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Does competition from new equity mitigate bank rent extraction? Insights from Japanese data

Xueping Wu [a,*], Piet Sercu [b], Jun Yao [c]

[a] Department of Economics and Finance, City University of Hong Kong, Kowloon, Hong Kong
[b] Faculty of Business and Economics, Katholieke Universiteit Leuven, Naamsestraat 69, 3000 Leuven, Belgium
[c] School of Accounting and Finance, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

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ABSTRACT

Previous research shows that bank information production mitigates asymmetric information problems. However, this literature has ignored the concern that firms with better growth prospects are more vulnerable to bank rent extraction. This paper points out that funding competition from new equity as an effective natural mechanism solves this important concern. Using Japanese data from 1983 to 1997, we show that the relationship between loan-to-debt ratio and growth, while starting significantly *negative* (consistent with holdup theory), turns significantly *positive* towards the high end of the growth spectrum. We confirm that high-growth firms raise more new equity than do low growth firms and use more equity relative to bonds in external finance. This is consistent with a generalized Myers–Majluf framework. These results suggest that for high growth firms, when competition from public debt lessens due to increased growth-based valuations, competition from new equity steps in to restrain bank rent extraction.

1. Introduction

A non-trivial aspect of a firm's capital-structure is its choice between relationship-based debt (monitored debt, mostly bank loans) and arm's-length debt (mostly bonds). However, there have been two important but seemingly contradictory predictions in the literature for this debt-mix choice.

One strand of literature suggests that benefits from monitored debt decrease when firm growth prospects improve. Having limited growth prospects to start with, firms are likely to have a moral hazard problem, causing suboptimal investments with a high risk but low, and even negative, net present value (NPV). If firms' moral hazard problems are severe, banks can monitor and control client firms (i.e., screen their projects) so that monitoring benefits overwhelm costs.[1] When firm quality and growth opportunities improve, the monitoring benefits decrease (Diamond, 1991). In addition, because of their information monopoly power over client firms, banks tend to extract rent, *ex post*, from the firms (Sharpe, 1990). Rajan (1992) suggests that such holdup behavior by banks affects firm incentives if banks are unchecked; consequently, firms that have better growth prospects prefer more public debt to monitored debt. Thus, both the holdup and the monitoring hypotheses produce the same prediction for the debt-mix choice: the use of monitored debt decreases with an improvement in corporate growth prospects.

The other strand of literature suggests the opposite – that is, high growth firms prefer monitored debt to public debt. Yosha (1995) argues that relationship-based financing prevents firms from disclosing proprietary information to product-market competitors, and at the same time, produces positive information for high-growth firms (see also Campbell, 1979). In effect, monitoring itself can generate an information production effect that reinforces the monitoring benefits (Leland and Pyle, 1977; Campbell and Kracaw, 1980). Information production in the sense of Yosha (1995) is actually associated with private information about firm value or quality that derives mainly from intangibles such as growth opportunities. This is about overcoming the information gap regarding risky but positive NPV projects. Unlike Diamond (1991) and Rajan

* Corresponding author. Tel.: +852 2788 7577; fax: +852 2788 8842.
E-mail addresses: efxpwu@cityu.edu.hk (X. Wu), piet.sercu@econ.kuleuven.ac.be (P. Sercu), afyaojun@inet.polyu.edu.hk (J. Yao).

[1] Diamond (1991) argues that firms whose ratings are too low for reputation effects to eliminate moral hazard but are high enough for bank monitoring to eliminate moral hazard start to demand monitored bank loans. In this paper, we do not consider firms that are less creditworthy than this; such firms are rare among listed firms.

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(1992), this strand of literature implies that the better the growth prospects, the more bank loans are used in the debt-mix (see supporting evidence in Krishnaswami et al. (1999), for US firms, and Anderson and Makhija, 1999, for Japanese firms).

While bank loans relative to public debt provide reasonable benefits to high growth firms, the existing literature has not explained why bank rent extraction, if increasing with corporate growth prospects, does not significantly offset these benefits. As Rajan (1992) argues, banking relationships bring significant holdup costs to high growth firms, especially when funding competition is weak. In effect, public debt tends to become very costly for high growth firms because intangibles such as growth opportunities make up a large part of their valuations. Thus, for these firms, there is a lack of competition from public debt.

This paper, however, finds funding competition from new equity to be a natural mechanism for high growth firms to restrain bank rent extraction. According to the generalized Myers–Majluf model developed by Cooney and Kalay (1993) and Wu and Wang (2005), asymmetric information about firm valuations that derive largely from growth opportunities does not inhibit but rather helps facilitate new equity issues. As a result, to curb bank rent extraction, the main competition from external finance can rely upon either public debt or new equity, and the external finance patterns depend on firm growth status or type.

More precisely, for firms with low and moderate growth prospects where asymmetric information about assets-in-place still dominates, new equity issuers will incur the highest costs of asymmetric information or adverse selection (Myers and Majluf, 1984). Thus, the firms' external finance relies mainly on debt. As a firm's growth prospects start to improve away from the low end, the firm's demand for monitoring decreases because the monitoring benefits decrease (Diamond, 1991) and the chance for bank *ex post* rent extraction increases (Rajan, 1992). As a result, governed by Myers' (1984) pecking order in financing, the firm tends to diversify its debt financing away from bank loans to public debt, as predicted by the holdup and monitoring hypotheses.

