# Single versus Multiple banking:

# Lessons from Initial Public Offerings

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**Abstract**

*A vast research in banking addresses the question of the costs and benefits of multiple bank relationships versus a single bank relationship. Although no clear-cutting conclusion is reached, several contributions suggest that multiple bank relationships might lead to a sub-optimal level of monitoring, compared to a single bank relationship, as a result of free riding and coordination problems. We take a novel approach to tackle this research question, by looking at the role, if any, played by the number of lending relationships in initial public offerings (IPOs). We look at the short-term performances of IPOs as measured by underpricing and find that firms that go public with multiple bank relationships exhibit more underpricing than those that go public with a single bank relationship. This finding is independent of the number of bank relationships and/or whether any of the lending banks also acts as underwriter in the offering. We interpret our results as suggesting that the market attributes a weaker certification role to multiple bank relationships because of their less effective monitoring of IPO firms.*

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## 1. Introduction

Firms often receive funding from more than one bank. Ongena and Smith (2000) document that on a sample of firms spanning across 20 European countries less than 15% of the firms borrow from a single bank. Although multiple banking seems to be more common among large firms due to its high transactions costs, there is a large evidence documenting reliance on multiple lenders also among small and medium businesses (Detragiache et al. (2000) for Italy; Farinha and Santos (2002) for Portugal and Guiso and Minetti (2010) for US). The question of the advantages of multiple bank relationships relative to a single bank relationship has attracted a lot of interest in the banking literature and several explanations have been put forward.[1]

This paper contributes to this literature by looking at the impact, if any at all, of the number of bank relationships on the short term performance of initial public offering (IPO) firms as measured by underpricing. IPO firms are an interesting laboratory to investigate this question as they are characterized by a high degree of ex-ante uncertainty and information asymmetry. The monitoring by their relationship banks is very important and, indeed, several papers document that the certification role of lending banks reduces the cost of going public for IPO firms (Slovin and Young, 1990; James and Wier, 1990, Schenone, 2004). However none of the existing papers investigates whether the benefits of bank lending on IPO performances depend on the number of bank relationships developed prior to the IPO date.[2]

The reason why we believe the number of bank relationships could potentially matter for IPO firms is that an extensive literature in banking, but not only, shows that when there are multiple

[1] See Degryse, Kim and Ongena (2009) for a complete survey of the empirical contributions on multiple banking relationships.

[2] We are here interested in the credit relationships developed by IPO firms with banks prior to the IPO date. Hence in what follows *single bank relationship* will refer to an IPO firm which is borrowing from a single bank whereas *multiple bank relationships* will refer to an IPO firms which is borrowing from more than one bank.

principals monitoring an agent in environments characterized by asymmetric information, coordination and free riding problems are likely to arise and adversely affect the level of monitoring (Carletti et al. (2007), Khalil et al. (2007)).[3] If this is the case then the certification role of multiple bank relationships for IPO firms might be weakened and, consequently, have a smaller beneficial impact on the IPO performance.

We test this hypothesis on a sample of 381 US IPOs between 1998 and 2008 and find that firms that have multiple banking relationships at the IPO date are fundamentally different from those with a single banking relationship. Specifically, we find that IPO firms with multiple bank relationships are generally larger but not necessarily less profitable contrary to what predicted by Carletti et al. (2007). More importantly, our results show that IPOs with multiple bank relationships are significantly more underpriced than IPOs with a single bank relationship after controlling for several factors that could explain the difference in the level of underpricing thereby providing convincing support to our main hypothesis. However, we find that the impact on the underpricing is not increasing in the number of banks or in the strength of the relationship. Finally, we investigate whether the effect on underpricing of multiple banking relationships is influenced by whether the firm decides to choose (at least) one of its relationship banks as its IPO underwriter, but, contrary to Schenone (2004), we do not find any empirical evidence supporting this hypothesis.

Our results suggest that the certification role of multiple bank relationships is perceived by the market as weaker than that of a single bank relationship, thereby supporting the view that multiple banks might be less effective at monitoring their companies.

[3] Similarly, in the venture capital literature a couple of recent papers (Chahine et al.(2012), Falconieri et al. (2013)) empirically document that IPO firms that are backed by VC syndicates tend to exhibit poorer short and long term IPO performance. The result are interpreted as the consequence of internal agency conflicts in VC syndicates which ultimately lead to poor monitoring and hence poor performances of their portfolio companies.

The remainder of the paper is organized as follows. The next section reviews the relevant literature and presents our testable hypothesis. In Section 3 we discuss in details the construction of our sample. The results of the empirical analysis are discussed in Section 4. The last Section concludes.

## 2. Literature review and hypothesis development

According to Diamond (1984), banks are considered to facilitate the lender-borrower relationship because they are able to monitor firms and, consequently, mitigate the asymmetric information problems between lenders and borrowers. Hence, monitoring is acknowledged as a key function of banks. However, the literature also acknowledges that the effectiveness of the monitoring function and thus of the ability of banks to mitigate the asymmetric information problems between lenders and borrowers might depend on the number of bank relationships a firm establishes. It seems clear that multiple banking faces a trade-off between the benefits in term of risk diversification and the costs in term of duplication of effort and free-riding problem which can undermine the effectiveness of their monitoring (Diamond, 1984). On the other hand, single banking exposes firms to the classical hold-up problem resulting from the informational monopoly power of the single bank (Sharpe, 1990 and Rajan, 1992) and to inefficient liquidation and constrained financing opportunities (Detragiache et al. (2000), Gopalan et al. (2011)).

More recent papers have attempted to theoretically analyze the single versus multiple bank relationships trade-off by focusing on the efficiency of having multiple principals monitoring an agent in the presence of asymmetric information. Carletti et al. (2007) develop a model where banks are subject to a double moral hazard problem, *vis-à-vis* depositors and *vis-à-vis* firms, and face limited diversification opportunities. In this context, the authors show that whether the existence of multiple banks results in lower monitoring compared to a single bank depends on the

trade-off between the benefits from diversification associated with multiple banks and their cost in term of duplication of efforts and free-riding problem. The empirical predictions that follow from their model suggest that multiple banking should become more likely **when** firms have lower profitability, lower equity and face high monitoring cost**s**. This seems to be consistent with the existing empirical evidence (Degryse and Ongena (2001), Guiso and Minetti (2010)). Khalil et al. (2007) achieve similar conclusions to Carletti et al. (2007) in a more general set up that can be applied to financial contracts with multiple financiers. They develop of a model of multiple principals monitoring a common agent. Their focus is on the design of the contract as well as the level of monitoring as a result of the degree of coordination among the principals. They show that when coordination is difficult, which typically occurs when principals have conflicting objectives, free riding results in sub-optimally poor level of monitoring.

