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Conflict of interest and certification in the U.S. IPO market ☆

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ABSTRACT

We examine the long-term return performance of U.S. IPOs underwritten by relationship banks. We show that, over one- to three-year horizons, IPOs managed by relationship banks experience buy-and-hold benchmark-adjusted returns that are similar to those observed for a matching sample of stocks managed by non-relationship underwriters. This result holds even when the returns' skewness and cross-sectional correlation is accounted for. 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 non-relationship institutions. Again, we conclude that the two groups of IPOs yield similar long-run returns. These findings support the certification role of relationship banks and suggest that, in this respect, the effect of the 1999 repeal of Sections 20 and 32 of the Glass–Steagall Act has not been negative.

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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 its initial public offering (IPO). However, a lending bank's

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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. We add to this debate with a study of the long-run performance of IPOs underwritten by commercial banks. First, we examine the cross section of buy-and-hold benchmark-adjusted returns on IPOs taken public by relationship and non-relationship banks. Second, we study 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 non-relationship institutions. In both cases, we find that over one- to three-year horizons IPOs underwritten by relationship banks yield returns similar to those on IPOs managed by non-relationship underwriters. These findings support the certification role of relationship banks underwriting their clients' IPOs.

The 1933 Glass–Steagall Act sought to address the potential conflict of interest and banned 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 began 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) and 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 pre-IPO bank during the period from 1998 to 2000, and present additional evidence that helps us understand the consequences of bringing down the commercial-investment bank firewalls. By combining different data sources, we identify the firm's pre-IPO bank, 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. In the rest of the article we refer to the bank that served the firm prior to its IPO as the relationship bank, while we refer to a bank that did not serve the firm prior to its IPO as an independent or outside bank.

We examine 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 underpricing of IPOs that had a relationship with a prospective underwriter. As a first step we focus 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 with similar risk characteristics that 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 indices (S&P 500, Nasdaq, as well as a portfolio comprising NYSE, AMEX, and NASADQ stocks). Further, we consider a logarithmic transformation to reduce the skewness of individual-firm long-horizon BHARs. 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 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. Therefore, in the second part of our long-run analysis we follow a calendar-time approach (e.g., Fama, 1998). Specifically, we examine the performance of three portfolios: the first entails a long position in the stocks underwritten by relationship banks, the second contains ex-ante similar stocks that have been taken public by outside banks, and the third is a zero-cost investment strategy that is long in the first portfolio and short in the second. We compute equal- and value-weighted weekly returns on such portfolios with holding periods of one, two, and three years. We test the performance of the three portfolios 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). In almost all regressions the abnormal return, α, is insignificant. This result applies not only to the long-short strategy, but also to the two individual portfolios. In most cases the abnormal return is also economically small, typically ranging from one percent per year when returns are value weighted to ten percent per year when returns are equally weighted. One exception to these findings concerns the portfolio that is long stocks underwritten by relationship banks when the holding period is one year. For this portfolio we find a 33 percent α when returns are equally weighted. Related, the α on the corresponding long-short portfolio is 35 percent. These abnormal returns are attenuated however when portfolio returns are sampled at the monthly frequency and matching criteria are ignored. Overall, we still conclude that IPOs underwritten by relationship banks perform similarly to the stocks in the control sample.

The remainder of the paper is organized as follows. Section 2 summarizes the conflict of interest and certification theories. In Section 3 we discuss how we construct the data set and the relevant variables. Section 4 presents the long-run performance predictions and analysis. Section 5 complements the long-run performance results with a brief analysis of the valuation of the IPOs in our sample. Section 6 addresses the interpretation of our results and concludes.

2. Certification and conflict of interest theories

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 with 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).

In contrast, 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.

To empirically disentangle the two theories, we examine long-run IPO returns. If certification prevails, stocks underwritten by relationship banks are priced accurately. Thus, these stocks will not exhibit abnormal long-run performance. In contrast, if conflict of interest prevails, investors purchase over-priced IPOs underwritten by relationship banks. Over time prices will adjust, resulting in negative abnormal returns. We complete this analysis by examining whether there is selection among the firms that go public with their bank; i.e., we test the prediction of the certification theory that high-value IPOs are more likely to be underwritten by the firm's relationship bank.

