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Banking during Bubbles: What Difference does it Make on Post-bubble Lending?

Laura Gonzalez[1]

Abstract

This paper examines the effect of "aggressive" bank lending on subsequent bank relationships. The analysis is based on a unique hand collected dataset of 515 technology and non-technology firms that went public during the 1996-2000 "dotcom" period. It examines the effect of their pre-IPO bank agreements during the subsequent contraction and relaxation of lending standards, a full cycle, up to 2007. Overall, despite the correction of "aggressive" bank lending to technology firms, pre-IPO lending increases the likelihood of post-IPO lending during the rest of the cycle. More specifically, and controlling for operating performance, pre-IPO "dotcom" lending is associated to more numerous larger deals with longer maturity years after. Thus, lending exuberances seem to facilitate earlier access to bank debt and, in association with those relationships, subsequent bank borrowing once aggressive lending is corrected.

JEL classifications: G32
Keywords: banks, bank loans, lending relationships, banking bubbles, aggressive lending

1 Introduction

Firms see lines of credit and other sources of liquidity vary with economic cycles and bank lending standards (see, for example [1] and [2]). Tightening of bank lending[2] is particularly important for public firms, which utilize revolving credit agreements more than any other debt. Previous work finds evidence of effective bank screening during periods of "aggressive" lending [3]. However, little is known about the effect of those banking relationships on subsequent loan agreements, following "tightening" in bank lending.

[1]Fordham University, USA.

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[2]The Federal Reserve Board's Senior Loan Officer Survey of the Terms of Bank Lending asks senior loan officers, among other things, whether their bank's standards for approving commercial and industrial loans have tightened during the quarter.

Firms that establish pre-IPO bank deals during a period of "aggressive" lending are more opaque, a perfect scenario to test the ability and incentives towards effective bank screening [3]. Once they are public, those firms would be hurt by the subsequent contraction in bank credit, but helped by the alleviation of the so called "information monopolies", as a result of their transition from private to public [4].

This paper studies the effect of "aggressive" banking on subsequent deals, during the following contraction period and subsequent relaxation of banking standards again, a full cycle. More specifically, it uses a unique hand collected dataset of bank loans to over 500 technology and non-technology firms that went public during the 1996 through 2000 "dotcom" time period. It contains their pre-IPO bank lending – as reported in their prospecti – and post-IPO bank syndicated lending up to 2007 – as reported in DealScan. This paper examines the determinants of bank agreements in the long-term, as well as the relation between bank lending and subsequent operating performance. Overall, technology firms that went public during the height of the "dotcom"– 1999 and 2000 - are less likely to obtain bank financing once public. However, controlling for performance, pre-IPO bank financing appears associated to more post-IPO bank lending throughout the banking cycle.

As reported in [3], firms with pre-IPO banking relations are older, more profitable or, in the case of technology firms, have lower losses. Once public, pre-IPO bank borrowing appears significantly associated to longer post-IPO maturities, more bank deals and common lenders. Moreover, larger pre-IPO non-bank debt is associated to larger post-IPO loans, longer maturities and earlier bank deals, closer to the IPO date. Operating performance, as measured by long-term industry-adjusted EBITDA to sales and operating cash flows to sales, improves for technology firms with respect to non-technology firms with the same number of post-IPO bank deals. In conclusion, results suggest that periods of aggressive bank lending can offer firms with potential earlier access to bank debt that facilitates bank borrowing during the subsequent tightening of credit standards.

The remainder of this paper is organized as follows. Section 2 provides a description of the data sources and sample. Section 3 examines the relation between banking relations through a credit cycle, pre-IPO banking relations and firm and industry characteristics. Section 4 studies long-term operating performance based on industry adjusted EBITDA to sales and operating cash flows to sales measures. Section 5 presents a summary and conclusions.

2 Sample Selections. Data and Summary Statistics

This section describes in detail the unique hand collected data set. It emphasizes the most relevant differences between technology and non-technology firms, bank borrowers and non bank borrowers.

2.1 Sample Selection

The sample consists of 385 technology (tech) and 130 non-technology (non-tech) firms that went public from 1996 through 2000. The tech and non-tech firms are selected from Jay Ritter's IPO database, a standard in the IPO literature. This database contains US IPOs with an issue price of $5.00 or more. The study sample excludes IPOs involving unit

offerings, spinoffs, American Depository Receipts, reverse leveraged buyouts, closed-end funds, Real Estate Investment Trusts and financial institutions. Because performance measures are scaled by sales, the sample also excludes firms with *de minimis* pre-IPO annual sales less than $1 million (the omitted firms represent about 8% of the original sample).