The beneficial effect of bank lending for IPO firms has been widely documented in the IPO literature. Slovin and Young (1990) provide evidence that the existence of bank debt and of credit lines lowers the expected initial return (underpricing) associated with IPOs. The rationale for this result lies in the certification role played by bank debt which becomes a signal to the market of the firm's value. Since, underpricing can be interpreted as a premium for ex-ante uncertainty about the firm market value (Ritter (1984), Beatty and Ritter (1986)), the certification role played by banks enables to reduce the ex-ante uncertainty surrounding the firm thereby leading to less underpricing (James and Wier (1990)). The evidence has recently received further support by Benzoni and Schenone (2010) who document that firms that have more leverage exhibit lower underpricing. They focus on bank relationships with institutions that could potentially underwrite the company's stocks at the IPO. Their findings show, consistently with Schenone (2004), that the existence of such relationships substantially reduces the company's underpricing, even when the

firm chooses to go public with an underwriter other than its relationship bank. Specifically, using a sample of US IPOs between 1998 and 2000, the authors find that having a relationship bank prior to the IPO can decrease underpricing by up to 17%.

Overall, these results show that bank lending contributes to reduce information asymmetry between IPO market participants.[4] This occurs because of the certification effect associated with the monitoring role played by lenders. Based on the banking literature, this monitoring efficiency depends however on the structure of the lending relationship. Because of coordination issues related to multiple banks (Khalil et al, (2007)) or costly duplicated monitoring, the impact of bank lending on the degree of asymmetric information in IPO markets would be mitigated by the structure of the lending relations of IPO firms. Thus, we hypothesize that multiple banks might actually result in less effective monitoring which would weaken their certification role for IPO firms and hence result in larger underpricing.

Based on the above discussion, we can formulate our central hypothesis as following:

*H1: Firms that go public with a single bank relationship exhibit smaller IPO underpricing than those that go public with multiple bank relationships.*

This hypothesis is tested using a dummy variable for whether the firm has one or more than one bank relationships. However, the literature on multiple banking previously surveyed suggests that the drawbacks of multiple bank relationships might increase in the number of relationships. This occurs because free-riding in monitoring as well as coordination between multiple bank

[4] We should note that we focus in this paper on asymmetric information as an IPO underpricing determinant. However, this is only one potential explanation for the existence of underpricing. Several alternative or complementary explanations have been proposed in the literature, such as underpricing as a result of the underwriter' s price stabilization activity or of the fear of subsequent lawsuits (see Ljungqvist (2007) for a detailed survey).

relationships worsen with the number of bank relationships. Consistently with this conjecture, we then test the following second hypothesis.

*H2: IPO underpricing increases with the number of bank relationships.*

*H2* aims at explicitly investigating whether the effect of multiple banking relationships on underpricing is discrete or it monotonically increases in the number of banking relationships.

Schenone (2004) shows that firms using their relationship banking as their underwriter in the IPO are less underpriced than those who do not. She argues that the certification role played by underwriters is strengthened by the existence of lending relations between the firm and its underwriter. Consistently with her argument, we investigate whether IPO firms with multiple banking relationships benefit from using one or more of their relationship banks as their underwriter relative to those who do not do so. This translates in testing the following hypothesis:

*H3: Firms with multiple banking relationships that use one or more of their relationship banks as their underwriter(s) in the IPO experience less underpricing than firms with multiple banking relationships who do not do so.*

Otherwise stated, the previous hypothesis investigates whether the use of a relationship bank as IPO underwriter can mitigate the negative impact of multiple banking relationships on the IPO performance as measured by the underpricing.

Our previous hypothesis assumes that all banking relationships are equally important which justifies then to take the number of relationships as a proxy for the efficiency of monitoring. However, while firms may borrow from more than one bank, these relationships might be asymmetric to the extent that firms might develop closer ties with only a few of them from which they will borrow more. This is indeed confirmed by Guiso and Minetti (2010) who, using US data,

document that firms with multiple lending banks do borrow more from only some of them. For instance they find that firms with three lenders would typically borrow around 65% from one bank and they claim that similar patterns are documented in other countries as well. If this is the case, we can expect that the largest lenders have stronger incentives to monitor the borrowing firm. Consequently, it would be more appropriate in our analysis to consider the "strength" of the lending relationship (or alternatively the concentration of borrowing) rather than the simple number of relationships. In order to do this, we test the following hypothesis:

*H4: For firms with multiple banking relationships, underpricing is negatively related to the strength of the lending relationships.*

We use several proxies for the strength of the lending relationships such as the average loan value and the loan concentration using a Herfindhal Index.

## 3. Data

We collect a sample of IPOs using the Thomson Financial Securities Data Company U.S. New Issues Database (SDC) for the period from January1998 to June 2008. Consistent with previous researches, we remove depository shares, spin-offs, real estate investment trusts (REITs), reverse leveraged buyouts, unit offers, financial institutions, savings and loans, closed-end funds, and IPOs with offer prices less than five dollars. We collect from SDC database information about firms (age, industry, etc.) and the characteristics of each issue (price, number of shares, underwriters, prospectus price ranges, etc.).[5] Some additional information about firms and issues like the classification of companies as internet based and information about financial and operational

[5] We correct some mistakes in the SDC database using information from Jay Ritter's (http://bear.warrington.ufl.edu/ritter/SDC%20corrections122811.pdf) and Alexander Ljungqvist (http://www.stern.nyu.edu/~aljungqv/research.html) webpages.

performances of firms the year before going public are collected using Jay Ritter's webpage and COMPUSTAT. The final sample contains a total of 1661 issues.

This sample is then matched with Dealscan which provides information about loan deals gathered mainly from SEC filings and contacts with the credit industry (Robert and Sufi, 2009). For each company in our SDC sample, we search for information about loans and identify the financial institutions that provided loans to the company up to five years prior to the IPO date. Loans in Dealscan are presented as deals or packages. Each deal may contain many facilities further split in different tranches. Each facility can be a sole lender loan or a syndicated loan. Since we are interested in the number of bank relationships for IPO firms, we base our analysis on the facility level in order to avoid information about potential relationships that can be ignored if we use the deal level analysis. For sole lender facilities, we use the name of the single lender as bank relation. For syndicated loans, we follow the procedure employed by Sufi (2007) to define the nature of bank relationship. Indeed, we first use the variable *LEAD-ARRANGER-CREDIT* to identify the lead arranger.[6] If the information is not available then we use the banks identified with "lead roles" in the variable *LENDERS-ALL-LENDERS*.[7] Since our argument is centered on the role of banks as monitors, we argue, in line with Bharat et al. (2011), that the leading banks in each facility are those who play this monitoring role for syndicated loans.

We collect the following information about each facility: the identities of the financial institutions with leading roles in the loan, whether the loan is syndicated, the total face value of the loan, and, when available, the information about the share of each financial institution in the loan. Our final sample consists of 381 IPO firms having a total of 850 loans reported in Dealscan.

[6] "Lead Arranger Credit" takes value "Yes" or "No" for every bank participating in the syndicated loan.
[7] Following Bharat et al. (2011), we identify the following roles: Lead Arranger, Arranger, Lead Manager, manager, or managing agent.