3. Data

3.1. 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 (e.g., 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 et al. (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. Nearly all firms that went public between 1998 and 2000 established their pre-IPO banking relationships without knowing with certainty that the Gramm–Leach–Bliley Financial Modernization Act (FMA) would open the way to IPO underwriting by commercial banks. Only four firms in our sample established a pre-IPO banking relationship after the November 1999 enactment of the FMA. Thus, firm self-selection into a pre-IPO relationship with a prospective IPO underwriter is unlikely. This claim is supported by the evidence in Schenone (2004), who considers a similar sample of IPOs and shows that firms that went public during this period had not selected their pre-IPO lender based on the effect that this choice could have had on IPO underpricing. However, after 2000 firms are likely to have chosen strategically 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 American Depositary Receipts (ADRs), closed-end funds, Real Estate Investment Trusts (REITs), financial institutions, private placements, 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 1245 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 and 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

Table 1
Summary statistics for firm characteristics at the time of the IPO.

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. of observations	306	93	213
Percent of sample	100.0	30.4	69.6

Notes. 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. The **Certify** variable equals one if the firm went public with its relationship bank, and zero otherwise. Standard deviations are reported in parentheses.

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. Therefore, 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 relationships (the bank lent its own funds to the firm) as well as underwriting relationships (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. Thus, it might also have an incentive to over-represent the value of its client firm when underwriting its IPO. Most of the firms in our sample have pre-IPO direct lending relationships.

3.2. 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 the 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 a Section 20 subsidiary, or another relationship bank with underwriting powers, underwrote the IPO, we code **Certify** = 1. The list of bank mergers is in Fig. 1, p. 310, of Ljungqvist et al. (2004).

3.3. 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 five 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; the return on the S&P 500 index; the return on the Nasdaq index; and the returns on 49 industry-ranked portfolios, also from Ken French's data library. In all cases, the benchmark returns are inclusive of all distributions.

4. Long-run performance: predictions and analysis

In Section 4.1 we examine the predictions for buy-and-hold abnormal returns in an event-time long-run performance study, while in Section 4.2 we follow a calendar-time approach.

4.1. 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 abnormal performance 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 known to be related to average returns (e.g., Fama and French, 1992; Daniel and Titman, 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.

4.1.1. 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]

[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 et al., 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.

Table 2
Wealth relatives.

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

Notes. 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.

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.[2] 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 stock is delisted before the ending date for its corresponding IPO issued by a relationship bank, then after its delisting date we use a similar strategy to replace it with a substitute matching stock. If the replacement stock is also delisted, we look for yet another substitute matching stock, and so on. This is similar to the approach followed by, e.g., Loughran and Ritter (1995) and Ritter (1991).

4.1.2. 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 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, 2007; Loughran and Ritter, 2000; and

[2] We do not use the same IPO multiple times to match other stocks in the sample. Once we pair a stock taken public by the firm's relationship bank with an IPO managed by an independent bank, we exclude the latter IPO from the set of candidate matching stocks.

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 et al. (1999).[3]

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. Thus, 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 a 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 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 there is not 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 performed similarly to the control sample of stocks. In unreported results we also repeat the analysis by including the first-trading-day return in the total return measures in Eqs. (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.

4.1.3. Correcting cross-sectional correlation and skewness biases

The skewness-adjusted statistics that we employed in Section 4.1.2 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; Kothari and Warner, 2007; 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 Fig. 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.

[3] Specifically, we compute the skewness adjusted *t*-ratio in Eq. (5), p. 174, of Lyon et al. (1999). We calculate the transformed test statistics in Eq. (6), p. 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.

Table 3
Mean buy-and-hold abnormal returns.