The number of firms randomly selected is determined so that each year the proportion of non-tech firms in the sample equals the corresponding annual proportion of non-tech firms in Ritter's IPO database so the sample is representative of the entire pool of US firms going public during the study period. Technology and non-technology firms are identified using the same criteria as in previous work [5]. The offering prospectus of firms with debt outstanding is required to describe the lending relations with enough detail as to determine whether or not a commercial bank was involved. From the offering prospectus, the sample collects information on pre-IPO short term and long term debt outstanding, public debt, amount and type of outstanding bank agreements, whether the loans were secured, and the amount of any lines of credit or other credit facilities. Bank loans are defined narrowly to be loans from commercial banks or other depository institutions. Debt from other private sources, such as private placements, suppliers, and finance companies, is classified as other debt.

There are two reasons for this classification. First, bank loans are generally considered special in the sense that banks obtain information through a deposit relation (and potentially other sources) that might not be available to other lenders (see, for example, [6]). Evidence from a number of empirical studies lends support to this view (for example, see [7] and [8]). Second, the source of private debt other than bank debt is often not reported in enough detail as to determine whether it was intermediated debt or directly placed debt. As a result, all other debt is grouped together. Thus, if finance companies and other intermediaries play a role similar to banks, the conservative classification is likely to understate the effect of pre-IPO bank borrowing[3].

Pre-IPO banking information is supplemented with pre-IPO financial data from Compustat. Once firms are public, data is collected manually from 10K filings for the first full fiscal year following the IPO and supplemented with Compustat data, and banking relationship data is obtained from Loan Pricing Corporation DealScan commercial database.

2.2 Summary Statistics

Table 1 provides annual summary statistics for the sample firms grouping all firms (Panel A) and considering only technology firms (Panel B). Table 1 reports by year the total number of cases, bank borrowers, and three year survivors. As reported in [3], most technology and non-technology firms in the sample have pre-IPO banking relationships. About 15 percent of the sample firms maintain their pre-IPO banking relations and about 80 percent of firms survive at least for 3 years following the IPO.

Panel B introduces statistics for tech firms. While practically all non-tech firms establish banking relations once they are public, only about 50 percent of tech firms have post-IPO bank borrowing. Among the tech firms that establish post-IPO bank borrowing, the

[3]Virtually all the other debt is private debt. Only three tech firms and one non-tech firm had public debt outstanding prior to the IPO in the original sample [3]. Information on public debt outstanding was collected from the offering prospecti.

proportion declines for those that go public during the peak of the "dotcom", from over 50 percent to about 30 percent.

Table 1: Panel A. All sample firms yearly distribution

Year	Number firms	Pre-IPO borrower	Through IPO borrower	Survived 3 years post IPO	Post-IPO bank borrower
1996	113	103	14	85	67
1997	100	96	15	76	57
1998	62	60	11	49	28
1999	137	132	23	108	40
2000	103	102	12	87	39
Total	515	493	75	405	231

Table 1 Panel B. Technology firms yearly distribution

Year	Number firms	Pre-IPO borrower	Through IPO borrower	Survived 3 years post IPO	Post-IPO bank borrower
1996	66	62	5	55	32
1997	61	58	6	49	25
1998	43	42	4	36	14
1999	129	125	23	100	36
2000	86	86	10	72	28
Total	385	373	48	312	135

Table 2 presents firm summary statistics. Panels A and B introduce the pre-IPO firm characteristics for tech and non-tech firms. Panels C and D introduce post-IPO firm characteristics for bank borrowers for the fiscal year preceding a bank deal. The reported summary statistics have frequently been used in the banking literature as proxies for information problems and the ex ante risk of the borrower (see, for example, [4] and [9]). Tangible/assets are plant, property and equipment divided by assets. Age is years since founding. Operating cash flows is reported in the offering prospectus and equals net profit plus depreciation and the change in accounts payable less the change in accounts receivable and inventory. Industry adjusted variables are computed by subtracting the industry median from the IPO firm's variable. Industry medians are medians for firms with the same four digit SIC code in the same fiscal year as the IPO firm, and are computed using data from Compustat. The calculation of medians by industry by fiscal year required at least four firms. When this condition was not met and/or when there was no match with our firms, the medians were calculated using the first three digits. VC Backing refers to whether the firm received venture capital financing. Focusing first on pre-IPO firm characteristics, Panel A of Table 2 shows significant differences between tech firms that

establish pre-IPO syndicated bank deals and those that do not. Tech borrowers present larger pre-IPO assets and sales, are older and with higher pre-IPO bank and non-bank debt to assets ratios than tech firms that do not close bank deals after their IPOs. Operating performance is measured in terms of EBITDA/sales and operating cash flows to sales[4],

[4]Results are similar if scaling by assets.

both with and without industry adjustments. Industry-adjusted statistics are computed by subtracting the industry median from the firm level data.