Based on the above information we construct the variable *BANK* capturing the number of bank relationships as a dummy variable equal to 1 if the IPO firm has only one bank relation before going public and zero if more than one bank are found to be facilities' lead arrangers to the IPO firm. During our sample period, the mergers and acquisitions market for financial institutions was particularly active because of the repeal of the Glass-Steagall act. We control for acquisitions by considering banks and their affiliated institutions as the same relationship for firms if the IPO date is after the merger date. Our second proxy for the number of bank relationships is *NUMBER_BANKS* defined as the actual number of bank relationships an IPO firm has at the IPO date. We additionally control for whether the loan is syndicated or not as it can be argued that syndicates are more prone to free riding problems in monitoring and hence exacerbate the negative impact on IPO underpricing. For this purpose we construct a proxy *SYND*: a dummy variable equal to one if at least one of the loans of the IPO firm was syndicated and 0 otherwise. Consistent with our argument, we can expect that low efficient monitoring would be associated with syndicated loans. Also, for each firm, we identify the names of lead underwriters and match them with the names of the lending banks. We define a dummy variable *DID* equal to 1 if one of the lead underwriter was also a relationship bank, and zero otherwise.

In order to test hypothesis 4, we define the following three proxies for bank relationships strength:

1) *AVERAGE_LOAN_VALUE*: the sum of loan face values divided by the number of bank relationships. The higher this measure, the more important are the links between relationship banks and the IPO firm. This should be associated with more incentives for bank to coordinate their effort to monitor the firm, leading to lower information asymmetry and lower underpricing.

2) *AVERAGE_NUMBER_LOANS*: the total number of deals for each firm divided by the number of bank relationships. Like for the *AVERAGE_LOAN_VALUE*, this should be positively related to the strength of the relation between the IPO firm and its bank relationships.

3) *HERFINDAHL*: For each loan, when the proportion lent by each bank is observable, the Herfindahl index is equal to the sum of the squared values of these proportions. The variable *HERFINDAHL* is equal to the average value of the Herfindahl indices for the different loans. This measures the strength of the commitment of each bank with the IPO firm and may affect the incentives of the different banks to monitor efficiently the firm. Note that this measure needs information about the proportion lent by each bank, which is available for only 258 IPO firms in our sample.

Before becoming publicly traded, firms are less transparent and information about their bank loans is not necessarily available on Dealscan. This may create several sampling biases we must control for. First, because Dealscan does not necessarily report all loans in particular for private firms, this may result in a misclassification of banks with multiple bank relations as single bank relation. This bias would play against our hypothesis as it reduces the difference between single and multiple bank relationships. Second, we find information about deals for only 23% of the whole IPO sample in our study period (381 over 1661 IPO firms). Compared to the whole sample (see Table 2), we can see that the average underpricing in our sample is 38.04% which is very close to the 38.30% average underpricing in the original SDC sample we crossed with Dealscan. Compared to previous research on IPO, the average underpricing in our sample is slightly higher

than the average underpricing reported in Jay Ritter's website.[8] We think that our subsample is not distorted in this respect. In Table 1 we define all the variables that will be used in our analysis.

**[Insert Table 1 here]**

## 4. Results

### 4.1. Univariate results

Table 2 reports the descriptive statistics of our sample of IPO firms and the differences between IPO firms having a single bank relationships (*BANK=1*) and those with multiple bank relationships (*BANK =0*). At first look, we observe a difference in the level of IPO underpricing between the two groups: firms with multiple banks have a mean underpricing of 30.33% vs. 44.64% for firms with one bank, and the difference is statistically significant at 5%. This observation is in contradiction with our main hypothesis (*H1*). However, we note that firms with multiple bank relationships are larger, in terms of asset value, with larger IPO proceeds and larger revenues. This might explain some of the difference in underpricing since the IPO literature widely documents that offer size and firm size do affect IPO underpricing. Consistently with the intuition, multiple bank relationships firms exhibit larger debt than firms with one bank relationship and the difference, like for size proxies, are all statistically significant at 1% level. Furthermore, firms with single bank relationship tend to go public with less reputed underwriter and are on average younger. Some of these observations are consistent with the banking literature about bank relationships (Farinha and Santos (2002), Detragiache et al. (2000)). In terms of deals' characteristics, the number of loans and the total value of loans for firms with multiple bank relationships are significantly larger than for firms with single bank. For firms with multiple bank

[8] The average underpricing for the same period reported by Ritter is 35.86% as can be derived from information on Ritter's website: http://bear.warrington.ufl.edu/ritter/IPOs2012Underpricing.pdf.

relationships, the average number of relations is 6.89 and more than 87% of loans are syndicated. Overall, the univariate results suggest that there is fundamental differences between IPO firms with a single bank relationship and those with multiple bank relationships which we will need to take carefully into account in our analysis.

**[Insert Table 2 here]**

### 4.2. The determinants of the number of pre-IPO bank relationships

As discussed in the previous section, the descriptive statistics seems to suggest that firms with a single lending relationship are fundamentally different from firms with multiple banks. Hence, it seems relevant, as a first step in our analysis, to try and shed some light on what are the key factors that affect the likelihood of having one rather than multiple bank relationships. This will allow us to understand the determinants of the key variable in our analysis. We thus run a probit model relating the likelihood for an IPO firm of having a single bank relationship to some of its characteristics. Our analysis extends Gonzales and James (2007) who, on a sample of 673 IPO firms between 1996 and 2000, investigate the determinants of the likelihood of having a pre-IPO banking relationship. We run the following probit model:

$$BANK_{i,t} = \alpha_0 + \alpha_{debt} Debt\ Characteristics_{i,t} + \alpha_{FIRM} Firm\ Characteristics_{i,t} + \varepsilon_{i,t} \quad (1)$$

Debt Characteristics is a vector of variables including information about firm's loan contracts. We consider leverage, the number of bank loans contracted by the firm and the total loan value. The vector Firm characteristics includes size, age, cash, revenue, whether the firm is in the technology sector, and whether it is financed by a VC. The results of the probit, reported in Table 3, are in line with the univariate results and confirm that the age of the firm does not affect the likelihood of

having a single bank relationship. Furthermore, the size of the firm (measured by total assets), the level of indebtedness (measured by the debt to assets ratio), and the ratio of total revenue to total assets do not affect the likelihood for firms to be single bank relationship. This may be explained by the fact that all these ratios do not necessarily reflect the size of the characteristics of the firm at the time of deciding the structure of bank relationships. Also, the likelihood of a single bank relationship appears to be independent of whether the company is a technology company or VC backed. These findings are in line with Detriagiache et al. (2000) who find that the age of firms and their ownership structure do not affect the likelihood of having single bank relationship. However, firms with a larger ratio of cash to assets (which may be a proxy for the quality of the IPO firm as a borrower) are more likely to have multiple bank relationship. Also, the total value of loans and the number of loans affect significantly the likelihood of firms to be single bank relationship. These results are consistent with Farinha and Santos (2002) who show that firms switching from single to multiple banks are concerned by the hold-up costs related to single bank relationship and to the willingness of banks to diversify their exposition to firm's risk when loan values (and number) are larger.