Yet, one cannot naively extrapolate this. As firms' valuations tilt towards growth opportunities, the debt overhang problem looms (Myers, 1977) and the use of public debt lessens. At the same time, unlike low growth firms where banks have hardly any rent to extract, high growth firms are an ideal holdup target, if banks remain unchecked. The high growth firms, however, do have a way out. For these firms, new equity provides effective funding competition to curb bank holdup behavior, since uncertainty over growth opportunities does not necessarily inhibit new equity financing. Thus, high growth firms, even with little access to public debt, are actually able to rely on new equity issuance to restrain bank holdup behavior.

We hypothesize a U-shaped relationship between the debt-mix choice and growth and test our hypothesis using Japanese data for 1983–1997. It is standard in the debt-mix literature to look at a relationship between a firm's loan-to-debt ratio and market-to-book ratio. We find that this relationship, while starting significantly *negative*, turns significantly *positive* towards the high end of the growth spectrum. The negative-sloped section of the U-shaped relationship is consistent with the first strand of the literature – in effect, the holdup problem is so severe in Japan because the widespread multi-banking seems unable to solve this problem – and the positive-sloped section is consistent with the second strand.

In addition, our regression results confirm that the relationship between the bond-to-external-finance ratio and growth forms a significantly inverted U-shape. This reflects the change in the mix of external finance due to shifts from bonds to equity in funding competition, to restrain bank holdup behavior. This is consistent with the finding of Kutsuna et al. (2007) that conflicts of interest expected in banking relationships in Japan are hardly prohibiting new equity issuance. Because costs of new equity for high growth firms can be much cheaper than as predicted by Myers and Majluf (1984), bank rent extraction is unlikely to become a major factor offsetting the benefits of bank financing. This insight reconciles the two strands of the literature, which previous studies often supported separately.

Our results can help us better understand the finding in Johnson (2003). Johnson argues that short-term debt mitigates the Myers (1977) under-investment/debt overhang problem for high growth firms, but at the same time increases liquidity risk; he finds that high growth firms have to lower leverage ratio to contain the risk of inefficient liquidation. Johnson (2003), however, did not consider the solution offered in the literature that bank loans (largely short-term in nature) as monitored debt can especially alleviate the inefficient liquidation problem. Yet bank financing can bring about a new problem – banks' rent extraction. To complement the analysis of Johnson (2003), our results suggest that increased new equity financing not only helps high growth firms to restrain bank holdup behavior but also lowers their leverage ratios at the same time.

In the remainder of our paper, Section 2 reviews the generalized Myers–Majluf framework. Section 3 forms our testable hypothesis and specifies tests. Section 4 describes the data. Section 5 reports and analyzes the empirical results. Section 6 concludes.

2. A theoretical basis for the funding competition from new equity

The traditional view, according to Myers' (1984) pecking order in financing, contends that new equity has the highest cost of asymmetric information due to adverse selection as described by Myers and Majluf (1984) and hence should be the last resort in financing. However, Fama and French (2002) find that less-levered, small-growth US firms actually favor new equity despite severe information asymmetries. Kang and Stulz (1996) also find surprisingly that seasoned equity public offerings on average have a positive announcement effect in Japan (see also Wu et al., 2005). These findings suggest the benefits of new equity issues by high-growth firms.

Evidence for low costs or even benefits of new equity issues, albeit puzzling in the traditional view, is actually consistent with the generalized Myers–Majluf model. While Myers and Majluf (1984) focus mainly on the adverse selection effect from dominant asymmetric information about assets-in-place, the generalized Myers–Majluf model of Cooney and Kalay (1993) and Wu and Wang (2005) predicts that dominant asymmetric information about growth opportunities can actually facilitate new equity issuance. By assuming that managers on behalf of existing shareholders launch only non-negative NPV new projects, Myers and Majluf (1984) limit the information gap regarding growth. To generalize, Cooney and Kalay (1993) relaxed this assumption and Wu and Wang (2005) further introduced private benefits of control to solve the incentive compatibility problem ignored by Cooney and Kalay (1993). As a result, the generalized model with a concrete structure of agency conflicts in Wu and Wang (2005) explicitly predicts that an increase in asymmetric information about growth opportunities boosts and can even produce a positive announcement effect of new equity issuance.[2]

The generalized model suggests that when asymmetric information about assets-in-place dominates, adverse selection in new equity issuance is a serious problem and the Myers (1984)

[2] Myers (2003) emphasizes that the asymmetric information cost of new equity in Myers and Majluf (1984) comes from the adverse selection effect – primarily caused by asymmetric information about assets-in-place. Wu and Wang (2005) nest this in their analysis on an increase in the uncertainty about growth.

pecking order rules. Conversely, when asymmetric information arises mostly from investment opportunities rather than from assets-in-place, new equity financing does not necessarily suffer the adverse-selection problem and can even convey good news. This enables funding competition to bank financing to arise from new equity issues for high growth firms fraught with this second type of asymmetric information.