	$T = 1$Y			$T = 2$Y			$T = 3$Y		
	S	M	$S - M$	S	M	$S - M$	S	M	$S - M$
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]
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]
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]
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]

Notes. 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 value of equity (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 C–D 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.

* Idem, 10%.

** Idem, 5%.

*** Significant at the 1% level.

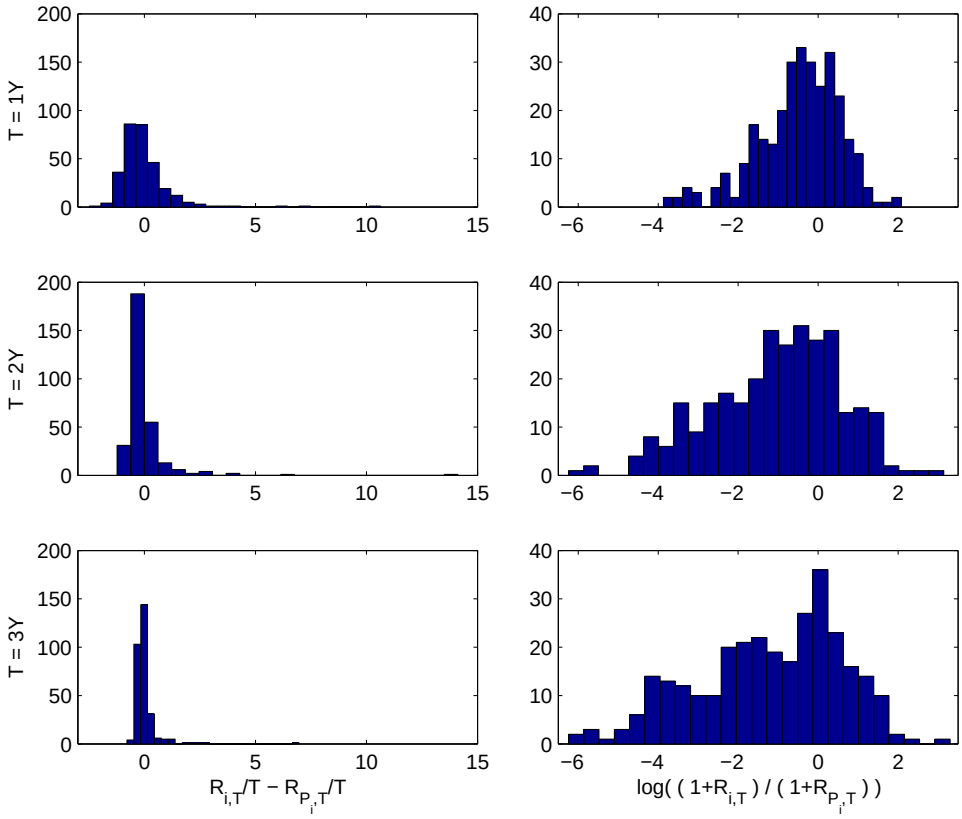

Fig. 1. The sample distribution of the buy-and-hold benchmark-adjusted returns. Buy-and-hold returns are computed by compounding daily returns from the day of the IPO (exclusive of the first trading day return) to the end of the holding period T, which ranges from one to three years. Where available, 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 value of equity deciles. In the right panels, the buy-and-hold abnormal return is $BHAR_i = \log(\frac{1+R_{i,T}}{1+R_{P_i,T}})$.

Consider now the cross-sectional regression

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

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:

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

Table 4
Skewness and kurtosis of the buy-and-hold benchmark-adjusted returns.

T	Skewness		Kurtosis	
	$\frac{R_{i,T}}{T} - \frac{R_{p_i,T}}{T}$	$\log(\frac{1+R_{i,T}}{1+R_{p_i,T}})$	$\frac{R_{i,T}}{T} - \frac{R_{p_i,T}}{T}$	$\log(\frac{1+R_{i,T}}{1+R_{p_i,T}})$
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

Notes. 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 value of equity deciles. The holding periods are $T = 1$, 2, and 3 years.

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 for 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 and Benzoni, forthcoming 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.