**[Insert Table 3 here]**

### 4.3. Multivariate regression results

In this section, we examine the relationship between the structure of bank relationships and the IPO underpricing for our sample of 381 IPOs in the US market between January 1998 and June 2008. To test our hypothesis H1, we consider the following regression:

$$Underpricing_{i,t} = \beta_0 + \beta_1 BANK_{i,t} + \beta_{FIRM} Firm\ Charactersitics_{i,t} + \beta_{IPO} IPO\ Characteristics_{i,t} + \varepsilon_{i,t} \quad (2)$$

where *Underpricing* is the first day return, $(P_1 - P_O)/P_O$ with $P_1$ is the closing price on the first trading day and $P_0$ is the offering price. *Bank* is our variable of interest as defined above. The firm characteristics are the following standard controls: *Ln(TotalAssets)* is a standard proxy for the size of the company which is expected to be negatively correlated to the underpricing; *Ln(1+Age)* measures the age of the firm as older companies have less ex-ante uncertainty and hence are less underpriced (Loughran and Ritter (2004)). Following Schenone (2004), we also control for the leverage and the amount of cash measured by the *Ln(TotalDebt/TotalAssets)* and *Ln(Cash/TotalAssets).* Firms with more leverage and less cash tend to be less underpriced consistent with the traditional argument that credit relationships certify the quality of the company. The *IPO Characteristics*, is a vector containing the IPO proceeds (relative to the total assets) which are expected to have a positive correlation with IPO underpricing (Beatty and Ritter, 1986), the *Bubble* period as being characterized by unusually high level of underpricing, the reputation of the underwriter and whether the firm is backed by a venture capitalist (VC). The results of our OLS regression are reported in Table 4.

Model 1 (first column) represents our basic model. The results show that having one bank relationship does significantly lower IPO underpricing: The coefficient on *Bank* is negative, and statistically and economically significant. We also find that firms with higher Cash to Total Assets ratios have significantly higher underpricing while more leveraged firms are less underpriced. As expected, we find that smaller offerings are more underpriced than larger ones. In Model 2, we control for the Internet bubble period and find that, as expected, IPOs exhibit higher underpricing during this period. The coefficient of *Bank* is -0.1519, statistically significant. In model 3, we include a dummy variable to control for whether the IPO is venture backed or not and find that underpricing is higher for venture-backed IPOs. This result is in contradiction with the certification

role associated to VC backing as documented in Megginson and Weiss (1991). However, like in our case, Lee and Wahal (2004) find that VC backing is associated with higher underpricing providing support to the grandstanding hypothesis according to which VCs tend to prematurely rush their investee companies to an IPO in order to exit their investment.

In model 4, we include a dummy variable to control for whether the IPO is underwritten by a prestigious underwriter or not and confirm that prestigious underwriter underprices more than non-prestigious underwriter. Loughran and Ritter (2004) find a similar result and argue that underwriters underprice IPOs strategically to have direct or indirect benefits from the higher underpricing. In model 5, we include price revision measure to control for institutional investor's interest in the offering and find that the coefficient of the *Price Revision* is positive and statistically significant. Thus the institutional interest in an IPO has a positive effect on underpricing. This result is consistent with the "partial adjustment phenomenon" documented by Hanley (1993). In model 6, we further control for technology firms and find that Technology IPO and more underpriced than non-technology IPOs. This result corroborates previous finding. In model 7, we include all firm and IPO characteristics, and confirm that the coefficient on *Bank* is negative and statistically significant ($\beta_{Bank}$ = - 0.1618). In other words, the underpricing for firms with one banking relationship is about 16% lower than the underpricing of firms with multiple banking relationships.

In model 8, we replace the dummy *Bank* with the actual number of bank relationships, for a given IPO firm, *log(1+Banks)*,[9] in order to check whether the negative impact on the underpricing is increasing in the number of banking relationships (*H2*). The results show that the coefficient of our variable of interest while of the expected sign is not statistically significant indicating a discrete

[9] We find similar results when we use number of bank relationships as an explanatory variable.

relationship between the number of banking relationships and IPO underpricing. Results are robust to testing for the non-linearity of the number of banking relationship by using a square term rather than the logarithmic transformation. Generally, our results suggest that the crucial factor is having a single banking relationship. This result is consistent with the monitoring loss of efficiency associated with multiple banking. Indeed, as suggested by Carletti et al. (2007), the free riding problem and the coordination problems increase with the number of bank relationships. However, the marginal loss of monitoring efficiency is decreasing with the number of bank relationships.[10] Our empirical results suggest that underpricing is affected only by the largest marginal loss of efficiency captured by the difference between single and multiple bank relationships.

**[Insert Table 4 here]**

### 4.5. The strength of the lending relationship

From the above analysis, we find that IPO firms with a single bank relationship are less underpriced than firms with multiple bank relationships. We argue that this occurs because multiple banks are less efficient/effective in monitoring firms, which results in a weaker certification role of multiple lenders that ultimately translates in more underpricing.

In the previous analysis our variable of interest does not distinguish whether the lending banks are part of a syndicate or not. Intuitively, the likelihood of free riding in monitoring is exacerbated in bank syndicates because, as suggested by Holmstrom and Tirole (1997), loans' leaders in syndicated loans may provide sub-optimal monitoring effort because they have fewer stakes in the loan. This is what Bharat et al. (2011) call "syndicate moral hazard". In order to test whether indeed this loss of efficiency depends on whether loans are syndicated, we estimate Equation (2) by

[10] In other words, the monitoring loss of efficiency is an increasing concave function of the number of bank relationships.

replacing the variable *BANK* by the dummy variable *SYND*, which takes value 1if the firm has at least one syndicated loan. The results, reported in Colum 1 in Table 5, show that our variable of interest SYND has a positive and statistically significant coefficient. This is consistent with the syndicate moral hazard issue reported in Bharat et al. (2011).

As documented by Schenone (2004), IPO underpricing seems to be lower for firms that go public with a bank lending relationship as an IPO underwriter. We are interested to see whether using a relationship bank as IPO underwriter can partially mitigate the negative impact of having multiple lending relationships. For this purpose we test the following equation:

$$\begin{aligned} Underpricing_{i,t} = \quad & \beta_0 + \beta_1(1 - BANK_{i,t}) + \beta_2(1 - BANK_{i,t}) * DID \\ & + \beta_{FIRM} Firm\ Charactersitics_{i,t} + \beta_{IPO} IPO\ Characteristics_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (3)$$

The variable *DID* is a dummy that takes value 1 if the firm has used one of its relationship bank as underwriter in the IPO and 0 otherwise. The descriptive statistics reported in Table 2 show that approximately 42% of firms with multiple bank relationships do use one of their lending banks as acting underwriters, whereas this is far less common among firms with a single bank relationship (only 8%). To capture the moderation effect of such a decision we interact the dummy DID with the variable (*1-BANK*). We choose to look at (*1-BANK*) as the effect of going public with a relationship bank is likely to be more beneficial, if at all, for firms with multiple banking relationships. Results are reported in Table 5 (Column 2). The variable (*1-Bank*) has as expected a positive coefficient estimate, which is also strongly statistically significant whereas the coefficient estimate of the interaction term is of the expected sign but statistically not significant.

Hence, we conclude that firms do not benefit from using their relationship banks as IPO underwriter contrary to what documented by Schenone (2004).[11]

We turn now to *H 4* that introduces other measures of bank relationship strength. We consider three different measures of bank relationship strength. For each IPO firm, we compute the average number of bank loans per bank relationship (*AVERAGE_NUMBER_LOANS*), the average loan value per bank (*AVERAGE_LOAN_VALUE*) and the average concentration of the bank participations in the different loans (*HERFINDAHL*).

