the Banking Relationship Matter?

If the bank lent its own funds to the firm, the firm had a lending relationship with the bank, and the binary variable *Loan* = 1. If the bank managed the firm's (private or public) debt issue, the firm had an underwriting relationship, and hence *Loan* = 0. *Could* equals 1 if the firm could have gone public with its relationship bank, and 0 otherwise. *Did* is equal to 1 if the firm did go public with its relationship bank, and 0 otherwise. The reason for distinguishing between these types of relationships is that lending relationships might generate more information than underwriting relationships. The lending bank has a stake in the borrowing firm, but the underwriting bank does not, and this might lead the bank with a lending relationship to screen and monitor the borrower more closely, thus generating more information than would be generated by a bank that underwrote the firm's prior debt issue. Though both types of relationships established prior to the IPO might help in reducing asymmetric information and thus underpricing, the effects of each type of relationship need not be the same.

	Could = 1				
	Lending: Loan = 1		Underwriting: Loan = 0		
	Did = 1	*Did* = 0	*Did* = 1	*Did* = 0	*Could* = 0
Relationship	(1)	(2)	(3)	(4)	(5)
Mean	20.91***	30.80**	40.52*	−5.30	62.42
Standard deviation	34.41	66.68	60.56	38.92	91.70
Median	11.63	9.77	11.11	−5.30	27.08
No. of observations	72	54	21	2	157
Percentage out of the total sample	23.53	17.65	6.86	0.65	51.31

***Significantly different at 1% between firms for which: *Could* = 1, *Did* = 1, and *Loan* = 1 and firms for which *Could* = 0 (columns 1 and 5).

**Significantly different at 5% between firms for which: *Could* = 1, *Did* = 0 and *Loan* = 1, and firms for which *Could* = 0 (columns 2 and 5).

*Significantly different at 10% between firms for which: *Could* = 1, *Did* = 1, and *Loan* = 1, and firms for which *Could* = 1, *Did* = 1, and *Loan* = 0 (columns 1 and 3).

Table XII compares the IPO underpricing of firms with lending relationships (those for which *Loan* = 1) with that of firms with underwriting relationships (*Loan* = 0). Given that only two firms with underwriting relationships switched banks, I cannot identify how underpricing differs between these firms and firms in all other categories. Yet there are interesting comparisons that can be made. First, I can compare the underpricing between firms with lending relationships that went public with their relationship bank and firms with lending relationships that switched banks (columns 1 and 2), and also between the former and firms without a relationship with a potential IPO underwriter (columns 1 and 5). Second, I can study the difference in underpricing between firms with lending relationships that switched banks at the time of the IPO and firms without a relationship with a potential underwriter (columns 2 and 5). Finally, I can compare underpricing between firms with lending relationships that went public with their relationship bank with that of firms with underwriting relationships

that went public with their bank (columns 1 and 3). This last comparison can suggest whether the type of pre-IPO banking relationship matters.

The univariate results shown in Table XII reveal that firms with lending relationships that went public with their relationship bank face over 40% lower underpricing than firms without a relationship with a potential underwriter, and this difference is both economically and statistically significant (columns 1 and 5). Firms that could have gone public with their relationship bank but switched banks exhibit about 32% lower underpricing than firms without a relationship with a prospective underwriter, also economically and statistically significant (columns 2 and 5). Hence, when narrowing the definition of banking relationships to *lending* relationships, the economic result of this paper remains valid: Having a pre-IPO lending relationship with a prospective underwriter helps to reduce asymmetric information and consequently reduces underpricing. Note that, as predicted, firms with pre-IPO lending relationships that actually go public with their pre-IPO lender do not face significantly different underpricing relative to those that switch banks (columns 1 and 2).

