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Conflict of Interest and Certification in the U.S. IPO Market

Abstract

We examine the long-run performance and valuation of IPOs underwritten by relationship banks. We find that over one- to three-year horizons these IPOs do not underperform similar stocks managed by independent institutions. Moreover, our analysis suggests that relationship banks avoid potential conflicts of interest by choosing to underwrite their best clients' IPOs. Consistent with this result, we show that investors value new issues managed by relationship banks higher than similar IPOs managed by outside banks. Our findings support the certification role of relationship banks and suggest that the effect of the 1999 repeal of Sections 20 and 32 of the Glass-Steagall Act has not been negative.

1 Introduction

There has been an extensive debate in the United States regarding the costs and benefits of participation by commercial banks in the securities underwriting business. When banks lend to firms they acquire proprietary firm-specific information about their clients (e.g., Diamond (1991), Rajan (1992), and Stein (2002)). A more informed bank can effectively certify a firm's value and facilitate the underwriting of its client's securities, especially IPOs. However, a lending bank's informational advantage presents a conflict of interest since a bank that has a stake in a firm has incentives to promote the overpriced issuance of a junior claim. This paper adds to the debate along two dimensions. First, we study the long-run performance of IPOs underwritten by commercial banks. We find that over one- to three-year horizons these IPOs do not underperform similar stocks managed by independent underwriters. Second, we examine the selection of IPOs that go public with their relationship bank. Our results suggest that relationship banks avoid potential conflicts of interest by choosing to underwrite their best clients' IPOs. Consistent with this conclusion, we show that investors value new issues managed by relationship banks higher than similar IPOs managed by outside banks.

The 1933 Glass-Steagall Act addressed the potential conflict of interest by banning commercial banks from the market for corporate securities underwriting (Sections 20 and 32 of the Act). Over the past two decades this restriction has been relaxed. The deregulation process begun in 1987 when regulators reinterpreted Section 20 of the Glass-Steagall Act and allowed some banks, such as JP Morgan and Bankers Trust, to set up Section 20 subsidiaries which can underwrite corporate securities (e.g., Puri (1999)). This process culminated in the 1999 Gramm-Leach-Bliley Financial Modernization Act, which brought down the 'firewalls' that limited information, resource, and financial linkages between Section 20 subsidiaries and their parent holding companies as well as with their commercial banking affiliates.

Motivated by these policy developments previous studies have investigated the conflict-of-interest and certification debate by examining the underwriting of bonds. For instance, Kroszner and Rajan (1994), Puri (1994, 1996) provide evidence based on bond issues underwritten prior to the enactment of the Glass-Steagall Act. Gande et al. (1997) use data on bond issues from January 1993 to March 1995. Consistent with the certification view, Puri (1996) and Gande et al. (1997) find that debt issues managed by commercial banks exhibit relatively higher prices, and further, Puri (1994) shows that bank underwritten issues defaulted less than non-bank underwritten issues. Also consistent with the certification role of banks, Kroszner and Rajan (1994) find that bond issues underwritten by commercial banks had default rates lower than similar issues managed by investment banks.

Here we consider a new sample, IPOs underwritten by the firm's commercial bank during the period from 1998 to 2000, and present additional evidence that helps understand the consequences of bringing down the commercial-investment bank firewalls. By combining different data sources, we identify the firm's pre-IPO bank (referred to as the 'relationship bank' in this article), the IPO underwriters, and the firm's characteristics. As such, we can precisely identify the IPOs that were underwritten by a bank subject to a potential conflict of interest.

We focus on two sets of tests. First, we study whether IPOs underwritten by relationship banks exhibit abnormal long-run returns compared to equity issues underwritten by independent banks. This analysis adds to Schenone (2004) who focuses on the short-run performance of IPOs that had a relationship with a prospective underwriter. Second, we examine the selection of IPOs that go public with their relationship banks. In particular, we study whether relationship banks avoid underwriting the IPOs of their low-value clients, which are typically higher-risk IPOs that could expose the bank to a conflict of interest. This work also adds to Schenone (2004), who studies IPO valuation but does not examine the selection of firms that go public with their bank.

The first part of our long-run performance study focuses on the cross-section of buy-and-hold abnormal returns (BHARs). We start out by computing mean BHARs, with holding periods from one to three years, for stocks managed by a relationship bank. For each of these IPOs we identify a matching stock which has similar risk characteristics but was managed by an independent underwriter. We do not find significant differences in performance between the returns on the two samples of stocks. This result is robust across the different benchmarks that we use to compute abnormal returns and across holding periods.

Fama (1998) warns that the results of a long-run performance study based on buy-and-hold abnormal returns should be interpreted with caution. Concerns arise from systematic errors due to imperfect expected return proxies (the 'bad-model' problem), the skewness of individual-firm long-horizon BHARs, and the cross-sectional correlation of BHARs that overlap in calendar time. We attempt to address these issues. To limit the bad model problem, we consider benchmark portfolios that are similar to the IPO stocks on characteristics known to be related to average returns. We focus on portfolios of stocks ranked by size and book-to-market, but we also examine industry-ranked portfolios and different market indeces (S&P 500, Nasdaq, as well as NYSE, AMEX, and NASDAQ stocks). Further, we consider a logarithmic transformation of the BHAR variable to address the asymmetry problem. More importantly, to deal with calendar-time dependence we estimate the cross-sectional correlations of the BHARs with daily returns data, and we use these estimates to conduct inference. We reach the same conclusion that the two samples of IPOs performed similarly, except for some evidence that IPOs underwritten by relationship banks in year 1999 did better at the one-year horizon.

Although we attempt to eliminate the effect of cross-sectional correlation there could be legitimate concerns that our approach to do so may still be inadequate. As such, in the second part of our long-run analysis we follow a calendar-time approach (e.g., Fama (1998)). Specifically, we consider a zero-cost investment strategy that entails a long position in the IPOs underwritten by relationship banks and a short position in ex-ante similar stocks that have been taken public by an outside bank. We compute equal- and value-weighted returns on such portfolio with holding periods of one, two, and three years. We test the performance of this strategy using a linear model which includes a market factor, the Fama and French (1993) HML and SMB factors, and a momentum factor (Jegadeesh and Titman (1993) and Carhart (1997)). We still reach the conclusion that IPOs underwritten by relationship banks do not underperform the stocks in the control sample.

Finally, in the last part of the paper we investigate whether there is self-selection among the firms that go public with their relationship bank. Self-selection could arise because relationship banks might shy away from underwriting the IPOs of their low-value clients, which are typically higher risk IPOs that could expose the bank to a conflict of interest. This effect is further reinforced because high-value firms might have an incentive to go public with their bank, which is in a position to certify the true worth of their stock. When certification prevails over conflicts of interest, the effect of such selection is that the average market value of the firms underwritten by relationship banks is no lower than that of firms taken public by independent banks. We consider a model that accounts for firm-bank selection and we study firm valuation. We find that the outcome of going public with a relationship bank is not random. Further, we show that the value of firms that go public with their bank is higher than the value of firms that go public with an outside institution. These results point towards the certification hypothesis.

The remainder of the paper is organized as follows. In Section 2 we discuss how we construct the data set and the relevant variables while Section 3 contains the analysis. Section 4 addresses the interpretation of our results and concludes.

2 Data

2.1 Sample selection

Sections 20 and 32 of the Glass-Steagall Act were officially repealed on November 12, 1999 with the enactment of the Gramm-Leach-Bliley Act. However, the move towards universal banking started in 1987 (see Puri (1999)) when the Federal Reserve Board granted permission to three banks to underwrite and deal in tier-one securities, i.e., municipal revenue bonds, mortgage-backed securities, commercial paper, and consumer-receivables-related securities. In 1989, the Board expanded the underwriting powers of five commercial banks to include tier-two securities, i.e., corporate debt and equity. Subsequently, and on a case-by-case basis, the Federal Reserve granted commercial banks permission to establish 'Section 20 subsidiaries,' which could engage in those underwriting activities that Section 20 of the Glass-Steagall Act considered ineligible. Still, these subsidiaries were subject to various firewalls that limited the flow of information, resources, and revenues between the subsidiary and the parent bank's holding company, as well as with the commercial bank affiliate.

These firewalls began to tumble in the late 1990s. For example, at the end of 1996 the Federal Reserve substantially increased the revenue cap on Section 20 subsidiaries and dropped many of the firewalls that limited information flows. Before 1998, the activity of commercial banks and their Section 20 subsidiaries in underwriting equity issues was very limited. Gande, Puri, and Saunders (1999) compute the share of the annual dollar volume and number of U.S. equity issues underwritten by Section 20 subsidiaries of commercial bank holding companies, and conclude that "to date, commercial banks have made little inroads into the equity underwriting market." Hence, our sample of IPO firms begins on January 1, 1998, when enough IPOs were underwritten by Section 20 subsidiaries to validate empirical analysis.

Our sample period ends on December 31, 2000. Firms that went public between 1998 and 2000 established their pre-IPO banking relationships without knowing that the Gramm-Leach-Bliley Financial Modernization Act would have opened the way to IPO underwriting by commercial banks. As such, there is no self-selection of a pre-IPO lender in our sample, a result that is consistent with the findings of Schenone (2004). However, after year 2000 firms are likely to strategically choose a pre-IPO banking relationship with a potential underwriter (see, e.g., Drucker (2005) for related evidence), which would create a bias in the results due to the self-selection problem. Thus, we do not include IPOs on or after 2001.

The IPO selection criteria are as follows. We exclude ADRs, closed-end funds, REITS, financial institutions, private placement, rights and unit issues. We also exclude IPOs in which the contract between the underwriter and the issuing firm does not entail firm commitment. This selection results in 1,245 firms.

We use the Securities Data Corporation (SDC) database to obtain the list of issuing firms, the offer date, information on whether they were venture-backed, the list of lead underwriters, the book managers, and the set of all underwriters. We cross-check this information with that in the IPO's last amended prospectus filed with the Securities and Exchange Commission (SEC). We also use the prospectus to gather firm characteristics reported in the balance sheet, income statement, and cashflow statement for the IPO year (or the previous one) and, if available, for the year in which the firm and the bank established their relationship.

To be included in our sample, the issuing firms must have at least one pre-IPO banking relationship within five years prior to the IPO reported in Dealscan. The Dealscan database is compiled by the Loan Pricing Corporation, and contains detailed information on syndicated loan contract terms, the identity of the loan's lead arranging bank as well as all other participants, as well as other loan characteristics (such as loan purpose and type). The primary sources of data for Dealscan are attachments on SEC 10-K filings and reports from the lending institutions. The minimum cutoff loan amount needed for Dealscan to record a loan is $100,000. Thus, the firms in our sample have at least one loan of $100,000 or more. Furthermore, we exclude the firms that report either less than a whole year of financial data or only pro-forma financial statements for the IPO year (or the previous one). These last two requirements restrict our sample to 306 firms. We report summary statistics on their characteristics in Table 1.