The first two measures capture the extent to which a bank is involved in the firm's financing. We conjecture that a higher average number of bank loans per bank or/and a higher average loan value per bank would increase the incentive for a bank to monitor the firm thereby reducing the negative spillover of having multiple banks. In the regression, we present the results using the natural logarithm of the average loan value. The Herfindhal Index measures whether firm loans are more or less concentrated among few banks. The index would be equal to 1 if loans are highly concentrated (i.e. are contracted by a single bank) and lower than one if they are dispersed among many different lenders. Hence, it is a good measure of the strength of the banking relationship. It is important here to note that we are able to calculate the H-index for only 258 firms in our sample. The results of this last test are reported in columns 3-5 of Table 5. We note that the average number of loans as well as the H-index have both the expected sign, negative, but appear to be statistically

[11] Schenone (2004) distinguishes between lending bank relationships that could take firms public and those that could not because they are not active in the underwriting market. In the context of our sample, we cannot employ such a classification because among the remaining 48% of firms with multiple banking that do not choose any of their relationship banks as their underwriter, the majority, approximatively 43%, have lending banks that are not active in the underwriting market. Hence results will be qualitatively similar to the ones we present here. The difference with respect to the sample used by Schenone (2004) may be due to different time frame covered in the analysis. Indeed, while our sample extends between 1998 and 2008, Schenone's sample only covers the first two years after the repeal of the Glass-Steagall Act, 1998-2000. It seems clear that after that commercial banks have become more active in the underwriting market.

insignificant. These results suggest that, at least from outside investors' perspective, what is important is mainly the structure of lending relationships (captured in our model by the variable *BANK*) rather than the strength of these relationships as measured by the average number of loans per bank or the concentration of loans among banks.

However, contrary to our intuition, Table 5 (Column 3) reports that the average loan value has a strongly statistically significant positive coefficient estimate. A possible explanation for this might be the high correlation existing between the average loan value and total assets (Pearson correlation equal to 0.7180) which suggests that the average loan value is not an adequate proxy for the strength of the lending relationship.[12]

**[Insert Table 5 here]**

### 4.6 Robustness Tests: The Endogeneity of the Bank Dummy

Results from Table 4 suggest that one bank relationship has a negative and significant effect on underpricing. This negative relation could be explained by the fact that banking relationships could indeed contain private information about underpricing not reflected in the other explanatory variables considered in our model. However, this observed negative relation could also be driven by the endogeneity of our Bank variable. Results from Tables 2 and 3 show that firms with multiple banking relationships are larger, have more debt, and less likely to be VC backed than firms with one bank relationship. These factors also affect the IPO underpricing. Thus, the effect of banking relationships on underpricing could reflect the endogenous nature of our variable Bank rather than any private information about underpricing it might contain. In order to address this problem we

[12] It should be noticed that this result might also be affected by whether the loan is secured or not. Everything else equal in fact, monitoring incentives would be lower the higher the value of collateral securing the bank's outstanding loans. Unfortunately our dataset does not provide this kind of information for us to test such hypothesis. We thank an anonymous referee for pointing out this issue.

use the same Two-Stage Estimate approach designed and implemented by Aggarwal et al (2002).[13] In the first stage, Bank is regressed on a vector of regressors that include also but not only those used in the OLS estimate. As an instrument we use the number of deals for IPO firms. From Table 3, we know that the number of loans strongly affect the likelihood of having one rather than many banking relationships. Furthermore, from the results presented in Table 5, the average number of deals is not correlated with underpricing. We run a similar regression to Model 4 in Table 5 by using the natural logarithm of the number of deals before the IPO and the results show that this variable does not significantly affect underpricing. We argue that the number of deals is not necessarily observable by investors during the IPO period since some of these deals do not necessarily appear in the IPO firm prospectus since we gather data up to five years before the IPO date. This suggests that the number of deals is a good candidate to be the instrument in our regression. In the first equation we run Equation (1) by including *ln(1+number of deals*) as an explanatory variable in order to avoid the count data bias.[14] In the second stage, the *fitted Bank* variable (from stage 1) is entered into Eq (2) instead of the Bank variable alongside with the term (*Bank –Fitted Bank*) which captures the exogenous part of the variable Bank. We expect that after controlling for the endogenous portion of the variable Bank, the exogenous portion measured by the term (*Bank –Fitted Bank*) would still have a negative and statistically significant coefficient estimate.[15] Table 6 reports the 2SLS estimates. The first column reports the first stage estimates of the *Bank* equation (1). We find that the coefficients of *Total Debt to Total Assets, Cash to Total*

[13] Their endogeneity problem is similar to ours and the technique considered by Aggarwal et al. (2002) is able to disentangle the endogenous portion of our variable of interest and hence to test whether the exogenous portion still has an impact on the dependent variable.

[14] We find qualitatively similar results by using the number of loans as an explanatory variable. Results are not reported here but are available from the authors upon request.

[15] Note that as highlighted by Aggarwal et al (2002) this additional term is an error term derived from the first stage regression and as such orthogonal to the other variables in the second stage equation. This ensures that it does not affect the other coefficient estimates.

*Assets*, *Ln(Total Assets)*, and *Ln(1+number of deals before IPO)* are negative and significant, while the coefficient of *Ln(1+age)* and *VC* are positive and significant. The second column reports the second stage estimates of the *Underpricing* equation. We find that the coefficient of *Fitted Bank* is negative but not significant, suggesting that the endogenous portion of the bank relationship variable is not related to underpricing. Further the coefficient of the variable (*Bank – Fitted Bank*) is negative and significant, which confirms that *Bank* has indeed private information about *Underpricing* not reflected in other variables.

## 5. Conclusions

This paper investigates the impact of the number of banking relationships on IPO underpricing. While the IPO literature widely document the beneficial role of bank lending and more generally of credit relationships on reducing ex-ante uncertainty for IPO firms (Slovin and Young, 1990; James and Wier, 1990, Schenone, 2004), no paper has yet investigated whether this beneficial impact is affected and, if so to what extent, by the exact number of banking relationships. This paper is an attempt to fill this gap.