Table XII also shows that firms that were taken public by banks from which they previously borrowed face a 19.61% lower underpricing compared to firms that were taken public by banks that previously underwrote some private or public debt issue for the firm (columns 1 and 3), and this difference is economically significant and statistically different from 0. This suggests that the type of banking relationship established prior to the IPO does matter: Firms with pre-IPO lending relationships with prospective underwriters face a significantly lower underpricing than firms with pre-IPO underwriting relationships. This is consistent with the idea that lending relationships generate more information than do underwriting relationships. Table XII further shows that firms that had a pre-IPO underwriting relationship with a bank that managed the firm's IPO exhibit 21.90% lower underpricing than firms without any pre-IPO banking relationship (columns 3 and 5).

Of course, these univariate results do not control for other firm characteristics that could be driving the results. The following section accounts for that.

A. Does the Nature of the Relationship Matter?

This section delves into the nature of the relationship, asking whether the firm's underpricing differs depending on the type of pre-IPO relationship once we control for firm, bank, and IPO characteristics. I estimate an equation of the form:

$$\begin{aligned}\text{Underpricing}_i = {} & \beta_0 + \beta_{\textit{Could Loan}}(\textit{Could}_i * \textit{Loan}_i) + \beta_{\textit{Did Loan}}(\textit{Did}_i * \textit{Loan}_i) \\ & + \beta_{\textit{Could Underwriting}}(\textit{Could}_i * \textit{Underwriting}_i) \\ & + \beta_{\text{Firm}}\,\text{Firm Characteristics}_i + \beta_{\text{IPO}}\text{IPO Characteristics}_i \\ & + \beta_{\text{Controls}}\,\text{Controls}_i + \varepsilon_i, \end{aligned} \tag{11}$$

where $\textit{Underwriting}_i = 1 - \textit{Loan}_i$.

In specifying this regression model, I do not distinguish between firms that did go public with their underwriting relationship bank and firms that switched from their underwriting relationship bank, because I lack identification power to make this distinction (only two firms with pre-IPO *underwriting* relationships switched banks).

The hypothesis of this paper translates into the following predictions. A firm with a lending relationship with a bank that could take it public and did take it public faces a lower asymmetric information problem compared to a firm without an established relationship with a potential underwriter. Thus, the former should exhibit a lower IPO underpricing. For otherwise equal firms, the difference in underpricing between them is $\beta_{Could\,Loan} + \beta_{Did\,Loan}$ and the predicted result is $\beta_{Could\,Loan} + \beta_{Did\,Loan} < 0$ and economically significant. For firms with pre-IPO lending relationships, the difference in underpricing between those that keep their lending bank as their IPO underwriter and those that switch banks is $\beta_{Did\,Loan}$, and the prediction is $\beta_{Did\,Loan}$ insignificant (recall that asymmetric information, and hence underpricing, is lower for firms that could have gone public with their pre-IPO relationship bank regardless of whether they did, or did not, go public with this bank). Finally, a firm with an underwriting relationship with a bank that could take the firm public faces a lower asymmetric information problem compared to a firm without any relationship with a potential underwriter. Thus, the former should exhibit a lower underpricing, and therefore the prediction is $\beta_{Could\,Underwriting} < 0$ and significant.

Table XIII shows the results from the estimation. The first column reports the basic regression. Firms with a lending relationship with a bank that can manage IPOs face over 16% lower underpricing than firms that do not have an established relationship with a potential underwriter ($\beta_{Could\,Loan} = -16.72$, t-statistic $= -1.90$, and p-value $= 0.059$). If the lending bank actually managed the IPO, then underpricing is further reduced by over 4%, which is statistically insignificant and economically small as predicted ($\beta_{Did\,Loan} = -4.82$, t-statistic $= -0.45$, and p-value $= 0.654$). Furthermore, the hypothesis $\beta_{Could\,Loan} + \beta_{Did\,Loan} = 0$ can be rejected at the 5% confidence level. The surprising result is that underpricing for firms with an underwriting relationship is only 7% lower than for firms without an established relationship with a potential underwriter, and it is statistically insignificant ($\beta_{Could\,Underwriting} = -7.37$, t-statistic $= -0.57$, and p-value $= 0.569$). This suggests that lending relationships are more valuable than underwriting relationships: Firms with lending relationships with prospective IPO managers face a significantly lower underpricing than firms with underwriting relationships with potential IPO managers. These results are robust to firm characteristics (columns two and three of Table XIII) and to bank characteristics (the fourth and fifth columns of Table XIII).