4.1.4. 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 Eq. (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 $\hat{\beta}_{\text{Certify}}$, and 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.

4.1.5. 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 Eq. (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 after 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 into 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

Table 5
Mean buy-and-hold abnormal returns: non-zero cross-sectional correlation.

	$T = 1$Y			$T = 2$Y			$T = 3$Y		
	$\hat{\beta}_0 + \hat{\beta}_{\text{Certify}}$	$\hat{\beta}_0$	$\hat{\beta}_{\text{Certify}}$	$\hat{\beta}_0 + \hat{\beta}_{\text{Certify}}$	$\hat{\beta}_0$	$\hat{\beta}_{\text{Certify}}$	$\hat{\beta}_0 + \hat{\beta}_{\text{Certify}}$	$\hat{\beta}_0$	$\hat{\beta}_{\text{Certify}}$
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]
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]

Notes. The abnormal return on IPO i is $BHAR_i = \log(\frac{1+R_{i,T}}{1+R_{P_i,T}})$, 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 value of equity (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:

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

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.

* Idem, 10%.
** Idem, 5%.
*** Significant at the 1% level.

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).

To account for these possible effects we consider the regression

$$\log\left(\frac{1+R_{i,T}}{1+R_{P_i,T}}\right) = \beta_0 + \beta_{\text{Certify}}\textbf{Certify}_i + \mathrm{X}_i\beta_{\mathrm{X}} + \varepsilon_i, \tag{7}$$

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). We acknowledge that these right-hand side variables might be endogenous. As such we present these regressions as a different way of describing the return variation across groups of firms in our sample.

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 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.

4.2. 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. Therefore, 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 4.1.1, except that now we consider matching firms that went public within a certain window before or after (rather than before) 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):

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

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 $\alpha \neq 0$.

4.2.1. 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

Table 6
Long-run portfolio returns: a calendar-time analysis.

	$r_{Sample,t} - r_{F,t}$			$r_{Match,t} - r_{F,t}$			$r_{Sample,t} - r_{Match,t}$		
	1Y	2Y	3Y	1Y	2Y	3Y	1Y	2Y	3Y
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%
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%
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%
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%

Notes. 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

Table 6 (*continued*)

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 excess 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. Coefficient t-ratios are in parentheses.

*** Significant at the 1% level.

** Idem, 5%.

* Idem, 10%.

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, i.e., prior to estimating the regressions we express the weekly return series in decimal form and annualize them using a factor of 52. Therefore, 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. In particular, the loading on the market portfolio is positive and close to unity when we match stocks by BE/ME, while it is higher than one when we match by ME. Moreover, we find $\beta_{SMB} > 0$ and $\beta_{HML} < 0$, i.e., the returns on both P_S and P_M correlate positively with the returns of small, low book-to-market stocks. This is consistent with the characteristics of the IPO stocks in P_S and P_M, which are typically small growth stocks, and is in line with the evidence in Loughran and Ritter (1995), Brav and Gompers (1997) and Brav et al. (2000), who document similar patterns in the *SMB* and *HML* factor loadings for the returns on portfolios of IPO stocks. Finally, we find $\beta_{UMD} < 0$, i.e., the returns on P_S and P_M correlate positively with the returns of low-past-return stocks. This is also consistent with the findings of the literature that has examined the performance of IPO stocks, e.g., Brav et al. (2000).

In contrast, 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 result 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). Finally, we have confirmed that this result is not robust when we do not impose matching criteria in constructing the return portfolios and when we estimate the model with return series sampled at the monthly frequency.

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.

5. Firm-underwriter selection and market valuation

We examine the selection of firms that go public with their relationship bank with a model similar to the one used by Puri (1996) and reviewed in Li and Prabhala (2007). We estimate the model using a Heckman (1979) two-step procedure. In the first step, we fit a probit model of the firm's choice to go public with its relationship bank. The number of banks in the lending syndicate correlates highly with **Certify** but not with the firm's market value. Thus, it is a valid instrument for the model estimation and we include it in the set Z of variables that determine selection.