We use COMPUSTAT data to examine the characteristics of the excluded firms. For each company we record the first entry in the database, which corresponds to either the IPO year or the first data year available in the prospectus (if the prospectus included pre-IPO data and COMPUSTAT backfiled that data within a three-year period prior to the IPO date). Compared to the IPOs in the sample, excluded firms are smaller. For instance, mean current assets are $15.75 million for excluded firms vs. $20.97 million for sample IPOs. Average sales are $334.32 million, lower than the $481.98 million for sample IPOs. Mean underpricing (which correlates negatively with firm size, e.g., Beatty and Ritter (1986)) is 56.65% vs. 45.13%. Further, mean long-term debt and debt due in one year are $95.92 and $9.09 million, respectively, compared to $144.34 and $11.16 million for sample firms. Thus, the stake of a bank in these stocks is smaller, which makes these firms less exposed to conflicts of interest (Puri (1999)). Also, for these firms we cannot always determine whether there was a relationship bank which could, or did, take them public. As such, we cannot determine whether a potential conflict of interest existed. In contrast, the companies we investigate are a homogeneous sample of firms that have received a significant stake from their relationship bank, and are therefore more highly affected by the costs and benefits of going public with their bank.

The requirement that the firms in our sample have at least one banking relationship reported in Dealscan prior to the IPO includes direct lending relationship (the bank lent its own funds to the firm) as well as underwriting relationship (the firm has a relationship with a bank that previously managed the firm's private or public debt placement). Both types of relationship can lead to certification or conflicts of interest if the relationship bank manages the firm's IPO. In the case of lending relationships, the lending bank monitors and audits the firm closely, so it will generate information that the bank can use to accurately certify the value of the firm's new issue. But because the bank has lent to the firm, it is also more likely to fall prey to conflicts of interest when underwriting the firm's IPO. In the case of underwriting relationships, the bank has its reputation capital at stake. Since the bank sells the firm's debt on the market (public issue) or to a group of private investors (private placement), the bank has an incentive to protect the interest of the investors who purchased such debt. As such, it might also have an incentive to over-represent the value of its client firm value when underwriting its IPO.

2.2 Pre-IPO lending relationship variables

We separate firms that went public with at least one of their relationship banks (flagged with a binary variable **Certify** $= 1$) and firms that did not go public with any of their relationship banks (for which we code **Certify** $= 0$).

In doing so, we carefully track the linkage between Section 20 subsidiaries that underwrote the IPOs and the commercial bank (or bank holding company) to which such subsidiary belonged. Specifically, for each Section 20 subsidiary, we record the date on which the Board of Governors granted the bank holding company initial approval, as reported on the Board of Governors site at http://www.federalreserve.gov/generalinfo/subsidiaries/. For Section 20 subsidiaries that are not listed on the Board of Governors site we obtained information by contacting the Federal Reserve Bank of Philadelphia. Before that date, commercial banks were not authorized to underwrite their clients' securities issues.

We also track whether the firm's relationship bank merged with a bank that had underwriting abilities before (or after) the firm's IPO. That is, for each IPO we check whether the firm's relationship bank had an authorized Section 20 subsidiary operating at the time of that IPO. If such Section 20 subsidiary, or another relationship bank with underwriting powers, underwrote the IPO we code **Certify** $= 1$. The list of bank mergers is in Figure 1, page 310, of Ljungqvist, Marston, and Wilhelm (2004).

2.3 Stock returns

We collect return data from the Center for Research in Security Prices (CRSP) database. We follow each firm from its stock's second trading day or, if that is not available, from the first day on which stock returns become listed in the CRSP files, i.e., date t_{start} (we separately study buy-and-hold returns inclusive of the first-trading-day return). The holding period ends after T years or on the stock's delisting date, whichever comes first, i.e., date $\min(T, t_{delist})$, where $T = 1$, 2, and 3 years. This approach yields buy-and-hold returns

$$R_{i,T} = \left[\prod_{s=t_{start}}^{\min(T,t_{delist})} (1 + r_{i,s}) - 1 \right], \tag{1}$$

where for each firm i, $r_{i,s}$ is the day-s return inclusive of distributions and adjusted for stock splits.

For each stock i, we also compute buy-and-hold returns on two benchmark portfolios:

$$R_{P_i,T} = \left[\prod_{s=t_{start}}^{\min(T,t_{delist})} (1 + r_{P_i,s}) - 1 \right], \tag{2}$$

where $r_{P_i,s}$ is the day-s return on one of two alternative portfolios.

The first, most relevant, benchmark is determined by the returns on 100 portfolios of stocks ranked by size and book-to-market. The portfolios, constructed at the end of each June, are the intersections of ten portfolios formed on size (market equity, ME) and ten portfolios formed on the ratio of book equity to market equity (BE/ME). We obtained daily returns on these portfolios from Ken French's data library. We pair each stock i with the benchmark portfolio that has the closest ME and BE/ME. We also consider four alternative benchmarks that are commonly used in the literature. They are the return on the CRSP value-weighted market portfolio inclusive of all distributions; the return on the S&P500 and Nasdaq indices inclusive of distributions; and return on the 49 industry-ranked portfolios, also from Ken French's data library.

3 Empirical Predictions and Analysis

We briefly review the two competing theories, certification and conflict of interest, in Section 3.1. Then in the rest of the section we formulate and test their predictions. In Section 3.2 we examine the predictions for buy-and-hold abnormal returns in an event-time long-run performance study, while in Section 3.3 we follow a calendar-time approach. Section 3.4 deals with the selection of firms that go public with their bank.

3.1 Certification and conflict of interest

Puri (1999) argues that commercial banks, as lenders to firms, can obtain better prices for securities issues than investment houses particularly when costs of information production are high. Similarly, Kroszner and Rajan (1994) note that banks may have firm-specific information which would give them an advantage over investment banks in underwriting more information-sensitive securities. Puri (1996) finds evidence that supports these predictions in her study of bond issues, i.e., she shows that there is a higher net certification effect for more junior securities.

As such, IPOs underwritten by commercial banks are an interesting data set to investigate the conflict-of-interest and certification debate. First, the pricing of equity is more information-sensitive than the pricing of debt. Thus, an inside bank can play an even more important role in resolving asymmetric information problems when underwriting its client's equity. Second, since equity is junior to debt, equity holders face a much higher risk of expropriation than debt holders do. Therefore the costs associated to potential conflict of interest are higher too.

The certification theory states that relationship banks that manage their clients' IPOs use their proprietary firm-specific information to price these stocks more accurately than an uninformed bank with no ties to the firm. Further, relationship banks have an incentive to avoid the underwriting of low-value clients, which are typically higher-risk IPOs that could expose the bank to a conflict of interest. This selection mechanism is reinforced because high-value firms also have an incentive to go public with their bank, which is in a position to certify the high value of their stock. In contrast, low-value firms are indifferent between staying with their bank (which would only take them public at a low price) or switching to an outside underwriter (which would infer the firm is low value and therefore would place it at a low price).

The conflict-of-interest theory states that relationship banks that manage their clients' IPOs use their proprietary firm-specific information to fool the public into buying overpriced securities. Further, banks do not shy away from underwriting the IPOs of their low-value firms. There is no selection in the firm-underwriter match, nor any difference in the valuations of IPOs underwritten by their bank and stocks taken public by independent banks.

3.2 Event-time analysis of the buy-and-hold abnormal returns

If certification prevails, IPOs underwritten by relationship banks are priced accurately. Thus, a testable prediction of the certification theory is that there should be no long-run underperformance for these stocks. However, the joint-hypothesis problem of testing this condition along with a certain asset pricing model for expected returns clouds the interpretation of the test's results. Here, our preferred approach is to measure the abnormal return as the difference between the event firm's return and the return on a portfolio of stocks that are similar on market size and book-to-market. These characteristics are know to be related to average returns (e.g., Fama and French (1992), Daniel and Titman (1997), Daniel et al. (1997)). There may still be a concern that this approach does not fully control for cross-firm variation in average returns due to differences in expected returns and to chance sample-specific patterns in average returns (e.g., Fama (1998)). As such, in our tests we focus on the difference in BHARs between IPOs underwritten by relationship banks and a matching sample of stocks with similar characteristics. Specifically, we test the null

H_0: There is zero difference between the BHARs on stocks that went public with a relationship bank and the BHARs on stocks taken public by an independent underwriter

against the alternative that the BHARs are different.

3.2.1 Matching criteria

For each IPO issued by the firm's relationship bank, we identify a matching firm that is brought to the market by an independent bank. We start by looking for a matching firm's IPO that has been issued within seven days prior to the IPO date of the stock managed by its relationship bank. We rank the candidate matches that satisfy this requirement by the value of their BE/ME, and we identify the stock that has a book-to-market ratio closest to, but higher than, that of the IPO originated by the relationship bank.[1]

We favor matching stocks with higher book-to-market ratios because they typically yield higher returns. That is, we bias the results of the long-run performance analysis against the prediction of the certification theory, which is our null hypothesis. Although we would also like to match stocks by size, as measured, e.g., by market value of equity, due to the limited number of firms in our sample we do not simultaneously match by size and book-to-market. We do however repeat the analysis by matching IPOs on market size and IPO date only, and find similar results.

If the BE/ME ratios of the two paired firms are within a narrow range, we finalize the match. If not, we keep looking for a match among the firms that went public within two weeks prior to the IPO date of the stock managed by the relationship bank; we follow the same strategy, except that we accept firms that are in a slightly wider BE/ME range. If we are still unsuccessful, we continue to expand the issuing window, up to three months. With this approach, we efficiently find matching firms that typically went public within a month and have a BE/ME ratio close to that of the stock to which they are paired. Only a very limited number of matches fall within the wider three-month window.

If a matching company is delisted before its corresponding stock is issued by a relationship bank, then after its delisting date we use a similar strategy to replace it with a substitute match. If the substitute match is also delisted, we look for yet another substitute, and so on.

3.2.2 Empirical findings

First, we follow Ritter (1991) and examine wealth relatives. We compute the average buy-and-hold return across the stocks underwritten by relationship banks, $\overline{R}_{T,S}$, and the average return on stocks in the matching sample, $\overline{R}_{T,M}$. The wealth relative is the ratio $(1+\overline{R}_{T,S})/(1+\overline{R}_{T,M})$. Table 2 reports the results for different holding periods and matching criteria. In all cases, wealth ratios are larger than one when the holding period is one year. Wealth ratios remain

[1] Our matching criteria are similar to those used in other studies that investigate the long-run performance of IPOs and seasoned equity offers (e.g., Eckbo, Masulis, and Norli (2000), and Loughran and Ritter (1995)). However, there is a significant difference. In our study, the matching firms are themselves IPO stocks. This is why we look for a match whose IPO date is close to that of the stock issued by the relationship bank.

higher than one at longer holding periods except for the case in which we use the book-to-market ratio as a matching criterion and returns are equally weighted. Overall, these results provide some mixed evidence that IPOs underwritten by relationship banks did not underperform similar stocks taken public by independent banks.

Next, we consider the BHARs variable

$$BHAR_i = \frac{R_{i,T}}{T} - \frac{R_{P_i,T}}{T}, \tag{3}$$

where $R_{P_i,T}$ is the buy-and-hold benchmark portfolio return and the holding period T is one, two, or three years. It is well known that the skewness of BHARs can bias the inference in a long-run performance study (e.g., Barber and Lyon (1997), Brav (2000), Brav et al. (2000), Eberhart and Siddique (2002), Fama (1998), Ikenberry et al. (1995), Kothari and Warner (1997 and 2006), Loughran and Ritter (2000), and Mitchell and Stafford (2000)). As a partial remedy to the problem, here we conduct inference based on the bootstrapped skewness-adjusted t-statistics of Lyon, Barber, and Tsai (1999).[2]

Table 3 contains results for the case in which stocks are matched by IPO date and book-to-market ratio. The matching criterion based on the market value of equity yields similar results, available from the authors on request. Throughout the table we use a yearly decimal scaling. As such, a mean abnormal return of, e.g., 0.01 indicates that the stocks in that portfolio outperformed the benchmark by 1% per year.