The results are consistent with the notion that lending relationships generate more information than underwriting relationships; and consequently, lending relationships reduce asymmetric information problems by more than do

Table XIII

Does the Nature of the Banking Relationship Matter? The Impact of Different Types of Banking Relationships on the Firm's IPO Underpricing

This table presents OLS estimates of the following regression equation:

$$\begin{aligned} Underpricing_i = {} & \beta_{Loan*Could}(Loan * Could)_i + \beta_{Loan*Did}(Loan * Did)_i \\ & + \beta_{Underwriting*Could}(Underwriting * Could)_i + \beta_{Firm}\, Firm\ Characteristics_i \\ & + \beta_{IPO}\, IPO\ Characteristics_i + \beta_{Bank}\, Underwriting\ bank\ characteristics_i + \varepsilon_i. \end{aligned}$$

The dependent variable is underpricing. *Could* = 1 if the firm could have gone public with its relationship bank, and 0 otherwise. *Did* = 1 if the firm did go public with its relationship bank, and 0 otherwise. *Loan* = 1 if the bank with which the firm has a relationship actually lent some of its own funds to the firm, and 0 otherwise. In this case, I will say there is a lending relationship. When *Loan* = 0, the bank managed the firm's earlier debt issue, and the relationship is of the underwriting type, hence *Underwriting* = 1. In addition to the variables reported, each regression includes year fixed effects, a standardized measure of the offer price, and an intercept. Firm characteristics are gathered from the last amended prospectus filed with the SEC, measured in thousands, for the last year prior to the IPO. Column 1 reports the basic regression. In column 2, I use a flexible firm-size specification: I replace Log(*Assets*) by categorical variables for the different percentiles of total assets (if the assets of firm *i* belong to the 10th percentile in the distribution of firm assets in my sample, then the 10th firm-size categorical variable for firm *i* is equal to 1 and the remaining categorical variables equal 0). Column 3 controls for firm uncertainty including the categorical variable *Transparency,* which describes how precise the firm is at describing the use of its IPO proceeds (*Transparency* = 1 if the firm is precise and transparent in the description of the uses of the IPO proceeds, and 0 otherwise; see the Appendix). Industry fixed effects are based on the first of the four digits in the SIC codes. Underwriter classification is constructed as described in the Appendix. Column 3 includes underwriter (book-runner) fixed effects. Column 5 includes all of the above mentioned controls.

	Basic	Flexible Size	Transparency	Bank FE	All
	(1)	(2)	(3)	(4)	(5)
Asymmetric information					
Loan ∗ *Could*	−16.72*	−17.49**	−15.85*	−21.03**	−20.64**
	(8.82)	(9.01)	(9.01)	(10.01)	(10.02)
Loan ∗ *Did*	−4.82	−7.77	−8.90	−0.33	−0.45
	(10.74)	(10.70)	(10.67)	(11.32)	(11.32)
Underwriting ∗ *Could*	−7.37	−14.99	−15.67	−7.80	−6.84
	(12.93)	(13.85)	(13.79)	(13.87)	(13.91)
Firm characteristics					
Log Assets	−10.27***			−13.10***	−13.62***
	(2.54)			(2.83)	(2.88)
$\left(\frac{\text{Total debt}}{\text{Total assets}}\right)$	−8.97**	−11.13***	−10.39**	−6.76	−6.82
	(4.05)	(4.15)	(4.15)	(4.24)	(4.24)
$\left(\frac{\text{Cash}}{\text{Total assets}}\right)$	36.60**	43.60***	38.10**	31.04*	27.51
	(15.75)	(16.14)	(16.32)	(17.55)	(17.93)
Transparent			−13.65*		
			(7.22)		
Firm age at IPO (in years)	−0.61**	−0.62**	−0.59*	−0.44	−0.43
	(0.29)	(0.31)	(0.30)	(0.31)	(0.31)
IPO Characteristics					
$\left(\frac{\text{IPO proceeds}}{\text{Total assets}}\right)$	−0.07*	−0.04	−0.04	−0.09**	−0.09**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)