In the second step we estimate the valuation regression

$$\text{Value}_i = \text{X}_i\beta + \pi\left\{\textbf{Certify}_i \frac{\phi(\text{Z}_i\hat{\gamma})}{\Phi(\text{Z}_i\hat{\gamma})} - (1 - \textbf{Certify}_i)\frac{\phi(\text{Z}_i\hat{\gamma})}{1-\Phi(\text{Z}_i\hat{\gamma})}\right\} + \nu_i, \tag{9}$$

where $\hat{\gamma}$ is the first-step estimate of the probit coefficients and the selection bias adjustment terms $\frac{\phi(\text{Z}_i\hat{\gamma})}{\Phi(\text{Z}_i\hat{\gamma})}$ and $\frac{\phi(\text{Z}_i\hat{\gamma})}{1-\Phi(\text{Z}_i\hat{\gamma})}$ measure the market's updated information regarding the value of the firm once the market observes the firm's choice of bank. The results in Table 7 show that the π coefficient in Eq. (9) is significant at the 5 or 10 percent levels, depending on the characteristics included in the variable X. Moreover, the point estimate $\hat{\pi}$ is positive and stable across different specifications, ranging from 0.22 to 0.29. These findings indicate that there is selection among firms that go public with their relationship bank and, in particular, that such firms are valued higher than firms that did not go public with their bank.

6. 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 for equity issues. Much of the debate on conflict of interest and certification in the market for IPOs has therefore focused on IPOs underwritten by investment banks that hold a venture capital position in the issuing firm. For

Table 7
Do firms self select into the **Certify** = 1 and **Certify** = 0 categories?

	(1)	(2)	(3)	(4)
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)
$\text{Log}(\frac{\text{IPO Proceeds}}{\text{Assets}})$	0.93***	1.43***	1.42***	1.41***
	(0.217)	(0.122)	(0.121)	(0.124)
$\text{Log}(\frac{\text{Shares Offered in IPO}}{\text{Total Shares Outstanding after IPO}})$	−1.34***	−1.22***	−1.14***	−1.14***
	(0.172)	(0.170)	(0.167)	(0.175)
$\text{Log}(\frac{\text{Cashflows}}{\text{Assets}})$			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[a]	Yes	No	No	No
Observations	298	298	293	298
R-squared	52%	55%	56%	55%

Notes. We report results for the second step of the Heckman two-step estimation procedure which accounts for firm selection. The regression model is:

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

where $\hat{\gamma}$ is the first-step probit estimate of the selection model

$$\textbf{Certify}_i = \begin{cases} 1 & \text{iff} \quad W_i = Z_i\gamma + \eta_i > 0, \\ 0 & \text{iff} \quad W_i = Z_i\gamma + \eta_i \leqslant 0. \end{cases}$$

We define $\text{Value}_i = \log(\frac{\text{Market Value of Equity}}{\text{Revenues at IPO year}})_i$, where 'Market Value' is the market value of equity 14 days after the IPO and 'Revenues at IPO year' is the most recent sales revenue figure reported in the last amended IPO prospectus. Each regression includes a categorical variable for the IPO year and a constant. Bootstrapped standard errors, reported in parentheses, correct for the pre-estimation of the γ coefficient in the first probit step.

[a] When 'Flexible form for firm size' is on, we replace the control variables (Log(Assets)) and (Log(Assets)^2) with categorical variables that equal one if the firm's assets fall in a particular size decile and zero otherwise.

* Idem, 10%.

** Idem, 5%.

*** Significant at the 1% level.

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 investigate the long-run performance of the IPOs underwritten by the firm's bank. 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

[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).

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 have a long-run performance similar to that of the control group of stocks managed by independent institutions.

The recent literature has examined multiple aspects of universal banking.[5] For instance, Gande et al. (1999) and Yasuda (2005) investigate the competitive effect of commercial banks' entry into the market for 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 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 yield returns that are similar to those on comparable new 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.

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