When returns are equally weighted, the abnormal return on both sample and matching stocks is insignificant, i.e., both samples of stocks were priced accurately. The difference between mean returns on stocks in the sample and in the matching group is also insignificant. This findings holds regardless of the benchmark and the holding period considered (Panel A). We reach similar conclusions when we break down stocks by IPO year, except that we find some evidence that 1999 IPOs underwritten by their bank did better than the other stocks at the one year horizon (Panel C). At longer maturities, however, any difference in performance dissipates. Economically, the difference in performance is 18 percent per year when the benchmark is the return on a portfolio of stocks ranked by size and book-to-market and the holding period is one year from the IPO date (Panel A, FF row, column 3). This figure drops to negative nine percent per year when the holding period increases to three years (Panel A, FF row, column 9).

Similar conclusions apply to the case in which returns are value weighted, except that IPOs taken public by their bank have underperformed all benchmarks at the one year horizon (Panel

[2]Specifically, we compute the skewness adjusted t-ratio in equation (5), page 174 of Lyon, Barber, and Tsai (1999). We calculate the transformed test statistics in equation (6), page 174, for 10,000 resamples each of size 1/2 of the original sample of BHARs (resamples of size 1/4 give similar results). We compute critical values from the 10,000 realizations of such transformed test statistics.

B). This result is mainly driven by the relatively poor performance of IPOs that went public in 1999 (Panel D). However, when compared to the stocks in the matching sample we do not find a significant difference in performance (Panels B and D). Economically, the abnormal returns on the long-short strategy are approximately 10% for the one-year holding period and they decrease to a few percentage points per year over longer horizons (Panel B).

Overall, this analysis suggests that IPOs underwritten by their relationship bank did not underperform the control sample of stocks. In unreported results we also repeat the analysis by including the first-trading-day return to the total return measures in equations (1) and (2). We reach the same conclusion. This is consistent with Schenone (2004), who shows that IPO underpricing does not depend on whether a firm goes public with its bank.

3.2.3 Correcting cross-sectional correlation and skewness biases

The skewness-adjusted statistics that we employed in Section 3.2.2 do not fully correct for the correlation of event-firm abnormal returns that overlap in calendar time. It is well known that ignoring this problem is likely to produce overstated test statistics (e.g., Brav (2000), Fama (1998), Kothary and Warner (2004), and Mitchell and Stafford (2000)). As such, here we attempt to deal with the cross-sectional dependence and the skewness of individual-firm long-run BHARs by following an alternative approach.

First, we consider a different measure of BHARs. For an IPO i, we define

$$BHAR_i = \log\left(\frac{1 + R_{i,T}}{1 + R_{P_i,T}}\right) . \tag{4}$$

As the holding period T shrinks to zero, this measure converges to the BHAR definition (3). Further, it retains some of the intuitive appeal of the more conventional BHAR definition (3), in that it is a monotonic transformation of a ratio which 'represents the investor experience' (Lyon et al. (1999)). One advantage, however, is that at longer horizons the skewness problem is considerably attenuated when we use definition (4). This is evident from Figure 1, which shows that for all holding periods the empirical distribution of the BHARs is much more symmetric when we use definition (4). Table 4 compares skewness and kurtosis for the two BHAR variables. When we use definition (4) we find values that are much closer to zero and three, respectively, which are the benchmarks for a standard normal distribution.

Consider now the cross-sectional regression

$$\log\left(\frac{1 + R_{i,T}}{1 + R_{P_i,T}}\right) = \beta_0 + \beta_{\text{Certify}}\, \mathbf{Certify}_i + \varepsilon_i\, . \tag{5}$$

Ordinary least squares estimates of β_0 and β_{Certify} would yield estimates of the mean BHAR for IPOs underwritten by relationship and independent banks. However, conventional t-ratios, even if computed with a bootstrapping procedure, would be contaminated by the cross-dependence problem. To deal with this problem we estimate the regression (5) by generalized least squares (GLS). For this application we need an estimate for the covariance matrix of the error term ε, which we calculate as shown below.

For each pair of stocks i and j we estimate the covariances of the dependent variables in (5) with high-frequency, daily data:

$$\widehat{\mathrm{Cov}}\left(\log\left(\frac{1+R_{i,T}}{1+R_{P_i,T}}\right), \log\left(\frac{1+R_{j,T}}{1+R_{P_j,T}}\right)\right) = \tag{6}$$
$$\sum_{t\in\Omega_{i,j}}\left(\log\left(\frac{1+r_{i,t}}{1+r_{P_i,t}}\right) - \widehat{\mathrm{E}}\left(\log\left(\frac{1+r_{i,t}}{1+r_{P_i,t}}\right)\right)\right) \times \left(\log\left(\frac{1+r_{j,t}}{1+r_{P_j,t}}\right) - \widehat{\mathrm{E}}\left(\log\left(\frac{1+r_{j,t}}{1+r_{P_j,t}}\right)\right)\right),$$

where $r_{i,t}$ and $r_{j,t}$ are the day-t total returns on stocks i and j, respectively; $\Omega_{i,j}$ is the set of overlapping trading dates in the buy-and-hold periods of stocks i and j; and $\widehat{\mathrm{E}}(\bullet)$ denotes the sample mean of a random variable.

We require a minimum of three months of overlap in the buy-and-hold periods of any stock pair i and j to estimate the covariance in (6). If $\Omega_{i,j}$ is shorter than three months, we fix the cross-sectional covariance between stocks i and j at zero. We obtain the variance estimate for any stock i by setting $i = j$ in (6). In that case, the overlapping trading window $\Omega_{i,i}$ coincides with the entire buy-and-hold period for that stock i.

As the intra-period return frequency increases, (6) converges to the cross-sectional covariances of the dependent variables in (5) (e.g., Andersen et al. (2003) and Jagannathan and Ma (2003)). Since the regressors in the right-hand side of (5) are constant over the holding period, our approach immediately yields a consistent and positive-definite estimate of the covariance matrix of the error term ε, which we use to fit model (5) by GLS.

3.2.4 Empirical results

In Table 5 we report mean abnormal return estimates. For stocks underwritten by relationship banks we compute the mean abnormal return as $(\hat{\beta}_0 + \hat{\beta}_{\text{Certify}})$, where $\hat{\beta}_0$ and $\hat{\beta}_{\text{Certify}}$ are the GLS estimates of the coefficients in equation (5). For stocks managed by independent banks, the mean abnormal return estimate is $\hat{\beta}_0$. The difference between the two means is measured by $\hat{\beta}_{\text{Certify}}$. t-ratios in square brackets are computed using the GLS standard errors.

In panel A we report results for all IPOs from 1998 to 2000. We find some evidence that IPOs taken public by their bank have overperformed the other stocks when the holding period is one year (Panel A, FF row, column 3). A break-down by IPO year suggests that this result is driven by the poor performance of stocks taken public by independent banks in 1999 (Panel B, column 3). However, when we consider holding periods of two and three years we do not find any difference in performance between the two groups of stocks regardless of the IPO year.

3.2.5 Robustness of the results

Among the members of a lending syndicate, the lead lender is likely to acquire the most information on the firm. Thus as a robustness check we replace **Certify** in equation (5) with a binary variable that takes value one when the lead lender is a member of the IPO syndicate. The results, not reported here, are unchanged: during the first year since the IPO date stocks underwritten by their bank overperformed other IPOs, but for longer holding periods any difference in performance dissipates.

Prior studies have examined the linkage between the performance of an IPO and its characteristics. For instance, Puri (1999) argues that if banks have smaller claims in a firm, their potential conflict of interest is lower and therefore they can fetch higher prices. Other studies focused instead on the effect of venture backing on IPO performance. A venture capitalist holding financial claims in a firm faces a conflict of interest. However, the same venture capitalist could reduce the asymmetric information problem and act as a certifier of the new issue's value. If venture-backed companies are better than nonventure-backed ones, investors should incorporate these expectations in market prices. Empirical evidence supports this view: venture-backed IPOs are valued higher than nonventure-backed stocks at the time of the IPO (Megginson and Weiss (1991)); venture investment by lead underwriters significantly reduces IPO underpricing (Li and Masulis (2003)); and venture-backed IPOs perform at least as well as other stocks over the long run (Brav and Gompers (1997), Gompers and Lerner (1999)). Also related, the reputation of the underwriting bank could have a positive effect on the future of the firm and this effect may not be fully incorporated in market prices (Carter et al. (1998)).

Here we examine whether the findings of Section 3.2.4 are robust to controlling for these effects. Specifically, we estimate the regression

$$\log\left(\frac{1+R_{i,T}}{1+R_{P_i,T}}\right) = \beta_0 + \beta_{\text{Certify}}\,\mathbf{Certify}_i + \beta_{\mathrm{X}}'\mathrm{X}_i + \varepsilon_i\,, \tag{7}$$

where X_i includes variables in the following categories:

Bank exposure to the issuing firm: Firm's leverage and 'IPO purpose.'

Venture capital backing: A binary variable that identifies venture-backed IPOs.

Underwriter reputation: The underwriter's market share during the IPO year.

'IPO purpose' is a categorical variable that equals one when the prospectus states that the IPO is meant to refinance or repay bank debt. The underwriter's market share during the IPO year is a commonly used measure of underwriter reputation which correlates highly with other proxies for reputations, e.g., the positioning of the underwriter's name in the IPO's tombstone (Carter et al. (1998)).

The results are available from the authors upon request. The main finding is that β_{Certify} remains insignificant and its point estimate is similar to what we obtained for the univariate regression (5). The coefficients on the other control variables are also insignificant. There are, however, two exceptions. First, the coefficient on the 'IPO purpose' variable is negative and significant at the five percent level when the holding period is one year. This evidence suggests that investors may have underestimated the firm's motive to pay back bank's debt with the IPO proceeds. However, at longer holding periods (two and three years) the same coefficient is insignificant. Second, the coefficient on the 'venture capital' variable is negative and significant at the five percent level when the holding period is one year. This is at odds with the conclusions of the literature that has examined the performance of venture-backed IPOs. Again, however, this result is not robust to the choice of the holding period: at the two- and three-year horizons the same coefficient is insignificant.

3.3 Calendar-time analysis of the portfolio returns

Although we attempt to eliminate the effect of cross-sectional correlation in buy-and-hold returns, there could be legitimate concerns that our approach to do so may still be inadequate. As such, here we pursue a calendar-time approach (e.g., Fama (1998)).

As we did in the event-time study, for each IPO issued by the firm's relationship bank we identify a matching firm that is brought to the market by an independent bank. The matching criteria are identical to those discussed in Section 3.2.1, except that now we consider matching firms that went public within a certain window before or after (rather than prior to) the IPO date of the stock taken public by a relationship bank. That is, we first look for a matching firm's IPO that has been issued within plus or minus seven days from the IPO date of the stock managed by its bank. We progressively expand that interval to plus or minus three months from the IPO date.