(*continued*)

Table XIII—*Continued*

	Basic (1)	Flexible Size (2)	Transparency (3)	Bank FE (4)	All (5)
$100 * \left(\frac{\text{Shares sold selling shareholders}}{\text{Shares sold}}\right)$	−0.19	−0.22*	−0.23*	−0.15	−0.16
	(0.13)	(0.14)	(0.14)	(0.14)	(0.14)
NASDAQ	15.57*	22.11**	18.64*	17.99*	17.38*
	(9.05)	(9.43)	(9.56)	(10.03)	(10.05)
Reputation					−0.93
					(0.96)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Underwriter fixed effects	No	No	No	Yes	Yes
Flexible firm size	No	Yes	Yes	No	No
$\beta_{Loan\,Could} + \beta_{Loan\,Did} = 0$	Reject at 5%	Reject at 1%	Reject at 1%	Reject at 5%	Reject at 5%
$\beta_{Loan\,Could} + \beta_{Loan\,Did} - \beta_{CouldU} = 0$	Cannot reject	Cannot reject	Cannot reject	Cannot reject	Cannot reject
Observations	303	303	303	303	303
R^2	0.42	0.43	0.44	0.52	0.52
Adjusted R^2	0.39	0.39	0.40	0.40	0.40
F-statistic	13.10***	9.78***	9.59***	4.38***	4.32***

*Significant at 10%; **significant at 5%; ***significant at 1%. Robust standard errors in parentheses.

underwriting relationships, which translates into lower IPO underpricing following lending relationships than underwriting relationships.

V. Discussion

The results of Sections II and III show that the banking relationships with prospective IPO underwriters established prior to the firm's IPO can significantly reduce IPO underpricing. This result is robust to firms endogenously selecting their pre-IPO banking institution. Given the strength and magnitude of the effect of banking relationships on the firm's IPO underpricing, the paper looks deeper into different types of banking relationships, distinguishing lending from underwriting relationships. Results in Section IV indicate that firms with pre-IPO lending relationships with prospective underwriters face significantly lower underpricing than firms with pre-IPO underwriting relationships with potential underwriters. This raises the question of why lending relationships ameliorate the asymmetric information problem more than underwriting relationships do. I discuss two possible hypotheses for this finding.

First, firms with an underwriting relationship might be better known by the market than firms with a lending relationship. Recall that the former firms have done a private or a public debt placement through which the market learned about the firm, while the latter have borrowed from a bank and

therefore are well known by the lending bank but possibly not by public market. Therefore, when going public, firms with underwriting relationships suffer less of an asymmetric information problem than firms with lending relationships. Thus, the underwriting relationship bank has less information to reveal to the market than the lending relationship bank, since the market already has some information about the firms with pre-IPO underwriting relationships. That is, the market has more to learn about the issuing firm when this firm had a pre-IPO lending relationship than when it had a pre-IPO underwriting relationship. But the results indicate that not only does the market have more to learn, but also that it learns more. This raises the following question: What makes lending relationships generate more information than underwriting relationships? The incentives that lending banks have can lead them to learn more about the firms: Since the lending bank has a stake in the firm, it has an incentive to constantly monitor the firm, evaluate its projects, the quality of its management, and the outcome of the firm's investments. Underwriting relationships instead do not entail such an involved and repeated interaction between the firm and the underwriting bank, since once the underwriting bank fulfills its due diligence and underwrites the firm's debt issue, its incentives to follow and monitor the firm's projects are not as strong as those lending banks have. When the bank that previously underwrote the firm's debt issue is called to underwrite the firm's equity issue, the firm could have changed, and the underwriting relationship bank has not been there to monitor these changes. Can the bank called to underwrite the equity issue for a firm for which it previously underwrote a debt issue know as much about the firm as the bank that has been constantly monitoring the firm's activities? Probably not. The incentives lending banks have lead them to study the firm more closely, generating more information about the firm than that generated by the underwriting relationship bank. Hence, at the IPO time, the lending relationship bank has more to reveal to the market, and though it may have a bigger asymmetric information problem to solve than the underwriting relationship bank has, it has the information needed to solve it.