An example can help illustrate how competition from new equity issuance can help high growth firms to curb bank holdup behavior. Assume that at a high growth firm, asymmetric information is mainly from the NPV of investment opportunities. Suppose the firm's manager knows that the NPV of a new investment is 100 million dollars, but the equity market has a lower estimate of, say, 40 million dollars. This information asymmetry, however, does not necessarily cause underinvestment. Rather than getting nothing, the manager, short of cash, is better off launching this project priced at the market-perceived payoff of 40 million dollars. This underestimation pushes down the new equity investors' participation price, at the firm's expense; but for the firm, the deal is still better than getting nothing.

Alternatively, the manager can ask the house bank for financing because he can better communicate with this insider the true NPV of the new investment. This is one important situation where the benefits of relationship banking and possibly the bank holdup costs arise. How to price the loan in this situation is beyond the scope of this paper. The main point is that the bank would extract rent from the firm in the absence of public debt if not for the competition from the equity market; as long as the bank's rent extraction looms large, the ability of the firm to turn to new equity tends to contain it. In equilibrium, because not all growth-oriented issuers are lemons, their new equity prices on average are actually higher than the case where adverse selection always dominates. In other words, new equity for high-growth firms can be cheaper than suggested by the main intuition of Myers and Majluf (1984).

3. Hypothesis, relevance, and test design

3.1. Testable hypothesis

The issue in this paper is of how the observed, correctly specified relationship between debt-mix decisions and corporate growth logically reflects the cost and benefit tradeoff of firms' use of monitored debt (or simply, bank financing). Relative to public debt, benefits of monitored debt in general include lower agency costs through a concentration of lenders (e.g. Diamond, 1984; Berlin and Loeys, 1988) and a reduced likelihood of inefficient liquidations (e.g., Chemmanur and Fulghieri, 1994). In addition, the bank-firm interaction and monitoring due to close banking relationships makes the house bank an "insider" (Fama, 1985). Bank monitoring can reduce earnings management (Ahn and Choi, 2009). A bank's seal of approval also signals positive information (Leland and Pyle, 1977; Campbell and Kracaw, 1980). Empirically, James (1987) and Lummer and McConnell (1989) find that stock price responses to the announcements of bank-loan agreements and renewals are significantly positive (for a Japanese context, see Kang and Liu, 2008). Such signaling, in turn, can relieve other fund providers from similar costly evaluations (Fama, 1985).

A firm's growth status or type can significantly influence the costs and benefits of relationship-based debt relative to public debt. Both the holdup and monitoring arguments predict relative increases in costs of bank financing when a firm's growth prospects improve (Diamond, 1991; Rajan, 1992). The holdup behavior should be most prevalent when there is no ex post competition (von Thadden, 1992). An improvement in growth prospects (and reputations), however, enables competition from public debt to curb banks' rent extraction.

On the other hand, information production (e.g., Yosha, 1995; Campbell, 1979) and the ability to mitigate the debt overhang problem (Myers, 1977) should enable monitored debt to benefit especially high growth firms. For example, bank loans, short-term in nature, are able to alleviate the underinvestment problem (Barclay and Smith, 1995). This literature, however, is silent about bank rent extraction, especially when public debt is largely absent. It is very costly for fast-growing highfliers to issue bonds (which are usually long-term) against growth prospects (Barclay and Smith, 1995). Yet for these firms, competition from new equity steps in to restrain banks' holdup behavior (from public debt).

Based on the above, we hypothesize that – depending on a firm's growth prospects, which tend to go hand in hand with growth uncertainty like call options – competition to bank financing mainly comes from either public debt or new equity. As illustrated in Fig. 1, we use a U-shaped relationship between the loan-to-debt ratio and growth to present our hypothesis. This U-shaped relationship, *ceteris paribus*, reflects a synthesis of existing theories.

Firstly, according to Diamond (1991) and Rajan (1992), when a firm has low valuations or poor prospects, the benefits of bank financing outweigh the monitoring and holdup costs; therefore, there are more bank loans in the debt-mix. As a firm's growth prospects and reputation improve, the firm can save on the monitoring costs and weaken their banks' hands by diversifying their debt financing away from bank loans to public debt. Thus, we observe the downward-sloping section of the U-shape (a hypothesis already well established in the literature).

Secondly, when firms have better growth opportunities, an increase in asymmetric information tends to follow. This asymmetric information, however, tends to be from growth opportunities. This is because asymmetric information about high-growth firms' valuations is likely to arise much more from growth than from assets-in-place. Although competition from public debt decreases because of the debt overhang problem, competition from new equity can step up in taking a major role in curbing bank holdup behavior. This occurs because an increase in asymmetric information with respect to growth can actually facilitate new equity financing (Wu and Wang, 2005). Thus, we observe the upward-sloping section of the U-shape curve towards the high end of the growth spectrum. Previous studies that showed such an upward-sloping relationship have been silent about the potential bank holdup problem.

Lastly, we need to check auxiliary conditions to make sure that competition from new equity is real. Firstly, firms with more investment opportunities are able to rely more on new equity. Secondly, these high growth firms, despite little availability of public debt, are able to use considerable amounts of bank loans in absolute terms (in terms of loan-to-assets ratios). Thirdly, the relative importance of bonds versus equity in external finance should depend on firm growth prospects. The relationship between the bond-to-external-finance ratio and growth should be an inverted U-shape if the competition from equity eventually replaces the competition from public debt financing in restraining bank rent extraction.