Once we have identified a sample of matching stocks, we compute both equal- and value-weighted returns on two portfolios, P_S and P_M. The first, P_S, consists of a long position in the stocks issued by relationship banks. The second, P_M, comprises a simultaneous long position in the corresponding matching stocks. We add a stock to both portfolios starting from the first week when both the stock issued by the relationship bank and its match are first listed. When a stock in the matching sample is delisted, we splice its returns with the returns on the substitute matching stock. We hold each pair of stocks in the portfolios P_S and P_M for a period that ranges from one to three years.

We consider a zero-cost investment strategy that entails a long position in portfolio P_S and a short position in portfolio P_M. We test the performance of P_S, P_M, and the long-short strategy $P_S - P_M$ using the Fama and French (1993) linear three-factor model, augmented with a fourth 'momentum' factor as in Carhart (1997):

$$r_{P,t} = \alpha + \beta_M (r_{M,t} - r_{F,t}) + \beta_{HML} HML_t + \beta_{SMB} SMB_t + \beta_{UMD} UMD_t + \varepsilon_t , \qquad (8)$$

where $r_{M,t} - r_{F,t}$ is the week-t excess return on the market portfolio; SMB_t is the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks in week t; HML_t is the difference between the return on a portfolio of high book-to-market stocks and the return on a portfolio of low book-to-market stocks in week t; and UMD_t is the week-t return on a momentum portfolio that is long stocks that have performed well in the past and short stocks that have performed poorly in the past. The data on the SMB_t, HML_t, and UMD_t factors are from Ken French's data library.

If certification prevails, then we have

H_0: $\alpha = 0$

We test this null hypothesis against the alternative that $\alpha \neq 0$.

3.3.1 Empirical findings

We report estimation results for the regression (8) in Table 6. In Columns 1-3 the dependent variable $r_{P,t}$ is the weekly excess return on the sample portfolio, P_S: $r_{P_S,t} - r_{F,t}$. In Columns 4-6, it is the weekly excess return on the matching portfolio, P_M: $r_{P_M,t} - r_{F,t}$. In Columns 7-9, the dependent variable is the weekly excess return on the portfolio that is long in the sample portfolio and short in the matching portfolio, $P_S - P_M$: $r_{P_S,t} - r_{P_M,t}$. In Panels A and C portfolio returns are equally weighted, while in Panels B and D they are value weighted. In Panels A and B the matching criteria are the IPO date and the book-to-market ratio, while in Panels C and D they are the IPO date and the market value of equity. Columns 1Y, 2Y, and 3Y report estimation results corresponding to holding periods of one, two, and three years for the stocks in the portfolios. In all regressions we use yearly decimal scaling for the return series. As such, an α estimate of, say, 0.01, indicates that a portfolio has had an abnormal return of 1% per year.

For regressions that have returns on the portfolios P_S and P_M as a dependent variable we find that all factors are priced. As expected, the coefficients on the market, SMB, HML, and UMD factors are all significant and the explanatory power of the regressions is high. But for the long-short portfolio $P_S - P_M$ most factor loadings are insignificant (Columns 7-9). In particular, this finding applies to the UMD factor. That is, although we have not explicitly used momentum as a matching criterion, the portfolio of matching stocks has a loading on the momentum factor that is very close to that of the portfolio of stocks underwritten by relationship banks. In some cases, the HML factor remains significant. This occurs especially when the holding horizon of the stocks in the portfolio is longer (two and three years). Not surprisingly, the HML factor is significant when the matching criteria are the IPO date and the market value of equity (Panels C and D). Further, the adjusted R^2 coefficient drops significantly when the dependent variable is the return on the long-short portfolio. In particular it is in most cases close to zero when the matching criteria are the IPO date and the book-to-market ratio. Overall, these results show that we have eliminated most sources of systematic risk from the long-short portfolios, especially when the matching criteria are the IPO date and the book-to-market ratio.

We then proceed to examine the performance of the three portfolios. In almost all regressions, the α coefficients are insignificant. This finding applies not only to the long-short $P_S - P_M$ strategy, but also to the individual portfolios P_S and P_M. Further, in most cases the α estimates are also economically small. For instance, the long-short portfolio has an insignificant abnormal return of 1% per year when the holding periods are two or three years, the matching criteria are the IPO date and the book-to-market ratio, and returns are value weighted (Table 6, Panel B, columns 8 and 9). When returns are equally weighted, the abnormal return is approximately 10% per year and insignificant (Panel A, columns 8 and 9). This difference in point estimates is likely driven by the relatively higher weight that smaller stocks are given when all stocks are given the same weight in the portfolio.

One exception to these findings concerns the α coefficient on the P_S portfolio when the holding period is one year and the matching criteria are the IPO date and the book-to-market ratio. When returns are equally weighted, we find $\alpha = 0.33$, significant at the 5% level (Table 6, Panel A, column 1). This results suggests that stocks underwritten by relationship banks had a 33% abnormal return per year when the holding period in the portfolio for these IPOs is one year. Related, we find $\alpha = 0.35$, significant at the 5% level, for the returns on the long-short portfolio $P_S - P_M$ (Panel A, column 7), i.e., based on this metric IPOs underwritten by relationship banks outperformed stocks taken public by independent banks. These findings, however, are not robust. For instance, when returns are value-weighted, the α coefficient on the P_S portfolio is insignificant (Panel B, column 1). Similarly, when the matching criteria are the IPO date and the market value of equity, the α estimates are insignificant for all portfolios and holding periods (Panels C and D).

Overall, this evidence suggests that the IPOs in our sample are priced accurately and, in particular, that there is no difference in performance between the IPOs taken public by either relationship or outside banks. There is some evidence that the pricing of IPOs did not fully incorporate the certification premium generated by relationship banks, but this finding is not robust to the choice of the holding period and the matching criteria.

3.4 Firm-underwriter selection and market valuation

We examine the selection of firms that go public with their relationship bank with a selection model similar to the one used by Puri (1996) and reviewed by Li and Prabhala (2005).[3] The selection variable W_i is a function of explanatory variables Z_i,

$$\begin{aligned} \mathbf{Certify}_i = 1 \quad \text{iff} \quad \mathrm{W}_i = \mathrm{Z}_i\gamma + \eta_i > 0 \\ \mathbf{Certify}_i = 0 \quad \text{iff} \quad \mathrm{W}_i = \mathrm{Z}_i\gamma + \eta_i \leq 0\,, \end{aligned} \tag{9}$$

where Z_i denotes publicly available information that affects the firm i's decision to go public with its relationship bank, γ is a vector of probit coefficients, and η_i is orthogonal to the publicly observable variables Z_i. Intuitively, the firm goes public with its bank if the benefits of doing so exceed its cost as represented by the condition $\mathrm{W}_i = \mathrm{Z}_i\gamma + \eta_i > 0$. The firm valuation equation is:

$$\mathrm{Value}_i = \mathrm{X}_i\beta + \epsilon_i\,, \tag{10}$$

where X_i denotes observable characteristics that determine firm value, β is a vector of coefficients to be estimated, and ϵ_i is orthogonal to the publicly observable variables X_i. Similar to Purnanandam and Swaminathan (2004), we normalize market value by firm size, i.e., $\mathrm{Value}_i = \log\left(\frac{\text{Market Value of Equity}}{\text{Revenues at IPO year}}\right)_i$.

If, as we conjecture, firms of certain value select to go public with their pre-IPO banks and these banks choose to manage their IPO (i.e., the firm-bank match is not random), then ϵ_i in equation (10) and η_i in equation (9) are correlated. In particular, as is standard in this literature we assume that ϵ_i and η_i have a mean-zero bivariate normal distribution with $\mathrm{var}(\eta) = 1$, $\mathrm{var}(\epsilon) = \sigma_\varepsilon^2$, and $\mathrm{cov}(\eta, \epsilon) = \sigma_{\eta,\varepsilon}$.

For the firms that select to go public with their pre-IPO relationship bank we have

$$\begin{aligned} \mathrm{Value}_i\,|(\mathbf{Certify}_i = 1) &= \mathrm{X}_i\beta + (\epsilon_i\,|\mathrm{Z}_i\gamma + \eta_i > 0) \\ &= \mathrm{X}_i\beta + \pi\,(\eta_i\,|\mathrm{Z}_i\gamma + \eta_i > 0) + \upsilon_i\,, \end{aligned} \tag{11}$$

where $\epsilon_i\,|\eta_i = \pi\eta_i + \upsilon_i$ and υ_i is an orthogonal mean-zero error term. Taking expectations of equation (11) we obtain

$$E\,(\mathrm{Value}_i\,|\mathbf{Certify}_i = 1) = \mathrm{X}_i\beta + \pi E\,(\eta_i\,|\mathrm{Z}_i\gamma + \eta_i > 0)\,. \tag{12}$$

Similarly, for the firms that go public with an outside bank we have

$$E\,(\mathrm{Value}_i\,|\mathbf{Certify}_i = 0) = \mathrm{X}_i\beta + \pi E\,(\eta_i\,|\mathrm{Z}_i\gamma + \eta_i \leq 0)\,. \tag{13}$$

[3] Schenone (2004) examines the firm's choice of a pre-IPO lender during the 1998-2000 period. She uses a Heckman two-step procedure to study whether there is selection among the firms that establish a relationship with a bank that can later underwrite their IPO, and finds no evidence that these firms acted strategically when establishing a pre-IPO banking relationship with a prospective underwriter. However, she does not examine the selection of firms that go public with their bank.

We have assumed that ϵ_i and η_i are bivariate normal, thus $E\left(\eta_i \,|\mathrm{Z}_i\gamma + \eta_i > 0\right) = \frac{\phi(\mathrm{Z}_i\gamma)}{\Phi(\mathrm{Z}_i\gamma)}$ and $E\left(\eta_i \,|\mathrm{Z}_i\gamma + \eta_i \leq 0\right) = -\frac{\phi(\mathrm{Z}_i\gamma)}{1-\Phi(\mathrm{Z}_i\gamma)}$. Equation (10) therefore becomes:

$$\begin{aligned}
\text{Value}_i &= \mathrm{X}_i\beta + \pi\mathbf{Certify}_i\frac{\phi(\mathrm{Z}_i\gamma)}{\Phi(\mathrm{Z}_i\gamma)} - \pi(1-\mathbf{Certify}_i)\frac{\phi(\mathrm{Z}_i\gamma)}{1-\Phi(\mathrm{Z}_i\gamma)} + \nu_i \\
&= \mathrm{X}_i\beta + \pi\left\{\mathbf{Certify}_i\frac{\phi(\mathrm{Z}_i\gamma)}{\Phi(\mathrm{Z}_i\gamma)} - (1-\mathbf{Certify}_i)\frac{\phi(\mathrm{Z}_i\gamma)}{1-\Phi(\mathrm{Z}_i\gamma)}\right\} + \nu_i\,. \qquad (14)
\end{aligned}$$

Note that $\pi = \rho_{\eta\epsilon}\sigma_\epsilon$, where $\rho_{\eta\epsilon}$ is the correlation coefficient between ϵ and η and σ_ϵ is the standard deviation of ϵ. Intuitively, the last term in equation (14) can be interpreted as the market's updated information regarding the value of the firm once the market observes the firm's choice of bank. That is, when investors observe a firm selecting in either the $\mathbf{Certify}_i = 1$ or the $\mathbf{Certify}_i = 0$ categories, they update their priors about the firm's value, and this updated information is incorporated in the valuation equation. The test for self-selection hinges on the estimate and significance of π. If $\pi = 0$, then firms are randomly selecting whether to go public with their pre-IPO relationship bank, if $\pi > 0$ then firms that are likely to go public with their relationship bank have a higher valuation, and if $\pi < 0$ then firms that are likely to go public with their relationship bank have a lower valuation.