Lock-in effects following underwriting relationships could also explain why pre-IPO lending relationships are associated with a greater reduction in underpricing than underwriting relationships are. Compare the probability that a firm goes public with its relationship bank conditional on a previous lending relationship with the probability that a firm goes public with its relationship bank conditional on a previous underwriting relationship:

$$\begin{aligned} &\Pr(Did = 1 \,|\, Could = 1 \quad \text{and} \quad Loan = 1) = 57.7\% \\ &\Pr(Did = 1 \,|\, Could = 1 \quad \text{and} \quad Loan = 0) = 91.30\%. \end{aligned} \tag{12}$$

There is a significantly higher probability that the issuing firm keeps its relationship bank as its IPO underwriter when the relationship bank has underwritten the firm's prior debt issue. This suggests that underwriting relationship

banks might lock in their client firms more than lending relationship banks.[33] If underwriters receive a benefit from selling underpriced shares (e.g., in the form of retributions from the client institutional investor who receives underpriced shares), then one way for the underwriting relationship bank to extract rents from the firm it has locked-in could be by selling underpriced shares. This could explain why the reduction in underpricing following an underwriting relationship is not as large as that following a lending relationship.

VI. Conclusions

The main point of this paper has been to investigate whether having a pre-IPO banking relationship with a prospective underwriter reduces the asymmetric information problem facing firms issuing equity for the first time. Given the prior empirical evidence reporting a negative correlation between asymmetric information and underpricing, if asymmetric information is in fact reduced following banking relationships with potential underwriters, then IPO underpricing should be lower for firms with these relationships. I test this hypothesis using a new and unique dataset, which compares the identity of the firm's pre-IPO bank to the underwriters managing the firm's new issue. The evidence reported here reveals that firms with an established relationship with a prospective underwriter face a 17% lower underpricing than firms without a pre-IPO relation with an underwriter. These results are robust to the firm's endogenous selection of banking institution prior to going public. Further, when distinguishing between lending and underwriting relationships, the results show that firms with a lending relationship with a prospective IPO underwriter experience a greater reduction in underpricing than firms that have pre-IPO underwriting relationships with prospective underwriters.

Appendix

A. A New Measure of Firm Uncertainty

Previous research has indicated that uncertainty regarding an issuing firm's value has a significant effect on the firm's IPO underpricing, see for instance, Ritter (1984), Beatty and Ritter (1986), Muscarella and Vetsuypens (1989), Carter and Manaster (1990), and James and Wier (1990).

A firm that is precise and transparent in describing the use of its IPO proceeds in the IPO prospectus is informing the market about the firm's available projects and future prospects. This reduces uncertainty regarding the firm's future value, and hence is expected to reduce IPO underpricing. Conversely, a

[33] On lock-in effects following banking relationships, see Rajan (1992), Sharpe (1990), and James (1992). That underwriting relationships generate a greater lock-in effect relative to lending relationships is in contrast to Rajan's findings that bank debt gives the lender more bargaining power over the profits of the firm relative to arm's-length debt. The greater lock-in effect generated through underwriting relationships in this case might be due to the underwriting relationship bank being further ahead in the underwriting business relative to the lending banks (for example, because of having customer networks).

firm that in its last amended IPO prospectus states that it has no specific use for the IPO proceeds is clearly *not* reducing uncertainty about its future investment opportunities. Consider the declaration of Visual Networks (VNWK—IPO on February 5, 1998): "The principal purposes of the offering are to increase the Company's working capital and equity base, create a public market for the Company's Common Stock, facilitate future access to public capital markets . . . The Company has no current plans for the net proceeds of the offering."