3.2. Related empirical literature

Regarding how growth prospects affect the debt-mix choice, empirical literature has yielded seemingly contradictory findings. Using US data, Houston and James (1996) find a significantly negative relationship between loan-to-debt ratio and growth for firms using a single bank. This contrasts with their evidence of a significantly positive relationship for firms using multiple banks. They conclude that bank rent extraction exists, but banking with multiple banks is an effective curb to holdup costs.

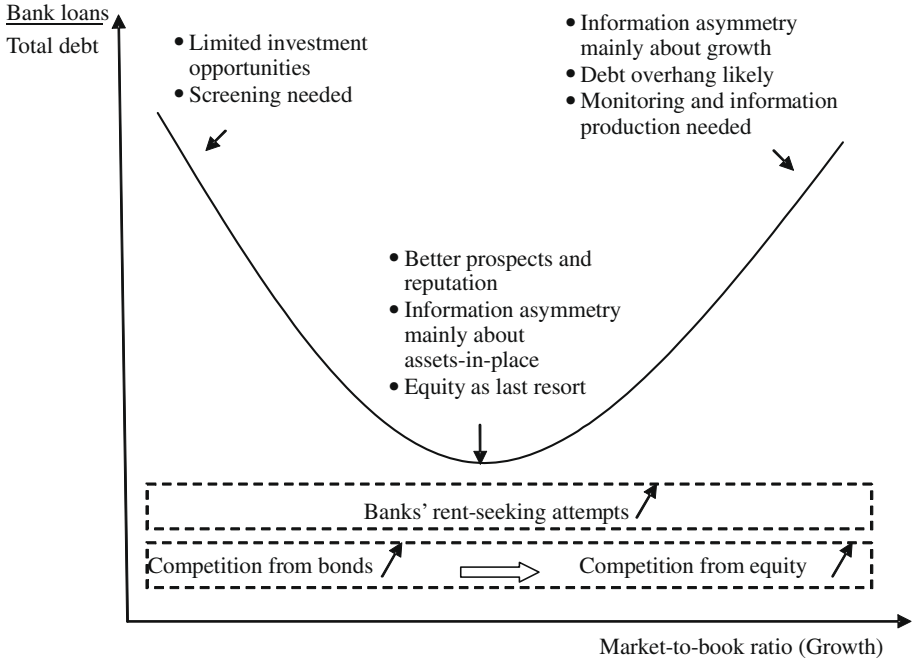

Fig. 1. A U-shaped relationship between debt-mix choice and growth: A synthesis of existing theories.

Johnson (1997), however, points out that the loan data used by Houston and James (1996) include other types of private debt, not just bank loans. Separating bank loans from other private debt in his data, Johnson (1997) finds a significantly negative relationship between bank-loan-to-debt ratio and growth. This implies that bank loans in general do have significant holdup costs. Note that the overwhelming majority of listed firms use multiple banks (Detragiache et al., 2000). To the extent that the use of multiple banks may not preclude a firm from having banking relationships close enough to produce significant bank financing benefits, Johnson's (1997) findings indicate that bank rent extraction is much more widespread than Houston and James (1996) conclude.

On the other hand, Johnson (1997) finds a significantly positive relationship between the private-debt-to-total-debt ratio and growth – evidence of the dominant benefits of non-bank private debt. However, Krishnaswami et al. (1999) find a significantly positive relationship even using data of mixed private debt and bank loans. While these careful studies shed much light on how growth affects the debt-mix choice, none of the above studies, except Houston and James (1996), explicitly addresses the bank holdup issue, which would deter high growth firms from using monitored debt.

Previous studies on Japanese banks' rent extraction are equally inconclusive. Examining Japanese firms, Hoshi et al. (1993) find that Keiretsu firms (which rely heavily on their main banks) with better growth prospects take less bank loans relative to bonds, consistent with the existence of significant holdup costs from bank loans. In contrast, Anderson and Makhija (1999) find that Japanese firms, particularly those previously restricted from access to public debt by regulation, rely more on bank financing when these firms show more growth prospects, even in the 1990s when regulatory restrictions on bond issues were largely lifted. They conclude that there are no meaningful holdup costs in Japan.

3.3. Regression specification and econometric issues

We model the U-shaped relationship in Fig. 1 as a quadratic cross-sectional regression as follows (where we suppress the cross-section subscript, j, for conciseness):

$$\frac{Loan_t}{Debt_t} = a + bGrowth_{t-1} + cGrowth_{t-1}^2 + \sum_i w_i ControlVariable_{i,t-1} + e_t. \quad (1)$$

The dependent variable is loan-to-debt ratio in year t, which measures the proportion of bank loans from the total debt of a firm. The explanatory variables are all in year $t-1$. The main variables are *Growth* and its square, $Growth^2$. We follow the literature to use the firm's market-to-book ratio to proxy for *Growth*. e_t is the regression error. The symbols a, b, c and w denote regression coefficients. We need $b < 0$ and $c > 0$ for the minimum to be observed at a positive value for Growth (the minimum of $a + bx + cx^2$ is at $x = -0.5b/c$). Thus, the significant estimates of b and c, with correct signs, determine the turning point of the U-shaped curve.