Our results suggest that IPO firms that go public with more than one banking relationships exhibit larger underpricing than those that go public with more than one banking relationships and that this remains true even after correcting for the potential endogeneity of our variable of interest. We interpret our results by linking them to the literature on multiple banking. Specifically, our findings provide some support to the theoretical arguments that show that multiple banking suffers from internal agency conflicts that might lead to sub-optimal levels of monitoring (Carletti et al., 2007; Khalil et al. 2007). This in turn would result in a weaker certification role of multiple banking relationships as opposite to single banking relationships and hence in a larger underpricing as we document in this paper. We also find that the effect of multiple banking relationships on IPO

underpricing is binary and does not increase with the number of bank relationships. Thus, the key factor seems to be having one banking relationships. Finally, we find that the strength of the banking relationship does not play a significant role in affecting IPO performances

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**Table 1: Definition of variables**

| | |
|---|---|
| *Age* | The age of the firm in years at the date of its IPO. |
| *Proceeds* | The logarithm of the gross proceeds measured as the number of shares offered times the offer price of the IPO. |
| *bubble* | A dummy variable that takes the value 1 for IPOs during the internet bubble period (1999 and 2000), 0 otherwise. |
| *Post-bubble* | A dummy variable that takes the value 1 for IPOs 3 years after the internet bubble period (2001 to 2003) market, 0 otherwise. |
| *Technology* | A dummy variable that takes the value 1 for technology IPOs, 0 otherwise. We define technology firms using the classification of Loughran and Ritter (2004). |
| *Internet* | A dummy variable that takes the value 1 for Internet IPOs, 0 otherwise. |
| *VC* | A dummy variable that takes the value 1 for venture capital (VC) backed IPOs, 0 otherwise. |
| *Nasdaq* | A dummy variable that takes the value 1 for Nasdaq IPOs, 0 otherwise. |
| *Price Revision* | The difference between the offer price and the mid-range price divided by the mid-range price multiplied by 100. |
| *Underpricing* | The first day return i.e. (First Day Closing Price – Offering Price) / First Day Closing Price. |
| *Reputation* | A measure of the reputation of the lead underwriter of the IPO using the ranking of Loughran and Ritter (2004). The underwriter's reputation is ranked on a scale of 1 to 9. The variable *Reputation* is a dummy variable that takes the value 1 for underwriters ranked at least 8, 0 otherwise. |
| *Reputation2* | A dummy variable based on The variable *Reputation*. If *Reputation* is higher than 8, then Reputation2 is equal to 1, 0 otherwise. |
| *BANK* | A dummy variable that takes the value 1 if the firm has only one banking relationship before its IPO, 0 in case of multiple banking relationships. |
| *AVERAGE_NUMBER_LOANS* | The number of loans contracted by the IPO firm five years before the IPO date divided by the number of bank relationships. |
| *NUMBER_BANKS* | The number of bank relationships having leading roles in the different loans contracted by the IPO firm. |
| *SYND* | A dummy variable equal to 1 if we have the firm contracted at least one syndicated loan and 0 otherwise. |
| AVERAGE_LOAN_VALUE | The total value of loans divided by the number of bank relationships. |
| HERFINDAHL | The sum of Herfindahl indices for different loans divided by the number of loans. For each loan, the Herfindahl index is the sum of squared proportions lent by different banks participating in the loan. |
| *DID* | A dummy variable equal to one if the IPO underwriter is one of the lending bank relationships, 0 otherwise. |

## Table 2: Descriptive Statistics

This table reports the descriptive statistics for a sample of 381 IPOs in the US market between January 1998 and June 2008. Our sample does not include depository shares, spin-offs, real estate investment trusts (REITs), reverse leveraged buyouts, unit offers, banks, savings and loans, closed-end funds, IPOs with offer prices less than five dollars and IPOs that have missing observations for any of the listed variables. We report the values for the whole sample and for the two subsamples of IPOs with multiple bank relationships (*BANK* = 0) and IPOs with a single bank relationship (*BANK* = 1). *Underpricing* is defined as the percentage first-day return from the offer price to the first-day closing price. *Proceeds* denotes the firm *i*'s offering size (in millions of dollars) defined as the total number of shares issued times the offering price. *Shares-Off/Shares-Oust* is the ratio of shares offered in the IPO over the total number of outstanding shares. *Number of Loans*, *Loan Value* and the *number of relationships* are defined as the number of loans, the total value of these loans and the number of banks with leading roles in the loans contracted by the IPO firm up to five years before its IPO date. *Reputation* is the Loughran and Ritter (2004) measure of underwriter's reputation and takes values between 1 and 9. *Age* is the number of years since the firm's founding date as of the IPO. *Technology* is a dummy variable that takes a value of one (zero otherwise) if the firm is in the technology business. *Bubble* is dummy equal to one (zero otherwise) if the IPO occurred during 1999-2000.*VC* is a dummy variable that indicates whether the firm is VC backed or not. *Did* is dummy variable equal to 1 if the IPO underwriter is a bank relationship, and 0 otherwise. *SYND* is a dummy variable equal to 1 if at least one of the loans contracted by the IPO firm is syndicated.

**Panel A: Continuous variables**

| Number of observations | | Total N = 381 | | | BANK = 0 N= 170 | | | BANK =1 N= 211 | | Differences in means |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | Mean | Std dev | Median | Mean | std dev | Median | Mean | std dev | Median | |
| *Underpricing (in %)* | 38.04 | 77.35 | 13.44 | 30.33 | 63.35 | 11.01 | 44.64 | 86.20 | 16.47 | -14.31** |
| *Proceeds (in M$)* | 129.43 | 164.28 | 73.66 | 195.35 | 202.82 | 126.5 | 62.03 | 48.56 | 52.00 | 133.32*** |
| *Total Assets (in M$)* | 399.71 | 1244.07 | 50.03 | 733.01 | 1627.83 | 250.27 | 127.60 | 700.63 | 25.84 | 605.40*** |
| *Total Cash (in M$)* | 25.49 | 81.10 | 5.85 | 43.52 | 114.38 | 7.91 | 9.10 | 12.93 | 4.71 | 34.42*** |
| *Total Debt (in M$)* | 157.51 | 439.47 | 8.5 | 312.37 | 613.97 | 111.90 | 29.88 | 90.85 | 3.66 | 289.49*** |
| *Total Revenue (in M$)* | 282.02 | 825.94 | 44.75 | 504.41 | 1135.42 | 133.77 | 101.93 | 348.86 | 24.61 | 402.49*** |
| *Shares-Off/Shares-Oust (in %)* | 28.12 | 44.34 | 25.21 | 30.22 | 17.11 | 27.21 | 26.42 | 14.08 | 23.88 | 3.80** |
| *Number of Loans* | 2.23 | 2.19 | 1.00 | 3.42 | 2.77 | 2.00 | 1.27 | 0.69 | 1.00 | 2.15*** |
| *Loan Value (in M$)* | 313.14 | 805.98 | 22.5 | 644.46 | 1107.52 | 290.45 | 45.90 | 164.56 | 7.50 | 598.56*** |
| *Number of Relationships* | 3.63 | 5.42 | 1.00 | 6.89 | 6.82 | 5.00 | 1.00 | 0.00 | 1.00 | 5.89*** |
| *Reputation* | 8.03 | 1.52 | 9.00 | 8.34 | 1.22 | 9.00 | 7.79 | 1.68 | 8.00 | 0.55*** |
| *Age (in years)* | 16.58 | 22.61 | 7.00 | 20.93 | 26.08 | 10.00 | 13.08 | 18.72 | 6.00 | 7.85*** |

**Panel B: dummy variables**

| | Total Proportion | BANK = 0 Proportion | BANK =1 Proportion | Difference in proportions |
|---|---|---|---|---|
| *Technology (in %)* | 44.47 | 36.47 | 50.95 | -14.71*** |
| *Bubble (in %)* | 42.10 | 34.12 | 48.82 | -14.70*** |
| *VC (in %)* | 49.73 | 34.12 | 62.38 | -28.26*** |
| *Did (in %)* | 23.68 | 42.94 | 8.10 | 34.88*** |
| *SYND (in %)* | 51.32 | 87.06 | 22.38 | 64.78*** |

* Significant at 10%; ** significant at 5%; *** significant at 1%.