And consider that of DSET Corp. (DSET—IPO on March 13, 1998): "The Company expects to use the net proceeds from this offering for general corporate purposes and working capital. [It] has not yet identified specific uses for such proceeds and will have broad discretion over their use and investment."

Neither of these firms is reducing the uncertainty regarding the firm's future value, its prospects and future projects. Compare these declarations with this one from Loudeye Technologies Inc. (LOUD—IPO March 15, 2000): "We expect to use approximately $9.0 million of the net proceeds in 2000 for capital expenditures primarily associated with expansion of our encoding and hosting infrastructure and other technology and systems upgrades. In addition, we plan to use approximately $2.0 million of the proceeds to establish production and sales facilities in Santa Monica, California and New York, [. . .]."

To capture the difference between these types of firms I define *Transparent* equal to 1 if the firm gives a precise list of the IPO uses of proceeds, and Transparent equal to 0 otherwise. Table AI (Panel A) shows that more transparent firms face significantly lower underpricing.

If relationship banking helps reduce asymmetric information about the firm, then firm transparency should not matter as much for firms with a relationship with a potential underwriter: The relationship bank solves their asymmetric information problem, thus the firm does not need to make the extra effort of being transparent. For firms that do not have a relationship with a potential underwriter, transparency should be much more important, since they cannot rely on the relationship bank to ameliorate asymmetric information. In Table AI (Panel B), I interact the firms' transparency measure with their pre-IPO banking relationship variables *Could* and *Did*. Notice that for firms with a relationship with a potential underwriter, transparency does not matter. But for firms without a relationship with a potential underwriter, transparency does matter: Transparent firms in this category have a mean underpricing of 46.4%, while those that do not make the extra effort of being transparent have an average underpricing of 87.63%.

B. The Classification of Underwriters

To identify the underwriter's type I create the following four categorical variables: *Commercial* = 1 if the lead underwriter is a commercial bank, and 0 otherwise; *Investment Bank* = 1 if the lead underwriter is an investment bank, and 0 otherwise; *Subsidiary* = 1 if the lead underwriter is a Section 20 (or a Section 4(k)(4)(E)) subsidiary, and 0 otherwise; *Other* = 1 for all other nondepository institutions, and 0 otherwise.

Table AI

The data in this table have been defined based on the precision with which the firm describes its use of IPO proceeds in the "Use of Proceeds" section in the last amended filing with the SEC. A firm that in the IPO prospectus is precise and transparent in describing the use of its IPO proceeds informs the market about the firm's available projects and future prospects. This reduces uncertainty regarding the firm's future value, and hence is expected to reduce IPO underpricing. Instead, a firm that in its last amended IPO prospectus states that it has no specific use for the IPO proceeds is clearly not reducing uncertainty about its future investment opportunities. To capture the difference between these types of firms I define Transparent equal to 1 if the firm gives a precise list of the IPO uses of proceeds, and Transparent equal to 0 otherwise. This table shows that more transparent firms face significantly lower underpricing. Does being transparent matter when the relationship bank can take the firm public? Is being transparent beneficial for firms that could not have gone public with their relationship bank? If relationship banking helps reduce asymmetric information about the firm, then firm transparency should not significantly matter for firms with a relationship with a potential underwriter: The relationship bank solves their asymmetric information problem, thus the firm does not need to make the extra effort of being transparent. For firms that do not have a relationship with a potential underwriter, transparency should be much more important, since they cannot rely on the relationship bank to ameliorate asymmetric information. This table interacts the firms' transparency measure with their pre-IPO banking relationship variables *Could* and *Did*. Notice that for firms with a relationship with a potential underwriter, transparency does not matter. But for firms without a relationship with a potential underwriter, transparency does matter: Transparent firms in this category have an underpricing of 46.4%, while those that do not make the extra effort of being transparent have an underpricing of 87.63%.