The effects of market imperfections on corporate debt-mix decisions may operate not only through growth but also through a host of other firms' characteristics. We include control variables in our cross-sectional analysis to isolate the growth effect. Note that all our control variables were used in Hoshi et al. (1993), Houston and James (1996), Johnson (1997) or Anderson and Makhija (1999). Our control variables are as follows.

3.3.1. Firm size

Logarithm of firm value is a popular proxy for information, contracting and monitoring costs, as well as credit risk. Small firms are subject to more information asymmetries, and have lower contracting costs for insider loans compared to outside debt (Fama, 1985). Small firms with close banking ties are in a better position to get access to cheaper credit (Berger and Udell, 1995, and Petersen and Rajan, 1994). Thus, smaller firms prefer bank loans. Larger firms require less monitoring (Diamond, 1991). Economies of scale in the issuance of public debt favor large firms (Blackwell and Kidwell, 1988). In general, firm size carries a significant weight in credit-rating evaluation, with smaller firms in a weaker position and therefore more likely to stay out of the public-debt market.

3.3.2. Leverage

The ratio of debt over total assets is a proxy for the likelihood of financial distress and risk of an inefficient liquidation. Thus, highly levered firms prefer bank loans to public debt (e.g., Chemmanur and Fulghieri, 1994).

3.3.3. Fixed-asset ratio

The ratio of fixed assets over total assets acts as a proxy for collateral and liquidation value. Hoshi et al. (1993) argue that firms with higher fixed asset ratios have lower information costs of issuing public debt and hence prefer bonds to costly bank loans.

3.3.4. Coverage

The interest-coverage ratio, or operating income over interest payments, is a proxy for financial health or financial conservatism. Coverage enters our regressions as an indicator (it equals unity if coverage ratio falls below three, and zero otherwise). Thus, the loan-to-debt ratio is positively related to the "Cov < 3" indicator.

3.3.5. Earnings volatility

The volatility of earnings over the last five years is a proxy for credit risk and uncertainty about future cash flows. Berlin and Loeys (1988) suggest that firms with less accurate financial indicators prefer bank loans.

Note that the dependent variable in (1) – bank loans as a fraction of total debt – is constrained between 0 and 1, implying that the residuals cannot be symmetrically distributed around the fitted value for all values of explanatory variables. Especially, the upper bound, unity, is often binding. We follow the extant literature and adopt the Tobit regression.

Another issue is that the debt-mix can be sticky, since debt-mix is the cumulative result of decisions taken over several years. Therefore, any given cross-section may notably deviate from the long-run equilibrium of debt-mix. Thus, we study cross-sections from different years, allowing for a cross-sectional common random time effect by including year dummies. In addition, to weaken the impact of autocorrelation in disequilibrium financial structures, we skip a couple of years after each cross-section, as in Houston and James (1996). That is, when we estimate the relation for the whole period of 1983–1997, we actually use only the data from the years 1983, 1986, 1990, 1992, 1994, and 1997. Likewise, when we split the whole sample into roughly equal sub-periods, the "1980s" sample contains the data from the years 1983, 1986, and 1990, while the "1990s" sample consists of data from the years 1992, 1994, and 1997 cross-sections. This provides a comparatively simple way to control for serial correlation in the regression residuals. The downside is a loss of power, but that only makes our significant results even more convincing.

4. Data and the context of corporate Japan

Japanese data offer at least three advantages for our tests. Firstly, unlike the US data used in the literature that had to be hand-collected from different sources (Houston and James, 1996; Johnson, 1997; Krishnaswami et al., 1999), the data on the amounts of bank loans and bonds for each Japanese firm are reliably available in machine-readable form. Thus, empirical results are easily comparable between our study and any others using these data (e.g., Hoshi et al., 1993; Anderson and Makhija, 1999). Secondly, borrowing from multiple banks in the US may significantly weaken the holdup behavior by banks (Houston and James, 1996). In contrast, because of close firm-lender relationships in the main-bank system, monitored debt is usually coordinated by main banks in Japan (Aoki et al., 1994). Thus, bank rent extraction may be more widespread for Japanese firms. Thirdly, because of the Japanese financial deregulation in the 1980s that facilitated arm's length financing, Japanese firms' debt-mix choice should become important (Hoshi et al., 1993).

We retrieve our Japanese data from the Pacific-Basin Capital Markets (PACAP) databases. The data we use cover two decades from 1977 to 1997. We selected all listed firms excluding those from the financial, utilities, and (heavily regulated) transportation and communication sectors. To qualify for inclusion, the firm should have 20 years of non-missing data on (i) short-term bank loans (data items JAF33) and straight bonds (JAF 50), (ii) book equity (BAL21), and (iii) market equity (MKT3 times MKT5 – stock price times shares outstanding at fiscal year end). Such full-data requirements can create a survival bias; but for the Japanese listed firms until 1997 – before the Asian Financial Crisis and the start of Japan's Big Bang reform – corporate demises were too rare to have had a material impact.