Table 2: Panel A. Technology firm pre-IPO summary statistics

	With post-IPO deals		Without deals	
	Mean	Median	Mean	Median
Assets (millions of dollars)	78.32*	22.68*	38.41	15.12
Sales (millions of dollars)	67.99*	23.77*	34.13	12.46
Age (years)	8.25+	5	6.84	0
Tangible/assets (percent)	23.91	14.81	24.12	14.91
Liabilities/assets (percent)	62.32+	57.11*	53.97	45.25
Debt/assets (percent)	21.4*	14.5*	14.12	0
Short-term post-IPO Debt/assets (percent)	2.24*	0	0.69	0
Other Debt/assets (percent)	22.57*	7.81*	13.72	3.42
Op. Cash Flows/ sales (percent)	-52.54*	-6.83*	-126.7	-23.93
EBITDA/sales (percent)	-65.34*	-9.62*	-153.1	-36.91
Ind.-Adj. Op. CFs/sales (%)	-55.64*	-12.17*	-127.3	-25.12
Ind.-Adj. EBITDA/sales (%)	-71.99*	-20.92*	-155.1	-35.66
VC support	0.65+	1	0.73	1
Failed within 3 yrs post-IPO (number of firms)	39		34	

Significantly different from firms without deals at the 0.05 (*) and 0.10 (+) level

Table 2: Panel B. Non-technology firms pre-IPO summary statistics

	With post-IPO deals		Without deals	
	Mean	Median	Mean	Median
Assets (millions of dollars)	999.87	44.44	7020.5	31.29
Sales (millions of dollars)	296.98	41.17	737.8	29.26
Age (years)	14.99	7.5	18.38	8.5
Tangible/assets (percent)	43.96*	21.01*	15.72*	7.6
Liabilities/assets (percent)	56.65	62.35	57.44	54.27
Debt/assets (percent)	15.97	0.65	10.67	0
Short-term post-IPO Debt/assets (percent)	9.43+	0	4	0
Other Debt/assets (percent)	27.38	21.84	24.19	10.54
Op. Cash Flows/ sales (percent)	-8.96	5.43	-67.77	2.66
EBITDA/sales (percent)	-8.02	8.25	-113.5	5.99
Industry-Adj. Op. CFs/sales (%)	-13.69	0.15	-58.08	0.6
Ind.-Adj. EBITDA/sales (%)	-20.71	-3.71	-105.2	1.63
VC support	26.04	0	26.47	0
Failed within 3 yrs post-IPO	28		9	

Significantly different from firms without deals at the 0.05 (*) and 0.10 (+) level

Panels C and D in Table 2 compare post-IPO tech and non-borrowers. As reported, for the fiscal year preceding each bank deal, tech borrowers are smaller in terms of assets and

sales than non-tech borrowers, with lower liabilities to assets and debt to assets, and with significantly worse operating.

Table 2: Panel C. Technology firm summary statistics preceding post-IPO bank deals

	With post IPO bank relations			
	Mean	Median	High	Low
Assets (book, millions of dollars)	969.9+	170.2*	31032.6	8.65
Market value of assets minus Book	1678.2*	232.45*	50640.8	-164.5
Sales (millions of dollars)	357.53*	120.07*	4552.4	2.41
Tangible/assets (percent)	19.07*	11.94*	87.41	0.97
Liabilities/assets (percent)	50.63*	44.88*	174.9	4.14
Debt/assets (percent)	24.64*	11.75*	102.48	0
Goodwill	130.8	1.03+	6120.1	0
Investment Rating	0*	0	0	0
Operating Cash Flows/ sales (percent)	-22.58*	-0.31*	77.46	-421.7
EBITDA/sales (percent)	-23.44*	4.75*	39.98	-643.56
Debt/EBITDA (percent)	-21.42+	0*	14462.1	-14227
Ind.-Adj. Operating CFs/sales (percent)	-21.43*	-2.95*	263.2	-421.1
Ind.-Adj. EBITDA/sales (percent)	-24.54*	-4.25*	266.4	-683.9
Ind.-Adj. Debt/EBITDA (percent)	-62.12	-0.88+	14462.2	-14460