Panel A: Underpricing According to the Degree of Firm Uncertainty: IPO Transparency

Firm Transparency	Transparent	Not Transparent
Mean	36.19***	64.10
Standard deviation	(75.76)	(76.81)
Median	11.85	31.54
No. observations	208	98

Panel B: Underpricing, the Degree of Transparency and the Pre-IPO Relationship

	Could		
	Did	*Did Not*	*Could Not*
Transparent			
Mean	26.09	29.45	46.40***
Standard deviation	(43.52)	(64.44)	(95.23)
No. of observations	67	45	96
Not transparent			
Mean	23.41	29.76	87.63
Standard deviation	(39.26)	(75.50)	(80.30)
No. of observations	26	11	61

For a given pre IPO relationship, ***indicates significantly different at 1% for firms that are transparent relative to firms that are not transparent (comparison across rows for a given column).

The criteria with which lead underwriters were classified are as follows:

1. Classification into investment bank/commercial bank using COMPUSTAT.
2. For those not classified in step 1, I check the Federal Reserve's Web site for all Section 20 subsidiaries (and Section 4(k)(4)(E) subsidiaries)

Table AII

Underwriters are classified as commercial banks, investment banks, Section 20 subsidiaries (or Section 4(k)(4)(E) subsidiaries), and other non-depository institutions, following the criteria described below.

1. Underwriters are classified as investment banks or commercial banks using COMPUSTAT.
2. For those underwriters not classified in step 1, data provided by Federal Reserve Board is used to identify all Section 20 subsidiaries (and Section 4(k)(4)(E) subsidiaries) and their parent organization. See: http://www.federalreserve.gov/generalinfo/subsidiaries/.
3. For those underwriters not classified in steps 1 and 2, the ranking of underwriters by Carter and Manaster (1990) is used to identify investment banks (note that all underwriters in Carter and Manaster (1990) are investment banks).
4. For those underwriters not classified in steps 1 to 3, data provided in the National Information Center (NIC) Web site: http://www.ffiec.gov/nic/ is used to complete the classification of underwriters.

This table presents mean and median underpricing for IPOs underwritten by each type of underwriting bank.

Panel A: Percentage of IPOs Managed by Each Type of Underwriter

	Could = 1		
	Did = 1	*Did* = 0	*Could* = 0
Underwriter is a:			
Commercial bank	1.06	0	4.38
Investment bank	60.64	60.00	58.75
Section 20 subsidiary	38.30	32.73	33.75
Other non-depository institution	0	7.27	3.13

Panel B: Underpricing of Issues Managed by Each Type of Underwriter

Underwriter is a:	Commercial Bank	Investment Bank	Section 20 Subsidiary	Other Nondepository Institution
Mean	63.69	48.34	40.91	14.65
Standard deviation	(53.68)	(73.75)	(85.55)	(43.22)
Median	46.35	17.26	13.94	0
No. of observations	8	181	108	9

and their parent organization: http://www.federalreserve.gov/generalinfo/subsidiaries/.

3. If I still cannot classify the underwriter, I check the Carter and Manaster (1990) ranking of underwriters; all underwriters in their ranking are investment banks.
4. If I cannot classify the underwriters with all the above information, I use the National Information Center (NIC) Web site: http://www.ffiec.gov/nic/. No institution in NIC appears as a Section 20 subsidiary. In NIC, some Section 20 subsidiaries appear as "Other non-depository institutions" and some investment banks appear as "Other institution." I give priority to the classification in the Federal Reserve's Web site.

The percentage of issues in the sample underwritten by each type of bank and the mean underpricing for issues underwritten by each bank type is reported in Table AII, (Panels A and B).

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