A full-data sample allows us to track more accurately the evolution of the choice of funding sources of corporate debt finance in Japan during the period of deregulation (1980s) and post-deregulation (1990s). Barring newly listed firms from the sample also avoids IPO-related effects in corporate finance. However, our main regression results in the next section remain qualitatively the same when we include all available firms in the sample.

During the sample period, Japan gradually deregulated its financial markets. This process started in the mid 1970s, speeded up in the mid 1980s, and culminated in 1990 when Japan lifted most of the original strict restrictions on bond issuance. For example, before 1983, Japan allowed only Toyota and Mitsubishi to issue unsecured corporate bonds, and banks usually guaranteed secured bonds. Thus, corporate bonds issued prior to 1983 are economically equivalent to bank loans financed by bank-issued bonds; that is, pre-1983 bank loan-to-debt ratios are not what they appear to be at first sight. Accordingly, our regressions ignore pre-1983 data. Note that we also have the data extended to 2003. The requirement for a balanced panel in our tests causes the number of firms to drop from 703 (during 1977–1997) to only 473 (during 1977–2003). This reflects a drastic restructuring/consolidation of corporate Japan after the Asian Financial Crisis and Japan's Big Bang reform since 1997/1998. Nevertheless, even during this checkered period from 1998 to 2003 (including the internet bubble bursting period), our main regression results in the next section remain qualitatively the same (results are available on request).

Table 1 shows annual averages of important variables for our analysis. We measure debt compositions and new equity for the current fiscal years, and all explanatory variables at the end of previous fiscal years (usually ending on March 31). For example, the observation labeled with $t = 1990$, contains the March 1991 loan-to-debt ratio, but the market-to-book ratio (*MtB*, or *Growth*) in March 1990. As important data, *Bank Loan*, covers both short-term and long-term loans (JAF33, 34, 48, 49); note that short-term bank loans (JAF33, 34) include the short-term portion of long-term loans. *Debt* is the sum of loans, straight bonds (JAF35, 50), and convertible bonds (JAF51). We omit liability items on trade accounts, which firms usually try to balance with comparable assets items, and we consider only interest-rate bearing debt in our debt-mix. *Leverage* is *Debt* divided by the book value of total assets, *Total Assets*. For the definitions of other variables, see the detailed notes to Table 1. We split the sample into four periods. (1) 1978–1982, contains the modest beginnings of financial deregulation. (2) 1983–1990, is a period of drastic deregulation and a booming market, ending with the stock market peaking. (3) 1991–1993, is the stock market crash period. (4) 1994–1997, is a period witnessing the prolonged slump following the crash years.

In Panel A of Table 1 (all firms), the effects of Japan's financial deregulation and its economic and stock market boom and bust are clearly evident. In terms of annual average book assets (*Total*

Table 1
Sample description for Japanese firms from the late 1970s to the late 1990s.

Annual average	Panel A: All Firms				Panel B: Constrained Firms				Panel C: Unconstrained firms			
	'78–82	'83–90	'91–93	'94–97	'78–82	'83–90	'91–93	'94–97	'78–82	'83–90	'91–93	'94–97
No. of firms	703	703	703	703	177	177	177	177	526	526	526	526
Total assets	77.8	118.9	186.1	186.5	40.9	46.6	55.4	58.0	90.2	143.2	230.1	229.7
Growth (MtB)	1.46	2.17	1.87	1.53	1.39	2.19	2.02	1.62	1.49	2.17	1.82	1.50
Leverage	0.60	0.55	0.51	0.51	0.71	0.71	0.66	0.66	0.57	0.49	0.46	0.45
Bank Loan/Assets	0.57	0.48	0.37	0.38	0.69	0.69	0.61	0.60	0.53	0.40	0.29	0.31
Bank Loan/Debt	0.93	0.81	0.70	0.74	0.97	0.97	0.90	0.91	0.92	0.76	0.64	0.69
St. Loan/Debt	0.63	0.61	0.49	0.54	0.63	0.69	0.61	0.65	0.63	0.58	0.46	0.50
Lt. Loan/Debt	0.30	0.20	0.21	0.20	0.34	0.28	0.29	0.26	0.29	0.18	0.18	0.18
New equity (%)	2.07	3.18	0.63	0.62	1.08	1.23	0.90	0.77	2.41	3.84	0.53	0.57
Coverage	3.45	4.95	5.11	8.67	1.79	2.07	2.49	4.06	4.00	5.91	5.99	10.2
Fix asset ratio	0.37	0.37	0.38	0.39	0.38	0.37	0.40	0.41	0.37	0.37	0.37	0.38
Earnings σ	N.A.	2.09	1.59	1.59	N.A.	3.08	2.68	2.33	N.A.	1.75	1.22	1.34