Table 2: Panel D. Non-tech firm summary statistics preceding post-IPO bank deals

	With post IPO bank relations			
	Mean	Median	High	Low
Assets (book, millions of dollars)	1654.51	345.97	23226.9	6.48
Market value of assets minus Book	486.18	100.35	10548.13	-2610.45
Sales (millions of dollars)	1118.3	263.14	25462.1	0
Tangible/assets (percent)	27.49	19.19	84.47	1.12
Liabilities/assets (percent)	60.86	58.77	186.57	5.23
Debt/assets (percent)	33.32	32.01	120.85	0
Goodwill	114.62	12.41	1562.9	0
Investment Rating	0.1	0	1	0
Operating Cash Flows/ sales (percent)	-0.03	6.05	71.98	-446.6
EBITDA/sales (percent)	5.3	15	53.3	-485.9
Debt/EBITDA (percent)	670.2	231.8	59397.3	-3504.7
Ind.-Adj. Operating CFs/sales (percent)	-4.73	-1.59	277.1	-431.3
Ind.-Adj. EBITDA/sales (percent)	-4.29	2.48	277.6	-486.3
Ind.-Adj. Debt/EBITDA (percent)	455.15	44.2	59092.1	-3729.2

Significantly different from non-technology firms at the 0.05 (*) and 0.10 (+) level

Descriptive statistics concerning post-IPO bank loans to tech and non-tech firms are presented in Table 3. Tech borrowers present more pre-IPO secure borrowing than non-tech ones. Tech borrowers also retain more frequently their pre-IPO bank borrowing for a year and establish post-IPO deals less frequently, smaller deals with shorter maturities. Based on these measures, banks appear to be more cautious when lending to tech firms

after their IPOs, given the higher riskiness and opaqueness of tech firms going public between 1996 and 2000.

DealScan expresses the all-in-drawn spread as a basis point mark-up over the 6-month LIBOR that includes recurring fees associated with the credit facility. The spread is used as a measure of per dollar cost of borrowing in a number of previous empirical studies on loan pricing. Number of common lenders refers to the previous post-IPO loan agreement. All firm statistics are for the fiscal year prior to bank deal activation.

Table 3: Per-firm median loan package characteristics

	Technology firms		Non-tech	
	Mean	Median	Mean	Median
Post-IPO Bank Deals				
Number of post-IPO bank deals	2.01*	1*	3.2	2.5
Days from IPO to Deal Activation	846.04	708.5	928.03	741.5
Days from last deal/IPO to Deal Activation	590.12	475.5	546.21	374
Deal Amount	79.65+	20*	118.34	52.28
Deal Maturity	35.04*	25.66*	44.93	42
Deal All-in-drawn	254.3+	255*	227.5	225
Number of Common Lenders	0.28	0	0.29	0
Deal Amount	126.68*	30*	252.27	100
Deal Maturity	37.48*	27.03*	47.96	40.8
Deal All-in-drawn	259.04	255	241.66	225
Number of Common Lenders	0.32	0	0.35	0
Pre-IPO Bank Borrowing				
Secured borrowing	0.58*	1*	0.43	0
Loan repay by IPO loan proceeds	0.38*	0	0.39	0
Pre-IPO Deal Amount/Assets	0.21	0.14*	0.16	0
Pre-IPO Deals maintained though IPO	0.15+	0	0.24	0
Following IPO Deal Amount/assets	0.02*	0	0.09	0

Significantly different from non-technology firms at the 0.05 (*) and 0.10 (+) level

Table 4 reports post-IPO syndicated bank deal purposes. Corporate purposes, as reported in DealScan, include working capital, capital expenditures, equipment and hardware purchase, commercial paper backup, and project finance purposes. Mergers and acquisitions include acquisition line and takeover purposes. Leverage buyouts include management buyouts, recaps, stock buyback and debtor in possession purposes

Table 4: Panel A. Post-IPO bank deal purposes (%)

	Technology	Non-technology
Corporate Purposes	66*	49.5
Mergers & Acquisitions	12.87	13.68
Leveraged Buyouts	0.74*	3.58
Debt Repay	15.8*	25.73
Other	5.5	7.5

Table 4: Panel B. Post-IPO bank deal purposes for technology firms by IPO year

	1996	1997	1998	1999	2000
Corporate	59.2	69.81	62.5	65.2	71.11
M&A	17.11	11.3	18.75	6.1	13.33
LBO	0	0	0	3.03	0
Debt Repay	19.74	16.98	15.63	12.12	13.33
Other	3.95	1.89	3.13	13.64	2.22

3 Determinants of Post-IPO Banking Relations

The empirical analysis is motivated by the large literature in banking that focuses on banks and other private lenders as screeners that reduce ex ante information asymmetries ([10], [6], [11]).[5] As reported in [3], bank screening of highly opaque technology firms appears effective during the "dotcom" period, and lending relations a positive signal of firm quality. Building upon those findings, tech firms remain significantly young and opaque after going public. Therefore, banks would arguably rely on pre-IPO screening when making post-IPO lending decisions.