We estimate equation (14) using a Heckman (1979) two-step procedure. In the first step, we fit a probit model by maximum likelihood to obtain an estimate $\hat{\gamma}$ in equation (9). We then use $\hat{\gamma}$ to calculate $\left(\frac{\phi(\hat{\gamma}'Z_i)}{1-\Phi(\hat{\gamma}'Z_i)}\right)$ and $\left(\frac{\phi(\hat{\gamma}'Z_i)}{\Phi(\hat{\gamma}'Z_i)}\right)$ in equation (14) and we fit the regression by ordinary least squares (OLS). In the second-step regression, the standard errors for the β coefficient must be corrected for the fact that (1) we fix γ at the first-step estimate $\hat{\gamma}$ and (2) the error term ν_i may be heteroskedastic. We compute corrected standard errors by using the bootstrapping method (we estimate $\hat{\gamma}$ and $\hat{\beta}$ for 1,000 resamples with replacement, each of the size of the original data set, and compute bootstrapped standard errors as in Greene (2003), page 924).

In the first estimation step we need instruments that explain whether the firm goes public with the relationship bank but are uncorrelated with the firm's post-IPO market value. We find that (1) the number of banks in the lending syndicate and (2) the percentage of the loan contributed by the lead lender correlate highly with **Certify** but not with the firm's market value. Since the correlation between these two instruments is also high, we only include one of the two, the number of banks in the lending syndicate.

The results in Table 7 show that the firm-bank selection is not random. Specifically, the π coefficient in equation (14) is significant at the 5 or 10 percent levels depending on the characteristics included in the variable X. Further, the point estimate $\hat{\pi}$ is positive and stable across different specifications, ranging from 0.22 to 0.29. These findings indicate that firms that go public with their relationship bank are valued higher than firms that did not go public with their bank.

The estimates for the other coefficients on the characteristics included in the X_i variable are also significant and their sign is consistent with a priori intuition. For instance, larger firms are valued higher, but at a decreasing rate (the coefficient on Log(Assets) is positive and significant and the coefficient on the squared value of Log(Assets) is negative and significant). Firms with higher cashflows to assets are valued higher. Further, firms in which the ratio of shares sold by existing shareholders to the total number of shares issued (an indicator for the firm's managers desire to cash out their investment) are valued lower.

Overall, these findings support the certification hypothesis: in an attempt to shy away from potential conflicts of interest, relationship banks carefully select to take public their higher value clients. This conclusion is consistent with the evidence in Puri (1996), who estimates a similar selection model and finds that bond underwriting by commercial banks conveys positive information about the issuer that improves the prices at which the debt offering can be sold.

4 Discussion and Conclusions

When a bank lends funds to a firm, it acquires privileged information on its client. What use the bank will make of such information is controversial. If the firm decides to issue new securities, the bank is in a position to convey its privileged information to less knowledgeable market participants and to act as a certifier of the new issue's true value. But, because of adverse selection problems the bank might fall prey to conflicts of interest and help its client to issue junior claims for more than their worth.

Prior to 1998 there was little involvement by commercial banks in the market of equity issues. As such, much of the debate on conflict of interest and certification in the market for IPOs focused on IPOs underwritten by investment banks that hold a venture capital position in the issuing firm. For instance, Gompers and Lerner (1999) find that IPOs underwritten by investment banks that hold a venture capital position in the issuing firm are sold at a greater discount than similar IPOs managed by independent banks, yet over the long run these stocks perform no worse, and may actually perform better, than offerings in which no underwriter has a venture stake. Li and Masulis (2003) show that venture investment in the issuing firm by the lead underwriter can significantly reduce IPO underpricing.[4]

In this paper we contribute to the debate by presenting evidence based on a new sample, IPOs managed by commercial banks. We focus on two sets of test. First, we investigate the

[4] Also related, other studies have found that venture capital backing has a positive effect on an IPO's performance (e.g., Aggarwal and Klapper (2003), Brav and Gompers (1997), and Megginson and Weiss (1991).

long-run performance of the IPOs underwritten by the firm's bank. As such, we add to Schenone (2004) who examines IPOs managed by relationship banks but focuses on their first-trading-day performance. Using a cross-sectional model, we find that IPOs managed by inside banks experience buy-and-hold benchmark-adjusted returns that are similar to those observed for a matching sample of stocks managed by outside banks. Further, we examine the calendar-time returns on a portfolio that is long the stocks underwritten by relationship banks and short ex-ante similar stocks taken public by independent institutions. We test the performance of this trading strategy using a linear four-factor model. Again, we conclude that the IPOs taken public by their bank perform at least as well as ex-ante similar stocks managed by independent institutions.

Second, we argue that the concern for conflicts of interest can generate self-selection among the firms that go public with their bank. We use a two-step procedure to estimate a Heckman (1979) type model similar to that of Puri (1996). We find that the outcome of going public with a relationship bank is not random. High-value firms that could go public with their bank typically do so, while lower-value firms go public with an independent underwriter. This evidence adds to Schenone (2004), who studies IPO valuation but does not examine the selection of firms that go public with their bank, and to Yasuda (2005), who examines a sample of debt issues and shows that bank relationships have positive and significant effects on a firm's underwriter choice.

The recent literature has examined multiple aspects of universal banking.[5] For instance, Gande, Puri, and Saunders (1999) and Yasuda (2005) investigate the competitive effect of commercial banks entry in the market of debt issues and find evidence consistent with the market becoming more competitive. However, Kanatas and Qi (2003) warn that an integrated financial services market can be less innovative than one with specialized intermediaries. Further, Drucker and Puri (2005) show that investment banks engage in a substantial amount of tying and that this practice allows firms to reduce their financing costs when issuing debt.

We add to this literature by presenting evidence that supports the certification role of relationship banks underwriting their clients' IPOs. This is consistent with the predictions of Puri's (1999) model and with the findings of the literature that has examined the certification role of commercial banks that underwrite debt issues (e.g., Kroszner and Rajan (1994), Gande et al. (1997), and Puri (1994, 1996)). Further, our results complement the evidence in Schenone (2004), who shows that pre-IPO banking relationships reduce the asymmetric information problems faced by first-time issuers.

Our results can be interpreted as follows. Relationship banks avoid potential conflicts of interest by choosing to underwrite their best clients' IPOs. Rational investors anticipate

[5]Drucker and Puri (2006) provide an extensive survey of this literature.

the bank's reaction and value issues underwritten by the pre-IPO lender higher than IPOs managed by independent banks. The market is not fooled. Over the long run, IPOs managed by relationship banks do not underperform similar issues managed by outside banks. In sum, our findings indicate that in this respect the effect of the 1999 repeal of Sections 20 and 32 of the Glass-Steagall Act has not been negative.

References

Aggarwal, Reena, and Leora Klapper, 2003, Ownership Structure and Initial Public Offerings, Working Paper, Georgetown University and The World Bank.

Andersen, Torben G., Tim Bollerslev, and Francis X. Diebold, 2004, Parametric and Nonparametric Volatility Measurement, in Lars P. Hansen and Yacine Ait-Sahalia, eds., *Handbook of Financial Econometrics*, North-Holland, Amsterdam, forthcoming.

Barber, Brad M., and John D. Lyon, 1997, Detecting Long-Run Abnormal Stock Returns: The Empirical Power and Specification of Test Statistics, *Journal of Financial Economics* 43, 341-372.

Beatty, Randolph P., and Jay R. Ritter, 1986, Investment Banking, Reputation, and the Underpricing of Initial Public Offerings, *Journal of Financial Economics* 15, 213-232.

Brav, Alon, 2000, Inference in Long-Horizon Event Studies: A Bayesian Approach with Application to Initial Public Offerings, *Journal of Finance* 55, 1979-2016.

Brav, Alon, Christopher Geczy, and Paul A. Gompers, 2000, Is the Abnormal Return Following Equity Issuances Anomalous?, *Journal of Financial Economics* 56, 209-249.

Brav, Alon, and Paul A. Gompers, 1997, Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Non venture Capital-Backed Companies, *Journal of Finance* 52, 1791-1821.

Carhart, Mark M., 1997, On Persistence in Mutual Fund Performance, *Journal of Finance* 52, 57-82.

Carter, Richard B., Frederick H. Dark, and Ajai K. Singh, 1998, Underwriter Reputation, Initial Returns, and the Long-Run Performance of IPO Stocks, *Journal of Finance* 53, 285-311.

Daniel, Kent, Mark Grinblatt, Sheridan Titman, and Russ Wermers, 1997, Measuring Mutual Fund Performance with Characteristic-Based Benchmarks, *Journal of Finance* 52, 1035-1058.

Diamond, Douglas W., 1991, Monitoring and Reputation: The Choice between Bank Loans and Directly Placed Debt, *Journal of Political Economy* 99, 689-721.

Drucker, Steven D., 2005, Information Asymmetry and the Effects of Banking Mergers on Firm-Bank Relationships, Working Paper, Stanford University.

Drucker, Steven D. and Manju Puri, 2005, On the benefits of concurrent lending and underwriting, *Journal of Finance* 60, 2763-2799.

Drucker, Steven D. and Manju Puri, 2006, Banks in Capital Markets, in B. Espen Eckbo, ed., *Handbook of Corporate Finance: Empirical Corporate Finance*, vol. 1, North-Holland, Amsterdam, forthcoming.

Eckbo, B. Espen, Ronald W. Masulis, and Øyvind Norli, 2000, Seasoned Public Offerings: Resolution of the 'New Issues Puzzle', *Journal of Financial Economics* 56, 251-291.

Eberhart, Allan C., and Akhtar Siddique, 2002, The Long-Term Performance of Corporate Bonds (and Stocks) Following Seasoned Equity Offerings, *Review of Financial Studies* 15, 1385-1406.

Fama, Eugene F., 1998, Market Efficiency, Long-Term Returns, and Behavioral Finance, *Journal of Financial Economics* 49, 283-306.

Fama, Eugene F., and Kenneth R. French, 1992, The Cross-Section of Expected Stock Returns, *Journal of Finance* 47, 427-465.

Fama, Eugene F., and Kenneth R. French, 1993, Common Risk Factors in the Returns on Stocks and Bonds, *Journal of Financial Economics* 33, 3-56.

Fernando, Chitru, Vladimir Gatchev, and Paul Spindt, 2005, Wanna Dance? How Firms and Underwriters Choose Each Other, *Journal of Finance*, forthcoming.

Gande, Amar, Manju Puri and Anthony Saunders, 1999, Bank Entry, Competition, and the Market for Corporate Securities Underwriting, *Journal of Financial Economics* 54, 165-195.

Gande, Amar, Manju Puri, Anthony Saunders, and Ingo Walter, 1997, Bank Underwriting of Debt Securities: Modern Evidence, *Review of Financial Studies* 10, 1175-1202.