This table shows annual averages of financial statement variables for all Japanese firms (Panel A), constrained firms (Panel B), and unconstrained firms (Panel C), during various periods. Constrained firms are defined in the same way as in Anderson and Makhija (1999) – namely, for four out of five years during 1984–1989, their relevant accounting figures do not pass the regulatory bond issuance standards. Otherwise, firms are unconstrained. Data are from the PACAP database for Japan. Firms, excluding sectors of financials (Japanese Industrial Codes 0501-0513), utilities (0801), and communications (0705), have non-missing data on debt-mix choice information for the whole sample period from 1978 to 1997. Total Assets in billions of yen is the book value of bank loans (PACAP data items: JAF33+JAF34+JAF48+JAF49) and public debt (JAF35+JAF50+JAF51) plus book equity (BAL21) at the end of the previous fiscal year ($t-1$). Leverage is the sum of bank loan and public debt, Debt, divided by total assets. Growth (or MtB) is the market value of total assets, which equals Debt plus market value of outstanding common stocks (MKT3 times MKT5), divided by total assets at the end of fiscal year $t-1$. Loan-to-assets ratio, Bank Loan/Assets, is bank loan divided by total assets. Loan-to-debt ratio, Bank Loan/Debt, is bank loan divided by the sum of bank loan and public debt, Debt, at the end of the current fiscal year t. Short-term loan, St. Loan, is the book value of short-term bank loan (JAF33+JAF34). Long-term loan, Lt. Loan, is the book value of long-term bank loan (JAF48+JAF49). The other two bank loan ratios, St. Loan/Debt and Lt. Loan/Debt, are also reported at the end of fiscal year t. New equity is the difference between investment (changes in Total assets + depreciation charges, JAF74) and the sum of returned earnings and changes in Debt of the current fiscal year, where returned earnings is net income (INC9) plus deprecation minus dividend (dividend/share, MKT1, times shares outstanding, MKT5). New equity at the end of current fiscal year is measured as percents of previous fiscal year-end Total Assets. Coverage is measured as operating income adjusted for depreciation charges (INC5+JAF74) divided by total interest charges (JAF67) at the end of fiscal year $t-1$. Fixed Assets ratio is the net fixed assets (BAL7) divided by total assets at the end of year $t-1$. Earnings volatility (σ) is the standard deviation of the percentage changes in operating incomes [(INC5-INC5(-1)/INC5(-1)] in the past five fiscal years.

Assets), a typical Japanese firm's size increases from 77.8 billion yen during 1978–1982 to 118.9 billion during 1983–1990. The average asset figure goes on rising to peak at 186.1 billion yen in the early 1990s, but then tails off towards the end of the sample period. Stock-market capitalizations reflect both the rise in book asset value and growth prospects. The highest annual average market-to-book ratio, *MtB*, of 2.17 occurred during 1983–1990, the boom years of the 1980s. With the bursting of the stock-market bubble in the early 1990s and the prolonged recession, the MtB ratio starts a long slide, ending at 1.53 during 1994–1997.

Japan's financial deregulation seems to have affected every aspect of Japanese corporate finance. Firms tended to shed debt steadily, leverage dropping from an annual average of 0.60 during 1978–1982, to 0.51 in the 1990s. This validates, in a larger sample, the earlier findings of Campbell and Hamao (1994). The composition of debt also underwent a drastic change. Both the loan-to-assets ratio (*Bank Loan*/*Assets*) and the loan-to-debt ratio (*Bank Loan*/*Debt*) show similar patterns of change. For example, the annual average of *Bank Loan*/*Debt* dropped substantially, from 0.93 during 1978–1982, all the way down to 0.70 during 1991–1993. One important deregulation effect from the earlier years 1978–1982 is the drastic decrease in long-term loans, from 0.30 to 0.20 for 1983–1990. From 1983 onwards, most of the variation in the loan-to-debt ratio apparently stemmed from short-maturity loans; that is, the debt-mix choices were largely between public debt and short-term loans (the class of debt providing maximal control to banks). The deregulation did seem to make Japanese corporate choice of debt sources more market-oriented. Interest coverage (*Coverage*), a measure for financial conservatism, whose annual averages increased from less than 5 in the 1980s to 8.67 in the late 1990s, also illustrates this deregulation effect. The deteriorating economic prospects that coincide with the much liberated bond markets in the 1990s obviously explain this conservatism.

Not all firms benefited from the gradual financial deregulation at the same speed. Japan lifted in the mid-1980s the tough regulatory restrictions on bond issuance for many firms. However, for a sizable minority of firms, the restrictions remained in place until 1990. To see whether this regulatory discrimination had an impact, we separated the firms into constrained and unconstrained groups following Anderson and Makhija (1999), where "constrained" means that in the 1980s, firms faced regulatory restrictions in their access to public debt. As shown in Panel B and C of Table 1, constrained firms represent about one-quarter of the total by number, and they tend to be much smaller in terms of book assets (46.6 versus 143.2 billion yen).

As shown in Panel B of Table 1, constrained firms' capital structures persist until 1990. Annual averages for leverage (0.71) and the loan-to-debt ratio (0.97) remain constant from 1978–1982 to 1983–1990. The lifting of the restrictions had an immediate impact: formerly constrained firms were able to lower their leverage and loan-to-debt ratios by 0.05 and 0.07, to 0.66 and 0.90, respectively, for the 1991–1993 period. These lowered annual averages persist in the late 1990s, indicating that the impact of the reform was long-lived.