Another reason for studying banking relations of post-IPO firms is to examine whether the determinants of lending relations for tech firms differ from the ones for non-tech firms. Anecdotal evidence from industry practitioners suggests that the loans to technology firms require more due diligence and rely more heavily on soft information[6] concerning intellectual property and human resources than loans to non-tech firms. Following the demise of the technology bubble, correction in aggressive lending to technology firms is expected. At the same time, firms with potential are expected to benefit from decreased "information monopolies".

The literature on the specialness of bank loans spans for several decades. Overall, previous empirical studies focus on the mix of public versus private debt, and find that firms that are younger, more opaque, with greater growth opportunities use relatively more bank debt (see, for example, [4], [9], [16]. Along with lending activities, banks participate in underwriting and venture capital activities and compete for early access to firms with potential. Previous works find that underwriters compete to get the IPO proceeds and to secure future underwriting business, as strategic investors who seek complementarities between venture capital and lending activities (see, for example [17] and [18]).

To our knowledge, this is the first study to examine how banking relations among small privately held firms can affect the determinants of subsequent banking relations once the firm is public and the bank lending environment changes for the industry. In fact, it is the

[5]See for example [12], [13] for a review of the literature on banking relations. See, for example, [14], [15] and [8] for a discussion of the importance of soft information in bank lending decisions.

[6]The term soft information refers to information that is difficult to quantify and transfer, such as information about the character of the borrower or information gathered through contacts with customers, competitors, and suppliers.

use of non public information in granting loans and monitoring what is often used to distinguish bank lending from arm's - length funding arrangements [19].
Since not all firms survive at least three years following the IPO, in tables 5 through 9, a two step Heckman procedure is used to test and correct sample selectivity (see [20] for a description of this technique). Since the inverse Mills ratio (λ) (estimated as reported in [3]) is not statistically significant in any of the regressions, ordinary least square techniques and probit models are used.

3.1 Determinants of Existence and Number of Post-IPO Banking Relations

The study of existence and number of post-IPO banking relations considers pre-IPO banking relations through two binary variables. One takes a value of 1 if the firm establishes pre-IPO bank deals. The second takes a value of 1 if the firm continues to borrow under the pre-IPO bank relation. The regression analysis also includes a dummy variable called *retain*, that takes the value of one if the firms has bank loans outstanding the year after the IPO
As shown in Table 5, the likelihood of establishing bank deals after the IPO decreases for technology firms and for older firms (as per log of age), and increases for firms with secured pre-IPO borrowing and higher pre-IPO sales (as per log of sales). Interestingly, the number of post-IPO bank deals decreases for tech firms and firms going public during the peak of the tech bubble (years 1999 and 2000). However, despite the correction in aggressive bank lending to tech firms, firms with pre-IPO bank borrowing have overall a significant higher likelihood of establishing a higher number of post-IPO bank deals.

Table 5: Determinants of post-IPO banking relations

	Post IPO banking	Post IPO banking	# Post IPO deals	# Post IPO deals
Pre-IPO banking			0.79	
			(2.53)	
Retain*pre_IPO borrowing	0.07			
	(1.13)			
Log (1 + IPO age)	-0.06	-0.07	-0.1	0.1
	(-2.18)	(-2.28)	(-0.7)	(-0.66)
Secure pre-IPO banking	0.11	0.13	0.3	0.27
	(2.18)	(2.73)	(1.86)	(1.69)
Pre IPO VC support	-0.06	-.0.7	-0.23	-0.17
	(-1.17)	(-1.2)	(-1.32)	(-1.04)
Post-bubble IPO	-0.004	-0.01	-0.36	-0.34
	(-0.07)	(-0.1)	(-2.59)	(-2.49)
Technology firm	-0.25	-0.26	-1.19	-1.2
	(-4.22)	(-4.42)	(-4.65)	(-4.65)
Pre-IPO tangible/assets	0.13	0.13	0.74	0.67
	(1.66)	(1.7)	(1.75)	(1.63)
Log(pre-IPO sales)	0.08	0.08	0.35	0.35
	(4.06)	(4.11)	(3.87)	(3.89)
Other Debt/Assets	0.14	0.14	0.56	0.63
	(1.32)	(1.3)	(1.17)	(1.33)