Gompers, Paul A., and Josh Lerner, 1999, Conflict of Interest in the Issuance of Public Securities: Evidence from Venture Capital, *Journal of Law and Economics* 42, 1-28.

Greene, William H., 2003, Econometric Analysis, Prentice Hall.

Heckman, James J., 1979, Sample Selection Bias as a Specification Error, *Econometrica* 47, 153-161.

Ikenberry, David, Josef Lakonishok and Theo Vermaelen, 1995, Market underreaction to open market share repurchases, *Journal of Financial Economics* 39, 181-208.

Jagannathan, Ravi, and Tongshu Ma, 2003, Risk Reduction in Large Portfolios: Why Imposing the Wrong Constraints Helps, *Journal of Finance* 58, 1651-1684.

Jegadeesh, Narasimhan, Sheridan Titman, 1993, Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency, *Journal of Finance* 48, 65-91.

Kanatas, George, and Jianping Qi, 2003, Integration of Lending and Underwriting: Implications of Scope Economies, *Journal of Finance* 58, 1167-1191.

Kothari, S. P., and Jerold B. Warner, 1997, Measuring Long-Horizon Security Price Performance, *Journal of Financial Economics* 43, 301-339.

Kothari, S. P., and Jerold B. Warner, 2006, Econometrics of Event Studies, in B. Espen Eckbo, ed., *Handbook of Corporate Finance: Empirical Corporate Finance*, vol. 1, North-Holland, Amsterdam, forthcoming.

Kroszner, Randall S., and Raghuram G. Rajan, 1994, Is the Glass-Steagall Act Justified? A Study of the U.S. Experience with Universal Banking Before 1933, *American Economic Review* 84, 810-832.

Li, Kai, and Nagpurnanand R. Prabhala, 2005, Self-selection models in corporate finance, in B. Espen Eckbo, ed., *Handbook of Corporate Finance: Empirical Corporate Finance*, vol. 1, North-Holland, Amsterdam, forthcoming.

Li, Xi, and Ronald W. Masulis, 2003, Venture Capital Investments by IPO underwriters: Certification or conflict of Interest?, Working Paper, University of Miami and Vanderbilt University.

Ljungqvist, Alexander, Felicia Marston, and William Wilhelm, 2004, Competing for Securities Underwriting Mandates: Banking Relationships and Analyst Recommendations, *Journal of Finance* 60, 301-340.

Loughran, Tim, and Jay R. Ritter, 1995, The New Issues Puzzle, *Journal of Finance* 50, 23-51.

Loughran, Tim, and Jay R. Ritter, 2000, Uniformly Least Powerful Tests of Market Efficiency, *Journal of Financial Economics* 55, 361-389.

Lyon, John D., Brad M. Barber, and Chih-Ling Tsai, 1999, Improved Methods for Tests of Long-Run Abnormal Stock Returns, *Journal of Finance* 54, 165-201.

Maddala, G.S., 1983, Limited-Dependent and Qualitative Variables in Econometrics, Econometric Society Monographs No.3, Cambridge University Press.

Megginson, William L., and Kathleen A. Weiss, 1991, Venture Capitalist Certification in Initial Public Offerings, *Journal of Finance* 46, 879-903.

Mitchell, Mark L., and Erik Stafford, 2000, Managerial Decisions and Long-Term Stock Price Performance, *Journal of Business* 73, 287-329.

Petersen, Mitchell A., and Raghuram G. Rajan, 1994, The Benefits of Lending Relationships: Evidence from Small Business Data, *Journal of Finance* 49, 3-37.

Puri, Manju, 1994, The long-term default performance of bank underwritten security issues, *Journal of Banking and Finance* 18, 397-418.

Puri, Manju, 1996, Commercial Banks in Investment Banking: Conflict of Interest or Certification Role?, *Journal of Financial Economics* 40, 373-401.

Puri, Manju, 1999, Commercial Banks as Underwriters: Implications for the Going Public Process, *Journal of Financial Economics* 54, 133-163.

Purnanandam, Amiyatosh K., and Bhaskaran Swaminathan, 2004, Are IPOs Really Underpriced?, *Review of Financial Studies* 17, 811-848.

Rajan, Raghuram G., 1992, Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt, *Journal of Finance* 47, 1367-1400.

Ritter, Jay R., 1991, The Long-Run Performance of Initial Public Offerings, *Journal of Finance* 46, 3-27.

Schenone, Carola, 2004, The Effect of Banking Relationships on the Firm's Cost of Equity in its IPO, *Journal of Finance* 59, 2901- .2958.

Stein, Jeremy C., 2002, Information Production and Capital Allocation: Decentralized versus Hierarchical Firms, *Journal of Finance* 57, 1891-1921.

Weinstein, David E., and Yishay Yafeh, 1998, On the Costs of a Bank-Centered Financial System: Evidence from the Changing Main Bank Relations in Japan, *Journal of Finance* 53, 635-672.

Yasuda, Ayako, 2005, Do Bank Relationships Affect the Firm's Underwriter Choice in the Corporate-Bond Underwriting Market?, *Journal of Finance* 60, 1259-1292.

Table 1: Summary Statistics for Firm Characteristics at the Time of the IPO. The data are hand-collected from the financial statements reported in the last amended prospectus filed with the SEC, for the last complete calendar year prior to the firm's IPO. All values are expressed in thousands of U.S. dollars. Certify equals one if the firm went public with its relationship bank, and zero otherwise. Standard deviations are reported in parentheses.

Firm Characteristics	All IPOs	**Certify** = 1	**Certify** = 0
Total Assets	356,701	1,033,532	61,183
	(1,598,672)	(2,784,841)	(150,607)
Total Debt	125,700	366,416	21,238
	(449,995)	(763,709)	(54,902)
Short term debt	9,229	21,486	4,069
	(38,199)	(66,196)	(12,386)
Revenues	362,774	1,035,020	69,259
	(2,380,223)	(4,247,221)	(194,381)
Gross Profits	87,433	249,652	20,097
	(411,545)	(735,018)	(41,457)
Operating Cash flow	28,024	89,382	1,853
	(244,262)	(440,098)	(29,085)
Working Capital	43,187	127,270	7,322
	(235,659)	(417,890)	(31,666)
Cash	21,231	55,051	6,485
	(98,193)	(173,551)	(9,706)
Shareholders Equity	84,345	260,813	8,124
	(646,382)	(1,158,361)	(61,728)
IPO Proceeds	154,942	356,018	67,683
	(417,378)	(708,500)	(91,602)
Firm Age	7.72	8.79	7.26
(years between inception and IPO date)	(11.08)	(13.36)	(9.92)
Fraction of the Firm Sold	27.55	34.74	24.53
by Shareholders (percent)	(30.87)	(53.17)	(12.03)
Underpricing (percent)	45.13	25.34	53.77
	(77.08)	(42.18)	(86.77)
No. Observations	306	93	213
Percent of Sample	100.0	30.4	69.6

Table 2: Wealth Relatives. For each IPO underwritten by the firm's pre-IPO relationship bank, we identify a matching firm that is brought to the market by an independent bank. When a stock in the matching sample is delisted, we splice its returns with the returns on a substitute matching stock. We compute the average buy-and-hold return across the stocks underwritten by relationship banks, $\overline{R}_{T,S}$, and the average return on stocks in the matching sample, $\overline{R}_{T,M}$. The wealth relative is the ratio $(1+\overline{R}_{T,S})/(1+\overline{R}_{T,M})$. In columns 1-6, the matching criteria are the IPO date and the book-to-market value of equity. In columns 7-12, they are the IPO date and the market value of equity on the fourteenth trading day. The holding period T ranges from one to three years.

IPO Date and BE/ME matching criteria						IPO Date and ME matching criteria					
Equal-weighted return			Value-weighted return			Equal-weighted return			Value-weighted return		
1Y	2Y	3Y	1Y	2Y	3Y	1Y	2Y	3Y	1Y	2Y	3Y
1.24	0.82	0.76	1.11	1.39	1.04	1.15	1.18	1.54	1.03	1.37	2.02

Table 3: Mean Buy-and-Hold Abnormal Returns. The abnormal return on IPO i is

$$BHAR_i = \frac{R_{i,T}}{T} - \frac{R_{P_i,T}}{T},$$

where $R_{i,T}$ and $R_{P_i,T}$ are buy-and-hold returns on stock i (exclusive of the first trading day return) and the benchmark portfolio P_i, respectively. The holding period T ranges from one to three years. Where available, we include the firm's delisting return. The benchmarks are the return on 100 portfolios of stocks ranked by size and book-to-market (FF); the return on the CRSP value-weighted index inclusive of distributions (VW); the S&P 500 cum-dividend return (S&P 500); the Nasdaq cum-dividend return (Nasdaq); and the return on 49 industry-ranked portfolios (Ind.). In column (S) we report mean (equal- and value-weighted) buy-and-hold abnormal returns for the sample of IPOs underwritten by the firm's pre-IPO relationship bank. For each IPO underwritten by the firm's pre-IPO relationship bank, we identify a matching firm that is brought to the market by an independent bank. The matching criteria are the IPO date and the book-to-market value of equity. When a stock in the matching sample is delisted, we splice its returns with the returns on a substitute matching stock. In column (M) we report (equal- and value-weighted) buy-and-hold abnormal returns for the IPOs in the matching sample. The difference between mean buy-and-hold abnormal returns for IPOs in the sample and in the matching group is in column (S-M). In Panels E-H we report results for 1998, 1999, and 2000 IPO years. Skewness-robust t-ratios are in square brackets. Significance levels are determined based on bootstrapped critical values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	$T = 1$Y			$T = 2$Y			$T = 3$Y		
	S	M	S-M	S	M	S-M	S	M	S-M
Table 3, Panel A: equal-weighted mean abnormal returns									
FF	0.12	-0.06	0.18	-0.04	0.09	-0.12	0.00	0.10	-0.09
	[0.81]	[-0.37]	[1.05]	[-0.39]	[0.64]	[-0.75]	[0.19]	[1.30]	[-0.97]
VW	0.06	-0.16	0.22	-0.05	0.06	-0.10	-0.05	0.03	-0.08
	[0.43]	[-0.85]	[1.22]	[-0.49]	[0.45]	[-0.64]	[-0.79]	[0.41]	[-0.87]
S&P 500	0.05	-0.17	0.22	-0.04	0.06	-0.10	-0.05	0.03	-0.08
	[0.35]	[-0.91]	[1.22]	[-0.48]	[0.46]	[-0.64]	[-0.81]	[0.40]	[-0.87]
Nasdaq	-0.01	-0.22	0.22	-0.12	-0.02	-0.10	-0.01	0.07	-0.08
	[0.07]	[-1.22]	[1.22]	[-1.25]	[0.05]	[-0.64]	[-0.12]	[0.97]	[-0.87]
Ind.	0.15	-0.13	0.29	0.03	0.09	-0.06	-0.00	0.04	-0.05
	[1.08]	[-0.81]	[1.74]	[0.45]	[0.66]	[-0.41]	[0.02]	[0.64]	[-0.53]
Table 3, Panel B: value-weighted mean abnormal returns									
FF	-0.30	-0.17	-0.12	-0.10	-0.10	0.00	-0.06	-0.01	-0.04
	[-2.40]***	[-0.49]	[-0.47]	[-1.49]	[-1.13]	[-0.00]	[-1.40]	[-0.06]	[-0.61]
VW	-0.24	-0.25	0.00	-0.11	-0.16	0.06	-0.08	-0.07	-0.01
	[-2.47]***	[-0.59]	[-0.10]	[-1.41]	[-1.75]	[0.48]	[-1.83]*	[-0.68]	[-0.18]
S&P 500	-0.24	-0.26	0.02	-0.11	-0.17	0.06	-0.08	-0.07	-0.01
	[-2.49]***	[-0.61]	[-0.05]	[-1.41]	[-1.77]	[0.50]	[-1.79]	[-0.67]	[-0.18]
Nasdaq	-0.32	-0.16	-0.16	-0.06	-0.09	0.03	-0.01	0.01	-0.02
	[-2.51]***	[-0.41]	[-0.59]	[-0.99]	[-1.16]	[0.28]	[-0.22]	[0.20]	[-0.29]
Ind.	-0.10	-0.21	0.10	-0.04	-0.12	0.08	-0.01	-0.03	0.02
	[-1.22]	[-0.56]	[0.25]	[-0.56]	[-1.45]	[0.87]	[-0.40]	[-0.31]	[0.13]
Table 3, Panel C: equal-weighted mean abnormal returns, FF benchmark									
1998	-0.05	0.11	-0.16	-0.13	0.29	-0.42	0.02	0.30	-0.28
	[-0.24]	[0.82]	[-0.83]	[-0.50]	[0.81]	[-0.99]	[0.29]	[1.61]*	[-1.17]
1999	0.33	-0.37	0.69	-0.07	-0.06	-0.01	-0.05	-0.04	-0.01
	[0.72]	[-0.78]	[2.05]**	[-0.72]	[-0.24]	[-0.09]	[-0.88]	[-0.46]	[-0.07]
2000	0.17	-0.19	0.36	0.13	-0.07	0.19	0.05	-0.04	0.09
	[1.61]*	[-1.43]	[1.89]	[1.84]*	[-0.88]	[1.85]	[1.23]	[-0.86]	[1.52]
Table 3, Panel D: value-weighted mean abnormal returns, FF benchmark									
1998	0.13	0.14	-0.01	0.13	0.34	-0.21	0.09	0.60	-0.51
	[0.84]	[0.60]	[-0.06]	[0.65]	[0.95]	[-0.46]	[0.98]	[1.39]	[-1.10]
1999	-0.56	-0.61	0.05	-0.20	-0.27	0.07	-0.11	-0.14	0.03
	[-2.82]***	[-1.93]**	[0.18]	[-2.57]***	[-1.95]**	[0.58]	[-2.06]**	[-1.87]**	[0.40]
2000	0.04	-0.37	0.41	-0.00	-0.14	0.14	-0.01	-0.09	0.08
	[0.35]	[-3.68]***	[2.24]**	[-0.06]	[-3.51]***	[1.12]	[-0.24]	[-2.26]**	[1.06]