**TABLE 3: The likelihood for IPO firms to be single bank relationship**

This table reports the results of a probit model for the likelihood for firms to be single bank relationship firm. The sample contains 381 IPOs in the US market between January 1998 and June 2008. Our sample does not include depository shares, spin-offs, real estate investment trusts (REITs), reverse leveraged buyouts, unit offers, banks, savings and loans, closed-end funds, IPOs with offer prices less than five dollars and IPOs that have missing observations for any of the listed variables. The dependent variable is *BANK*, equal to 1 if the IPO firm has only one bank relationship up to five years before its IPO date, 0 otherwise. *Log* is defined as the natural logarithm. *DebtToAssets*, *CashToAssets* and *RevenueToAssets* are ratios using data about the IPO firm the year preceding the IPO year. *Assets* is the total value of assets the last year before the IPO. *Number of Loans* and *Total Loan Value* are defined as the number of loans and the total value of these loans contracted by the IPO firm up to five years before its IPO date. *Age* is the number of years since the firm's founding date as of the IPO. *Technology* is a dummy variable that takes a value of one (zero otherwise) if the firm is in the technology business. *VC* is a dummy variable that indicates whether the firm is VC backed or not.

| Variable | *Coefficient.* | *Std. Err.* | *p-value* |
|---|---|---|---|
| *Log(DebtToAssets)* | -0.0027 | 0.0598 | 0.964 |
| *Log(CashToAssets)* | -0.1131 | 0.0448 | 0.012 |
| *Log(Assets)* | -0.1096 | 0.0802 | 0.172 |
| *Log(RevenueToAssets)* | -0.0312 | 0.0345 | 0.366 |
| *Log(1+Number of Loans)* | -1.8124 | 0.2804 | 0.000 |
| *Log (Total loan Value)* | -0.3005 | 0.0686 | 0.000 |
| *VC* | 0.0736 | 0.2042 | 0.718 |
| *Log(1+Age)* | 0.1151 | 0.0854 | 0.178 |
| *Technology* | -0.0895 | 0.1910 | 0.639 |
| *Cons* | 7.03871 | 1.0960 | 0.000 |
| *Log Likelihood* | | -151.98604 | |
| *LR Chi2(9)* | | 217.41 | |
| *Pseudo R-Square* | | 41.70% | |
| *Number of observations* | | 381 | |

## Table 4: OLS regression results

This table examines the relationship between the number of bank relationships and the IPO underpricing for our sample of 381 IPOs in the US market between January 1998 and June 2008. Our sample does not include depository shares, spin-offs, real estate investment trusts (REITs), reverse leveraged buyouts, unit offers, banks, savings and loans, closed-end funds, IPOs with offer prices less than five dollars and IPOs that have missing observations for any of the listed variables. We only consider loans of $100,000 and above. Our candidate variable is *BANK* which is a dummy variable that takes the value 1 if the firm has one banking relationship before its IPO, 0 otherwise (in case of multiple banking relationships). The control variables used are: *Ln*(*Total Assets)* which denotes the log of firm *i*'s total assets the year before the IPO date (in millions of dollars); *Total Debt to Total Assets* is the debt-to-assets ratio (at the IPO year); *Cash to Total Assets* is the cash-to-assets ratio (at the IPO year); *Ln(1+age)* is the natural log of 1 plus the years since the firm's founding date as of the IPO; *Total Proceeds to Total Assets* total proceeds-to-total assets ratio (at the IPO year). The *Bubble* dummy takes a value of one (zero otherwise) if the IPO occurred during 1999-2000. *VC* is a dummy variable that indicates whether the firm is VC backed or not. *Reputation* dummy takes a value of one if the lead underwriter has a ranking according to Carter and Manaster (1990) of 8 or more, and zero otherwise. *Price Revision* = [(Offer Price − Mean Filing Price) /Mean Filing Price]; *Technology* is a dummy variable that takes a value of one (zero otherwise) if the firm is in the technology business. Model 1 represents our basic model. In model 2, we include the bubble variable to our basic model. In model 3, we add the VC variable to our basic model. In model 4, we add underwriter's reputation variable to our basic model. In model 5, we add Price Revision measure to our basic model. In model 6, we add Technology variable to our basic model. In model 7, we include all our control variables to our basic model. Model 8 tests our Hypothesis 2 by including the logarithm of the number of banks as an explanatory variable instead of the BANK variable. Finally, Model 9 tests the non linearity relation by including the squared value of Ln (1+Number of Banks) as an explanatory variable of underpricing.

| | **Model 1: Basic** | **Model 2: bubble** | **Model 3: VC** | **Model 4: Reputation** | **Model 5: Price Revision** | **Model 6: Technology** | **Model 7** | **Model 8-H2** |
|---|---|---|---|---|---|---|---|---|
| **Variable** | **Coef.** | **Coef.** | **Coef.** | **Coef.** | **Coef.** | **Coef.** | **Coef.** | **Coef.** |
| Intercept | 0.9405*** | 0.6219*** | 0.7435*** | 0.7280*** | 0.9006*** | 0.6582*** | 0.5975*** | 0.3904*** |
| BANK | -0.1719** | -0.1519** | -0.1992** | -0.1468* | -0.1717** | -0.1625* | -0.1618* | |
| Ln (1+Number of Banks) | | | | | | | | 0.0695 |
| Ln (Total Assets) | -0.0979*** | -0.0614** | -0.0825*** | -0.1177*** | -0.0940*** | -0.0768*** | -0.0839*** | -0.0741*** |
| Total Debt to Total Assets | -0.3064*** | -0.2798*** | -0.2890*** | -0.2904*** | -0.2465*** | -0.2872*** | -0.2345*** | -0.2248*** |
| Cash to Total Assets | 0.3117*** | 0.2939*** | 0.2973*** | 0.2993*** | 0.2461*** | 0.2978*** | 0.2388*** | 0.2354*** |
| Ln (1+age) | -0.0153 | -0.0216 | 0.0006 | -0.0020 | -0.0127 | -0.0017 | 0.0042 | 0.0012 |
| Total proceeds to Total Assets | 0.0052*** | 0.0055*** | 0.0056*** | 0.0046*** | 0.0008 | 0.0054*** | 0.0013 | 0.0010 |
| Bubble | | 0.3909*** | | | | | 0.1445* | 0.1476** |
| VC | | | 0.2038*** | | | | 0.0079 | -0.0065 |
| Underwriter's reputation | | | | 0.3150*** | | | 0.0981 | 0.1076 |
| Price Revision | | | | | 0.0111*** | | 0.0099*** | 0.0098*** |
| Technology | | | | | | 0.3376*** | 0.1511** | 0.1591** |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-Square | 0.3129 | 0.3639 | 0.3256 | 0.3364 | 0.4630 | 0.3524 | 0.4889 | 0.4852 |
| Adjusted $R^2$ | 0.3016 | 0.3511 | 0.3126 | 0.3235 | 0.4523 | 0.3394 | 0.4720 | 0.4682 |

* Significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 5: The impact of different measures of bank relationship strength on IPO underpricing**

This table examines the relationship between different measures of bank relationships strength and the IPO underpricing for our sample of 381 IPOs in the US market between January 1998 and June 2008. We only consider loans of $100,000 and above. The control variables used are: *Ln*(*Total Assets)* which denotes the log of firm *i*'s total assets the year before the IPO date (in millions of dollars); *Total Debt to Total Assets* is the debt-to-assets ratio (at the IPO year); *Cash to Total Assets* is the cash-to-assets ratio (at the IPO year); *Ln(1+age)* is the natural log of 1 plus the years since the firm's founding date as of the IPO; *Total Proceeds to Total Assets* total proceeds-to-total assets ratio (at the IPO year). The *Bubble* dummy takes a value of one (zero otherwise) if the IPO occurred during 1999-2000. *VC* is a dummy variable that indicates whether the firm is VC backed or not. *Reputation* dummy takes a value of one if the lead underwriter has a ranking according to Carter and Manaster (1990) of 8 or more, and zero otherwise. *Price Revision* = [(Offer Price − Mean Filing Price) /Mean Filing Price]; *Technology* is a dummy variable that takes a value of one (zero otherwise) if the firm is in the technology business. Model 1 tests the impact of syndicated loans on underpricing by using the variable SYND that is equal to 1 if at least one of the loans is syndicated and 0 otherwise. Model 2 tests the marginal impact on underpricing for firms going public with one of lending relationships. Did is equal to 1 if the firm's lead IPO underwriter is a bank relationship. We consider the variable (1-BANK) that is equal to 1 for firms with multiple banks and 0 otherwise. . Models 3, 4 and 5 test the impact on underpricing of other measures of bank relationship strength: Average Loan Value, Average number of Loans and Herfindahl index, respectively. We use the natural logarithm of Average Loan Value (in millions) which is the total value of loans divided by the number of relationships. Average number of Loans is the total number of Loans divided by the number of relationships. HERFINDAHL is the average Herfindahl index for the different loans. Data needed to calculate Herfindahl index is available only for only 258 firms in our sample.

| | **Model 1 - SYND** | **Model 2: DID** | **Model 3: Average Loan value** | **Model 4: Average Number of loans** | **Model 5: Herfindahl** |
|---|---|---|---|---|---|
| **Variable** | **Coef.** | **Coef.** | **Coef.** | **Coef.** | **Coef.** |
| Intercept | 0.4152*** | 0.429*** | -0.4348 | 0.4047*** | 0.6677* |
| SYND | 0.1240* | | | | |
| 1-BANK | | 0.1667** | | | |
| (1-BANK)*DID | | -0.00110 | | | |
| Ln(Average Loan Value) | | | 0.0571** | | |
| Average Number of Loans | | | | -0.0749 | |
| HERFINDAHL | | | | | -0.0868 |
| Ln (Total Assets) | -0.0734*** | -0.0833*** | -0.0918*** | -0.0667*** | -0.0920** |
| Total Debt to Total Assets | -0.2259*** | -0.2327*** | -0.2385*** | -0.2250*** | -0.2536*** |
| Cash to Total Assets | 0.2351*** | 0.2379*** | 0.2424*** | 0.2373*** | 0.2484*** |
| Ln (1+age) | 0.0015 | 0.0063 | 0.0010 | 0.0072 | -0.0117 |
| Total proceeds to Total Assets | 0.0012 | 0.0009 | 0.0012 | 0.0013 | 0.0007 |
| Bubble | 0.1509** | 0.1441* | 0.1582** | 0.1512** | 0.1237 |
| VC | -0.0039 | -0.0001 | 0.0332 | -0.0109 | -0.0566 |
| Underwriter's reputation | 0.1002 | 0.1051 | 0.0908 | 0.1167 | 0.0864 |
| Price Revision | 0.0097*** | 0.0098*** | 0.0099*** | 0.0097*** | 0/0104*** |
| Technology | 0.1466* | 0.1562** | 0.1616** | 0.1596** | 0.1711* |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes |
| R-Square | 0.4877 | 0.4903 | 0.4897 | 0.4862 | 0.4779 |
| Adjusted $R^2$ | 0.4707 | 0.4718 | 0.4728 | 0.4692 | 0.4525 |

* Significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 6: 2SLS regression**

We consider a sample of 381 IPOs in the US market between January 1998 and June 2008. Our sample does not include depository shares, spin-offs, real estate investment trusts (REITs), reverse leveraged buyouts, unit offers, banks, savings and loans, closed-end funds, IPOs with offer prices less than five dollars and IPOs that have missing observations for any of the listed variables. We only consider loans of $100,000 and above. In equation (1), we regress *BANK* (which is a dummy variable that takes the value 1 if the firm has one banking relationship before its IPO, 0 otherwise (in case of multiple banking relationships)) on the following control variables : *Ln*(*Total Assets)* which denotes the log of firm *i*'s total assets the year before the IPO date (in millions of dollars). ; *Total Debt to Total Assets* is the debt-to-assets ratio (at the IPO year); *Cash to Total Assets* is the cash-to-assets ratio (at the IPO year); *Ln(1+age)* is the natural log of 1 plus the years since the firm's founding date as of the IPO; *Ln(1+number of deals before IPO)* is the natural log of 1 plus the number of deals before IPO; *Total Proceeds to Total Assets is the* total proceeds-to-total assets ratio (at the IPO year). The *Bubble* dummy takes a value of one (zero otherwise) if the IPO occurred during 1999-2000. *Price Revision* = [(Offer Price − Mean Filing Price) /Mean Filing Price]* 100; *Technology* is a dummy variable that takes a value of one (zero otherwise) if the firm is in the technology business. In equation (2), we regress *Underpricing* (or initial return) on the same set of control variables of equation (1).We also add the Fitted Bank variable (from estimation (1) and the difference variable (Bank –Fitted Bank) to test if *BANK* contains private information. Industry dummies are included in the regression but not reported in the table.

| | **Equation (1) Dependent Variable : BANK** | **Equation (2) Dependent Variable: Underpricing** |
|---|---|---|
| *Fitted Bank* | | -0.2163 |
| *Difference (Bank-Fitted Bank)* | | -0.0398* |
| *Total Debt to Total Assets* | -0.1224** | -0.1353 |
| *Cash to Total Assets* | -0.0226* | 0.0778*** |
| *Total Proceeds to Total Assets* | -0.0004 | 0.0007 |
| *Ln(Total Assets)* | -0.0908*** | -0.0884** |
| *Ln (1+number of deals before IPO)* | -0.5172*** | |
| *Ln(1+age)* | 0.0454** | -0.0049 |
| *VC* | 0.1072** | 0.0837 |
| *Reputation* | -0.0516 | 0.1104 |
| *Technology* | -0.0535 | 0.1335* |
| *Bubble* | -0.0239 | 0.1710** |
| *Price Revision* | 0.0003 | 0.0112*** |
| *Intercept* | 1.3715*** | 0.6040** |
| *Adjusted* $R^2$ | 34.16% | 40.94% |

* Significant at 10%; ** significant at 5%; *** significant at 1%.