Pre-IPO EBITDA/sales	0.01	0.01	-0.03	-0.02
	(1.86)	(1.74)	(-1.36)	(-1.29)
Pre-IPO Liabilities/Assets	-0.06	-0.01	-0.12	-0.18
	(-0.11)	(-0.15)	(-0.47)	(-0.68)
Constant	0.45	-.46	0.21	0.98
	(4.15)	(4.27)	(0.38)	(2.03)
Adj R-squared	0.21	0.20	0.26	0.25

3.2 Timing and Common Lenders of Post-IPO Banking Deals

As presented in Table 6, the number of days since the IPO or previous post-IPO banking deal decreases with higher pre-IPO non-bank-debt to assets. One interpretation could be that those pre-IPO private borrowings are interpreted as signal of firm quality, even if the lenders are less effective screeners than banks.

Table 6: Determinants of average number of days to subsequent post-IPO bank deal

	Average number of days	
Retain pre IPO borrowing	-35.5	
	(-0.35)	
Log (1 + IPO age)	60.16	62.43
	(1.47)	(1.44)
Secure pre-IPO borrowing	-48.67	-59.73
	(-0.52)	(-0.74)
Pre IPO VC support	68.02	67.93
	(0.71)	(0.71)
Post-bubble IPO	-61.71	-64.63
	(-0.82)	(-0.88)
Technology firm	61.59	68.06
	(0.73)	(0.79)
Pre-IPO tangible/assets	45.6	42.02
	(0.33)	(0.31)
Log(pre-IPO sales)	-14.81	-15.48
	(-0.56)	(-0.58)
Pre IPO Other Debt/Assets	-39.65	-38.8
	(-3.25)	(-3.23)
Pre-IPO EBITDA/sales	59.08	59.79
	(1.73)	(1.75)
Pre-IPO Liabilities/Assets	31.9	31.99
	(0.34)	(0.34)
Constant	58.4	57.9
	(3.59)	(3.49)
Adj R-squared	0.09	0.09

The results of the study of common lenders are reported in Table 7. First, in Panel A, grouping all deals per firm, pre-IPO banking and higher EBITDA to sales significantly are associated to less common lenders per firm. Secondly, in Panel B, when studying all

post-IPO deals separately, it shows that the number of common lenders increases with the number of previous post-IPO bank deals and decreases with higher assets. In addition, the ratio of intangibles per assets is associated to more common lenders, suggesting lending based on soft information.

Table7: Panel A. Determinants of common lenders in post-IPO banking relations

	Number of common lenders	
Pre-IPO bank borrowing	-0.63	
	(-6.58)	
Log (1 + IPO age)	-0.02	-0.02
	(-0.61)	(0.54)
Secure pre-IPO borrowing	0.12	0.13
	(1.43)	(1.53)
Pre IPO VC support	-0.1	-0.11
	(-0.86)	(-1.0)
Post-bubble IPO	-0.12	-0.13
	(-0.91)	(-0.98)
Technology firm	-0.06	-0.04
	(-0.61)	(-0.45)
Pre-IPO tangible/assets	0.02	0.01
	(0.15)	(0.1)
Log(pre-IPO sales)	0.03	0.03
	(0.77)	(0.81)
Other Debt/Assets	-0.11	-0.12
	(-0.73)	(-0.83)
Pre-IPO EBITDA/sales	-0.1	-0.1
	(-2.1)	(-2.09)
Pre-IPO Liabilities/Assets	0.05	0.05
	(0.45)	(0.48)
Constant	0.86	0.22
	(4.4)	(1.4)
Adj R-squared	0.4	0.4

Table 7: Panel B. Determinants of post-IPO bank deal common lenders

Adj R-squared: 0.12	Number of common lenders
Pre-IPO borrowing retained through IPO	-0.12
	(-1.23)
Number of previous Post-IPO Deals	0.09
	(3.36)
Pre-IPO Non-bank Debt/Assets	-0.04
	(-0.34)
Technology firm	-0.03
	(-0.34)
Post-bubble IPO	0.04
	(0.31)
Assets	-0.01
	(-2.72)
Investment credit rating	-0.25
	(-1.46)
Goodwill	0.01
	(0.68)
Intangibles/assets	0.43
	(2.0)
Constant	0.09
	(-0.9)