Table 4: Skewness and Kurtosis of the Buy-and-Hold Benchmark-Adjusted Returns. We report sample skewness and kurtosis for the buy-and-hold benchmark-adjusted returns. Here, the benchmark is the return on 100 portfolios of stocks ranked by size and book-to-market deciles. The holding periods are $T = 1$, 2, and 3 years.

	Skewness		Kurtosis	
T	$\frac{R_{i,T}}{T} - \frac{R_{P_i,T}}{T}$	$\log\left(\frac{1+R_{i,T}}{1+R_{P_i,T}}\right)$	$\frac{R_{i,T}}{T} - \frac{R_{P_i,T}}{T}$	$\log\left(\frac{1+R_{i,T}}{1+R_{P_i,T}}\right)$
1Y	4.09	-0.71	30.98	3.62
2Y	7.82	-0.45	88.87	2.94
3Y	7.34	-0.44	81.82	2.51

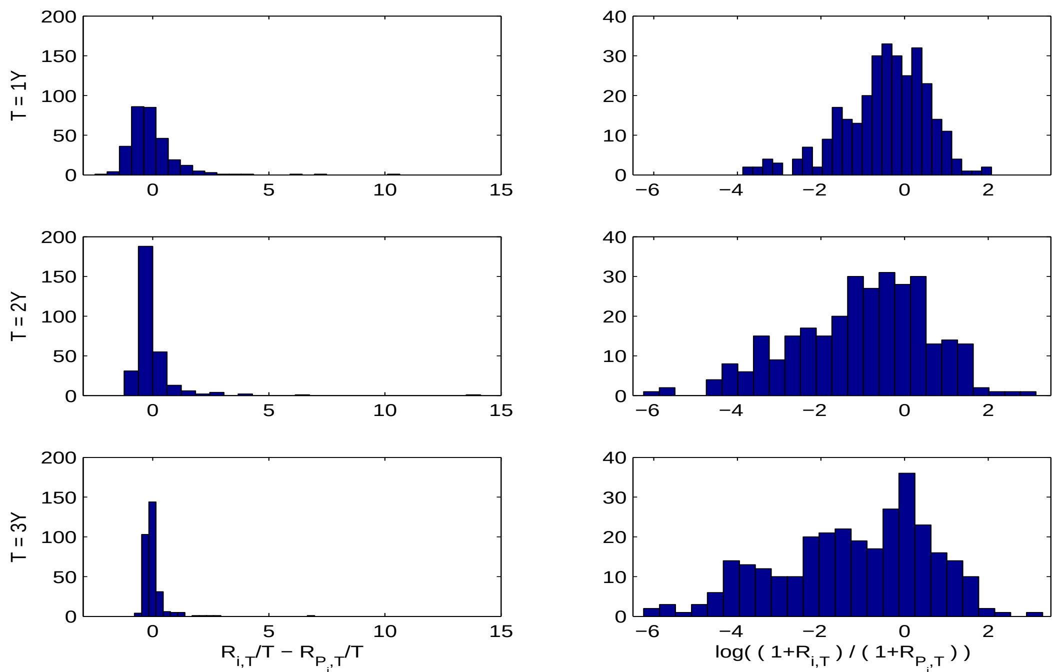

Figure 1: The Sample Distribution of the Buy-and-Hold Benchmark-Adjusted Returns. Buy-and-hold returns are computed by compounding daily returns from the day of the IPO (exclusive of the first trading day return) to the end of the holding period T, which ranges from one to three years. Where available, we include the firm's delisting return. In the left panels, the buy-and-hold abnormal return on IPO i is $BHAR_i = \frac{R_{i,T}}{T} - \frac{R_{P_i,T}}{T}$, where $R_{P_i,T}$ is the buy-and-hold benchmark portfolio return. Here, the benchmark is the return on 100 portfolios of stocks ranked by size and book-to-market deciles. In the right panels, the buy-and-hold abnormal return is $BHAR_i = \log\left(\frac{1+R_{i,T}}{1+R_{P_i,T}}\right)$.

Table 5: Mean Buy-and-Hold Abnormal Returns: Nonzero Cross-Sectional Correlation. The abnormal return on IPO i is

$$BHAR_i = \log\left(\frac{1+R_{i,T}}{1+R_{P_i,T}}\right),$$

where $R_{i,T}$ and $R_{P_i,T}$ are buy-and-hold returns on stock i (exclusive of the first trading day return) and the benchmark portfolio P_i, respectively. The holding period T ranges from one to three years. Where available, we include the firm's delisting return. The benchmarks are the return on 100 portfolios of stocks ranked by size and book-to-market (FF); the return on the CRSP value-weighted index inclusive of distributions (VW); the S&P 500 cum-dividend return (S&P 500); the Nasdaq cum-dividend return (Nasdaq); and the return on 49 industry-ranked portfolios (Ind.). To deal with the heteroskedasticity and the cross-sectional dependence of returns that overlap in calendar time, we fit the following regression by GLS:

$$\log\left(\frac{1+R_{i,T}}{1+R_{P_i,T}}\right) = \beta_0 + \beta_{\text{Certify}}\,\mathbf{Certify}_i + \varepsilon_i\,.$$

The variance-covariance matrix of the error term is consistently estimated using high-frequency, daily returns. If the returns on stocks i and j overlap for less than three months, we fix their covariance at zero. The mean abnormal return for IPOs underwritten by the firm's bank is estimated by $\hat{\beta}_0 + \hat{\beta}_{\text{Certify}}$ (columns 1, 4, and 7). The mean abnormal return for IPOs underwritten by outside banks is estimated by $\hat{\beta}_0$ (columns 2, 5, and 8). The difference between the two means is estimated by $\hat{\beta}_{\text{Certify}}$ (columns 3, 6, and 9). In square brackets are t-ratios. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	$T = 1\text{Y}$			$T = 2\text{Y}$			$T = 3\text{Y}$		
	$\hat\beta_0 + \hat\beta_{Cert.}$	$\hat\beta_0$	$\hat\beta_{Cert.}$	$\hat\beta_0 + \hat\beta_{Cert.}$	$\hat\beta_0$	$\hat\beta_{Cert.}$	$\hat\beta_0 + \hat\beta_{Cert.}$	$\hat\beta_0$	$\hat\beta_{Cert.}$
Table 5, Panel A: Mean abnormal returns for all IPOs from 1998 to 2000.									
FF	0.03	-0.15	0.18	-0.05	-0.16	0.11	-0.02	-0.13	0.10
	[0.32]	[-2.06]**	[1.98]**	[-0.48]	[-1.56]	[0.89]	[-0.20]	[-1.12]	[0.74]
VW	-0.04	-0.05	0.01	0.06	0.08	-0.02	0.08	0.25	-0.17
	[-0.44]	[-0.51]	[0.09]	[0.51]	[0.61]	[-0.17]	[0.69]	[1.83]*	[-1.15]
S&P 500	0.07	0.01	0.06	0.08	0.09	-0.00	0.12	0.28	-0.16
	[0.68]	[0.06]	[0.64]	[0.64]	[0.58]	[-0.03]	[0.94]	[1.87]*	[-1.05]
Nasdaq	-0.34	0.05	-0.39	0.17	0.16	0.01	0.12	0.25	-0.13
	[-2.90]***	[0.44]	[-4.69]***	[1.21]	[1.07]	[0.09]	[0.84]	[1.70]*	[-0.91]
Ind.	0.02	-0.09	0.11	-0.01	0.05	-0.07	0.07	0.20	-0.12
	[0.20]	[-1.11]	[1.15]	[-0.14]	[0.44]	[-0.50]	[0.67]	[1.57]	[-0.87]
Table 5, Panel B: Mean abnormal returns by IPO year, FF benchmark									
1998	0.15	0.01	0.14	-0.04	-0.13	0.10	0.04	-0.09	0.13
	[1.43]	[0.08]	[1.13]	[-0.20]	[-0.97]	[0.50]	[0.19]	[-0.60]	[0.57]
1999	-0.13	-0.43	0.30	-0.18	-0.33	0.15	-0.16	-0.28	0.12
	[-0.81]	[-3.27]***	[1.70]*	[-0.87]	[-1.88]*	[0.68]	[-0.70]	[-1.51]	[0.48]
2000	0.11	-0.16	0.27	-0.03	-0.20	0.17	-0.10	-0.18	0.08
	[0.89]	[-0.88]	[1.40]	[-0.18]	[-0.76]	[0.57]	[-0.48]	[-0.62]	[0.25]

Table 6: Long-Run Portfolio Returns: A Calendar-Time Analysis. For each IPO underwritten by the firm's pre-IPO relationship bank, we identify a matching firm that is brought to the market by an independent bank. In Panels A and B the matching criteria are the IPO date and the book-to-market value of equity, while in Panels C and D they are the IPO date and the market value of equity. The sample portfolio consists of stocks underwritten by the firm's relationship bank. The matching stocks managed by independent institutions are included in the matching portfolio. We add a pair of stocks to the sample and matching portfolios starting from the first week when both the stock issued by the relationship bank and its match are first listed. When a stock in the matching sample is delisted, we splice its returns with the returns on a substitute matching stock. Where available, we include the firm's delisting return. The stock in the sample portfolio and its corresponding match in the matching portfolio are held for a period that ranges from one to three years. In all panels, the dependent variable in Columns 1-3 and 4-6 is the weekly return on the sample and matching portfolios, respectively. The dependent variable in Columns 7-9 is the return on a portfolio that is long the sample stocks and is short the matching stocks. In Panels A and C portfolio returns are equally weighted, while in Panels B and D they are value weighted. The independent variables are $MKT_t = r_{M,t} - r_{F,t}$, the weekly excess return on the market portfolio; SMB_t, the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks; HML_t, the difference between the return on a portfolio of high book-to-market stocks and the return on a portfolio of low book-to-market stocks; and UMD_t, the return on a 'momentum' portfolio. Returns are measured in yearly decimal units. Standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	$r_{Sample,t} - r_{F,t}$			$r_{Match,t} - r_{F,t}$			$r_{Sample,t} - r_{Match,t}$		
	1Y	2Y	3Y	1Y	2Y	3Y	1Y	2Y	3Y
Table 6, Panel A: IPO Date and BE/ME matching criteria; equal-weighted portfolio returns									
α	0.33**	0.10	0.02	-0.02	-0.01	0.11	0.35**	0.10	-0.09
	[2.37]	[0.88]	[0.24]	[-0.11]	[-0.04]	[0.96]	[2.03]	[0.84]	[-0.90]
MKT_t	1.18***	1.01***	1.10***	0.94***	0.83***	1.01***	0.24	0.18	0.09
	[7.21]	[8.06]	[9.93]	[5.13]	[4.95]	[11.27]	[1.31]	[1.17]	[0.73]
SMB_t	1.11***	1.15***	1.20***	1.28***	1.18***	1.34***	-0.17	-0.04	-0.14
	[5.00]	[8.94]	[9.50]	[7.73]	[7.83]	[11.65]	[-0.82]	[-0.21]	[-0.87]
HML_t	-0.52**	-0.33**	-0.04	-0.77***	-0.77***	-0.31**	0.25	0.43**	0.27
	[-2.20]	[-2.45]	[-0.28]	[-2.72]	[-3.91]	[-2.41]	[0.83]	[2.07]	[1.52]
UMD_t	-0.55***	-0.61***	-0.59***	-0.45***	-0.53***	-0.54***	-0.10	-0.08	-0.05
	[-4.63]	[-6.63]	[-7.82]	[-4.14]	[-4.76]	[-6.08]	[-0.96]	[-0.91]	[-0.59]
$R^2_{Adj.}$	68.92%	65.29%	62.73%	62.42%	61.69%	69.20%	0.72%	1.53%	0.87%
Table 6, Panel B: IPO Date and BE/ME matching criteria; value-weighted portfolio returns									
α	0.22	0.00	0.01	-0.16	-0.01	-0.00	0.39*	0.01	0.01
	[1.27]	[0.01]	[0.06]	[-0.67]	[-0.05]	[-0.02]	[1.66]	[0.06]	[0.07]
MKT_t	1.24***	0.92***	1.02***	1.00***	0.77***	1.19***	0.24	0.15	-0.17
	[5.59]	[5.55]	[6.13]	[3.44]	[3.56]	[7.32]	[0.89]	[0.79]	[-0.97]
SMB_t	1.14***	1.09***	1.11***	1.31***	1.32***	1.37***	-0.17	-0.22	-0.27
	[3.76]	[6.00]	[7.39]	[4.19]	[5.52]	[6.31]	[-0.49]	[-0.76]	[-1.10]
HML_t	-0.61**	-0.47***	-0.31	-1.13***	-1.42***	-0.92***	0.53	0.95***	0.61***
	[-2.15]	[-2.63]	[-1.40]	[-2.58]	[-5.44]	[-4.91]	[1.26]	[3.66]	[3.12]
UMD_t	-0.58***	-0.67***	-0.68***	-0.44**	-0.65***	-0.78***	-0.15	-0.01	0.10
	[-3.54]	[-5.26]	[-5.66]	[-2.02]	[-4.00]	[-6.18]	[-0.85]	[-0.08]	[0.64]
$R^2_{Adj.}$	63.68%	52.98%	62.95%	52.11%	56.85%	63.29%	1.40%	8.07%	8.29%

	$r_{Sample,t} - r_{F,t}$			$r_{Match,t} - r_{F,t}$			$r_{Sample,t} - r_{Match,t}$		
	1Y	2Y	3Y	1Y	2Y	3Y	1Y	2Y	3Y
Table 6, Panel C: IPO Date and ME matching criteria; equal-weighted portfolio returns									
α	0.19*	0.07	0.04	0.29*	0.21	0.26**	-0.10	-0.14	-0.21*
	[1.84]	[0.72]	[0.55]	[1.73]	[1.56]	[2.23]	[-0.68]	[-1.13]	[-1.92]
MKT_t	1.30***	1.20***	1.14***	1.28***	1.19***	1.29***	0.03	0.02	-0.14
	[12.10]	[12.14]	[11.20]	[7.33]	[9.56]	[12.14]	[0.16]	[0.14]	[-1.26]
SMB_t	1.20***	1.14***	1.14***	1.26***	1.35***	1.47***	-0.06	-0.21	-0.34**
	[7.08]	[8.57]	[9.52]	[6.82]	[8.37]	[10.99]	[-0.42]	[-1.44]	[-2.46]
HML_t	-0.05	-0.03	0.04	-1.05***	-1.00***	-0.58***	1.00***	0.97***	0.63***
	[-0.34]	[-0.23]	[0.35]	[-4.37]	[-5.97]	[-3.63]	[4.70]	[5.93]	[3.88]
UMD_t	-0.46***	-0.56***	-0.57***	-0.36***	-0.54***	-0.53***	-0.10	-0.02	-0.04
	[-4.60]	[-7.09]	[-7.57]	[-2.74]	[-5.03]	[-5.68]	[-1.10]	[-0.24]	[-0.46]
$R^2_{Adj.}$	72.26%	72.70%	68.27%	72.24%	72.67%	75.55%	21.15%	21.53%	16.47%
Table 6, Panel D: IPO Date and ME matching criteria; value-weighted portfolio returns									
α	0.12	0.03	0.06	0.37**	0.28*	0.24*	-0.25	-0.26	-0.18
	[0.79]	[0.20]	[0.58]	[2.06]	[1.83]	[1.66]	[-1.25]	[-1.62]	[-1.34]
MKT_t	1.35***	1.13***	1.11***	1.49***	1.38***	1.58***	-0.14	-0.25	-0.46***
	[6.53]	[7.53]	[6.85]	[5.56]	[6.87]	[9.07]	[-0.48]	[-1.24]	[-2.81]
SMB_t	1.26***	1.14***	1.09***	1.26***	1.38***	1.52***	-0.01	-0.24	-0.43**
	[4.93]	[6.81]	[7.48]	[5.90]	[7.48]	[7.53]	[-0.02]	[-1.30]	[-2.42]
HML_t	-0.18	-0.15	-0.16	-1.13***	-1.27***	-0.92***	0.95**	1.12***	0.76***
	[-0.76]	[-0.88]	[-0.77]	[-2.94]	[-4.73]	[-3.53]	[2.38]	[4.05]	[3.29]
UMD_t	-0.56***	-0.67***	-0.68***	-0.18	-0.65***	-0.74***	-0.39***	-0.02	0.06
	[-3.59]	[-6.23]	[-6.08]	[-1.28]	[-4.20]	[-5.06]	[-2.70]	[-0.13]	[0.36]
$R^2_{Adj.}$	64.38%	61.47%	65.49%	64.14%	66.88%	69.84%	14.39%	22.46%	21.36%

Table 7: Do firms self select into the Certify=1 and Certify=0 categories? The results reported in this table correspond to the second step of the Heckman two-step estimation procedure to account for firm selection. The regression model is:

$$\text{Value}_i = \beta'\text{X}_i + \pi \left\{ \left(\frac{\phi(\hat{\gamma}' Z_i)}{\Phi(\hat{\gamma}' Z_i)} \right) \textbf{Certify}_i - \left(\frac{\phi(\hat{\gamma}' Z_i)}{1 - \Phi(\hat{\gamma}' I_i)} \right) (1 - \textbf{Certify}_i) \right\} + \nu_i \,,$$

where $\hat{\gamma}$ is the first-step probit estimate of the selection model $\textbf{Certify}_i = \begin{cases} 1 & \text{iff} \quad \text{W}_i = \text{Z}_i\gamma + \eta_i \geq 0 \,, \\ 0 & \text{iff} \quad \text{W}_i = \text{Z}_i\gamma + \eta_i < 0 \,. \end{cases}$ Each regression includes a categorical variable for the IPO year and a constant. Bootstrapped standard errors, reported in parentheses, correct for the fact that in the estimation of this regression model we fix γ at the first-stage probit estimate $\hat{\gamma}$ (we estimate $\hat{\gamma}$ and $\hat{\beta}$ for 1,000 resamples with replacement, each of the size of the original data set, and compute bootstrapped standard errors as in Greene (2003), page 924). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	(1) Firm Size 1	(2) Firm Size 2	(3) Cash flows	(4) Internet Stock
π	0.29^{**}	0.22^{**}	0.27^{**}	0.25^{*}
	(0.141)	(0.130)	(0.133)	(0.131)
Log(Assets)		1.69^{***}	2.01^{***}	1.66^{***}
		(0.410)	(0.512)	(0.412)
Log(Assets)^2		-0.05^{***}	-0.06^{***}	-0.05^{***}
		(0.017)	(0.022)	(0.017)
$\text{Log}\left(\frac{\text{IPO Proceeds}}{\text{Assets}}\right)$	0.93^{***}	1.43^{***}	1.42^{***}	1.41^{***}
	(0.217)	(0.122)	(0.121)	(0.124)
$\text{Log}\left(\frac{\text{Shares Offered in IPO}}{\text{Total Shares Outstanding after IPO}}\right)$	-1.34^{***}	-1.22^{***}	-1.14^{***}	-1.14^{***}
	(0.172)	(0.170)	(0.167)	(0.175)
$\text{Log}\left(\frac{\text{Cashflows}}{\text{Assets}}\right)$			0.14^{**}	
			(0.055)	
Internet Stock Categorical Variable				0.42
				(0.219)
IPO Year Fixed Effects	Yes	Yes	Yes	Yes
Flexible form for firm size	Yes	No	No	No
Observations	298	298	293	298
R-squared	52%	55%	56%	55%

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