Table 8: Determinants of post-IPO bank deal size

Adj R-squared:0.38	Post-IPO Bank Deal Size
Pre-IPO bank borrowing	-149.83
	(-1.48)
Number of previous Post-IPO Deals	21.36
	(1.28)
Pre-IPO Non-bank Debt/Assets	192.79
	(3.05)
Technology firm	-20.69
	(-0.63)
Post-bubble IPO	-1.2
	(-0.03)
Assets	0.02
	(1.36)
Investment credit rating	303.92
	(2.3)
Goodwill	0.09
	(2.72)
Tangibles/assets	39.41
	(0.4)
Constant	178.85
	(1.81)

Table 9: Determinants of post-IPO bank deal maturity

	Post-IPO Deal Maturity
Pre-IPO bank borrowing retained through IPO year	8.48
	(1.88)
Number of previous Post-IPO Bank Deals	-0.07
	(-0.05)
Pre-IPO Non-bank Debt/Assets	22.61
	(3.55)
Technology firm	-7.6
	(-1.94)
Post-bubble IPO	-11.01
	(-2.8)
Assets	-0.001
	(-2.85)
Investment credit rating	3.79
	(-0.32)
Goodwill	0.01
	(2.38)
Tangibles/assets	19.55
	(1.98)
Constant	38.69
	(8.8)
Adj R-squared	0.18

4 Banking Relations and Operating Performance

If banks continue identifying firms with the best future prospects after their IPOs, one could expect an improvement the operating performance of more opaque borrowers, the technology firms. This is exactly the finding for two measures of post-IPO operating performance: EBITDA/sales and operating cash flows/sales. The findings are not sensitive to whether scaling is done by sales or assets.

The focus is on EBITDA and operating cash flows because these performance measures are most closely linked to the ability of the borrower to service both current and future bank borrowings. While stock returns and net income are also important measures of performance, they are more removed from the banker's principal focus. In addition, the EBITDA and operating cash flows per sales are used in previous studies of operating performance following securities [21].

For each firm in the sample, operating performance data is obtained from Compustat for the fiscal year preceding the activation of bank deals following the IPO. Unadjusted and industry-adjusted operating performance measures are considered. To limit the effect of outliers the focus is on medians. The industry-adjusted performance measure subtracts from each firm's level observation the industry median. Industries are defined by four-digit Standard Industrial Classification (SIC) codes. If there are fewer than four firms in the industry, three-digit SIC codes are used [22].

4.1 Univariate Analysis

Summary statistics of post-IPO industry adjusted operating performance group by technology vs. non-technology firms are presented in Table 10. Following the common practice, medians are reported, - similar results are found for means. Year 1 through Year 5 refer to the fiscal years preceding the first through fifth post-IPO bank deals. N is the number of observations. All data is expressed as percentage. The post-IPO performance measures indicate that tech firms obtain bank borrowing as they improve operating performance with respect to non-technology firms. The third measure of performance is not an operating one, but a common bank covenant ratio, debt to EBITDA. As expected from the loan purpose summary statistics, technology firms do not use post-IPO debt to repay old one and despite improving EBITDA, the ratio of debt/EBITDA increases significantly with respect to that of non-technology firms.

A high debt to EBITDA ratio could hamper bank deal conditions for technology firms, but as indicated in the firm summary statistics, the market value of assets is much higher than the book value for technology than for non-technology firm. Thus, the market appears to infer pre and post-IPO bank screening - besides improved operating performance, given that there is no difference in the deal all-in-drawn[7] spread measures of tech and non-tech firms. This is consistent previous work, which finds reliance on bank borrowing increasing for higher past earnings, especially among most information problematic borrowers [1].

Table 10: Long-term operating performance of bank borrowers

	Ind. Adjusted EBITDA/Sales				Ind. Adjusted Operating Cash Flows /Sales				Ind. Adjusted Debt/EBITDA			
	Tech		Non tech		Tech		Non tech		Tech		Non tech	
	Median	N	Med.	N	Med.	N	Med.	N	Med.	N	Med.	N
Yr. 1	-7.5*	85	2.48	67	-12.6*	85	-3.78	67	-19.2*	85	-1.16	67
Yr. 2	-6.2*	41	2.69	43	-4.68+	42	-0.47	44	-4.77	41	4.99	43
Yr. 3	5.72	19	4.71	23	-7.77	21	0.9	24	121.2	19	22.6	23
Yr. 4	13.17+	8	5.26	13	6.17	8	3.52	14	414.9+	8	-36.8	13
Yr. 5	14.4+	5	4.65	5	14.8*	5	-0.69	5	492.2*	5	148	5

Statistically different from non technology firms at 0.05 (*) and 0.1 (+) level

4.2 Multivariate Analysis of Post-IPO Performance

One explanation for why firms with pre-IPO banking relations, like the case of most of our post-IPO bank borrowers, perform better after they go public is that there is

[7]DealScan expresses the all-in-drawn spread as a basis point mark-up over the 6-month LIBOR that includes recurring fees associated with the credit facility. The spread is used as a measure of per dollar cost of borrowing in a number of previous empirical studies on loan pricing ([23] and [24] and [25]). DealScan computes the spread for non-LIBOR based loans by converting index used to price the loan into a LIBOR equivalent using the historical relationship between the index and the LIBOR.

persistence in performance. Alternatively, better performance could be explained by ex ante observable differences that are correlated with whether or not a firm establishes a banking relation. Assuming the study has a reasonably complete list of ex ante publicly observable measures, the importance of bankers' soft information can be tested.

Table 11 reports the results of a regression model relating post-IPO performance to pre-IPO banking relations and firm characteristics. An obvious danger when including post-IPO borrowing in the regression model is that post-IPO borrowing is likely to be endogenous. Given this caveat, the study includes a dummy variable *Retain*, that equals one if the first post-IPO 10K indicates that the firm continued to borrow under its pre-IPO bank credit facilities. In addition, to control for selectivity bias, a two-step Heckman procedure is also used, like in section 3.Once again, the coefficient estimate of the inverse Mills ratio is insignificant and the performance regressions use ordinary least squares.

Overall, as shown in Table 11, firms that continue to borrow from their pre-IPO bank relations through the IPO year are more likely to present higher industry-adjusted EBITDA to sales. In addition, 1999-2000 IPO firms present lower industry adjusted EBITDA to sales preceding each post-IPO loan. Previous work examines the relation between long run performance and bank borrowing [24]. However, they examine the relation between performance and the announcement of bank loan agreements. Moreover, since indicate that most publicly traded firms have bank lending relations [1], underperformance could be associated to circumstances surrounding the public announcement of a new loan and not with the existence of a prior lending relation.

Table 11: Determinants of post-IPO operating performance of bank borrowers

	Ind. Adj. EBITDA/sales in Post-IPO bank borrowers
Pre-IPO borrowing retained through IPO	0.14
	(1.92)
Number of previous Post-IPO Deals	0.03
	(1.5)
Pre-IPO Non-bank Debt/Assets	-0.14
	(-0.63)
Technology firm	-0.04
	(-0.34)
Post-bubble IPO	-0.73
	(-3.4)
Assets	0.001
	(-0.25)
Pre-IPO VC support	-0.2
	(-1.87)
Constant	-0.02
	(-0.3)
Adj R-squared	0.13

5 Summary and Conclusions

An important strand of the banking literature holds that bank relations are special in that, through an ongoing relation with a borrowing customer, bankers gain access to information that is not available to the other firm claimants. This information is generally soft in nature and is used in conjunction with current financial and other hard data when making credit decisions. Soft information is generally thought to be most important in lending to small and young firms because these firms lack a long track record and might not report financial information in a consistent fashion. For these firms, banking relations are expected to be particularly informative about the borrowing firm's future prospects. However, it is unclear whether relationship lending established during periods of aggressive lending can have long term effects.

This paper analyzes this issue by examining the banking relations of 515 technology and non-technology firms that went public between 1996 and 2000. The analysis is based on a unique hand collected data set that describes their loan agreements during a full banking cycle, through the aggressive lending of the "dotcom" years, subsequent tightening of bank lending and relaxation in lending up to 2007.

Overall, controlling for operating performance, pre-IPO lending established during the "dotcom" period appears associated to increased bank lending years after. Despite the tightening in lending to technology firms, pre-IPO bank borrowing appears significantly associated to longer post-IPO maturities, more bank deals and common lenders. Operating performance, as measured by long-term industry-adjusted EBITDA to sales and operating cash flows to sales, improves for technology firms with respect to non-technology firms with the same number of post-IPO bank deals. In conclusion, results suggest that periods of aggressive bank lending can offer firms with potential earlier access to bank debt that facilitates bank borrowing during the subsequent tightening of credit standards.

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