If regulatory restrictions had caused a noted difference in corporate finance between constrained and unconstrained firms in the 1980s, this difference should have diminished in the 1990s. However, as shown in Panels B and C, a comparison between the two firm groups reveals that bank holdup behavior, despite the lifting of the discriminatory controls, did not affect formerly regulated firms. That is, erstwhile-constrained firms continued to use, on average, more debt and especially loans in total debt (0.66 and 0.90, respectively) than did unconstrained firms (0.46 and 0.64, respectively) in the 1991–1993 period. This is also true in both short- and long-term loan ratios (0.61 and 0.29 for constrained firms, versus 0.46 and 0.18 for unconstrained firms, respectively).

Formerly constrained firms' heavy reliance on debt and especially loans may reflect less financial conservatism. Consistent with this notion, the annual average for the interest-coverage ratio in constrained firms (2.49) is much smaller than that in unconstrained firms (5.99) during the early 1990s (1991–1993). Interestingly, in the same period, the constrained firms, deemed to be easily held up by banks, also raised on average more new equity

relative to total assets (0.90%) than did unconstrained firms (0.53%). As also shown in Panels B and C in Table 1, the patterns in the late 1990s (1994–1997) are similar.

Since regulation on bond issuance may have facilitated bank holdup behavior in the 1980s (especially in the case of constrained firms), we also control for this regulatory restriction effect in our regression tests (presented in the next section).

5. Empirical results

Before we report our main results, we first explore the level of loans and bonds (components of debt) as well as new equity (a flow variable) in relation to growth.

5.1. Loans, bonds, and new equity across growth deciles: A first look

In Fig. 2, each year, we sort by the lagged MtB all firms into ten decile groups, denoted by D1 (the lowest) to D10 (the highest); we then average loans and bonds to total assets ratios, respectively, within each of the deciles. Panel A shows their annual averages for the whole period (1983–1997), and Panels B and C for the sub-periods (1983–1990 and 1991–1997). Recall that Japan first introduced genuine public debt in 1983, and lifted the tough bond issuance regulations on all firms in 1990 (the year we split the sample).

In Panel A of Fig. 2, for the whole period (1983–1997), annual average bond-to-asset ratios across growth deciles show an inverted U-shape – confirming the view that bonds are less competitive for firms with either extremely low or extremely high growth prospects. This pattern also holds for our two sub-periods: 1983–1990 (Panel B) and 1991–1997 (Panel C).

On the other hand, as shown in Panel A of Fig. 2, the loan-to-asset ratio decreases all the way towards the highest growth decile, D10. For the low- to moderate-growth firms, we have seen that public debt financing increases with growth, unlike loans. Thus, these findings confirm that competition from public debt financing is likely to keep bank holdup behavior in check, consistent with the negative-sloped section of the U-shaped relationship between the debt-mix choice and growth as shown in Fig. 1.

For high growth firms, as growth increases towards the highest levels, we see decreases in both loan and bond financing but at different speeds. As shown in Panel A of Fig. 2, at the high end of corporate growth, the decrease in loan financing is slower than the decrease in bond financing. For example, from D9 to D10, the intra-decile average loan-to-asset ratio drops by less than 0.01 while the bond-to-asset ratio drops by more than 0.03 for the whole period (1983–1997). The evidence is stronger for 1983–1990 in Panel B, where the loan-to-asset ratio actually increases from D9 to D10. Also as shown in Panel C for 1991–1997, the drop in loan-to-asset ratio never exceeds the drop in bond-to-asset ratio for high growth deciles. Thus, the debt-mix choice in relation to growth is consistent with the upward-sloping section of the U-shaped relationship. If bank rent extraction were most severe for high growth deciles, we would have simply seen drastic decreases in their loan-to-asset ratios. The fact that high-growth firms find bonds much less competitive but are still able to use relatively more bank loans indicates competition from some other source must be curbing the bank holdup behavior.

An increased reliance on equity financing by high growth firms would confirm our explanation for the upward-sloping section of the U-shaped relationship. Panel A of Fig. 3, shows that the intra-decile average market-to-book ratios (MtB) swing up and down during the whole sample period in line with Japan's stock market boom and bust. The two sets of charts for 1983–1990 (top) and 1991–1997 (bottom) in Panel A, show that changes in market-to-book ratio over time are large among glamorous firms, and are especially prominent in the most glamorous group, D10. High volatility in valuations for these high growth firms is associated with severe information asymmetries. According to the generalized Myers–Majluf model, asymmetric information about growth, however, does not inhibit new equity issuance.

Panel B of Fig. 3 shows patterns for new equity, measured as a percentage of a firm's total assets and then averaged across firms within each of the deciles. Again, the charts for different periods represent annual averages. Consistent with our conjecture, firms in the highest-growth deciles tend to raise most new equity. For high-growth firms, while bonds become less competitive (as shown in Fig. 2), new equity steps up (as shown in Fig. 3). This will likely keep bank holdup behavior in continued check.

5.2. The main regression results

We run regression tests on the hypothesized U-shaped relationship as described in Fig. 1. Table 2 presents the results from regression (1) using two specifications, with and without control variables. For the total period (1983–1997), the slope estimates for both *Growth* (lagged market-to-book ratio, MtB) and its square are always significant (p-values < 0.001). As hypothesized, the slope estimate for *Growth* is negative, while the slope for $Growth^2$ is positive. For example, in the first column, the slope estimates for *Growth* and $Growth^2$ are −0.125 and 0.022, respectively. Thus, the estimated relationship between the weight of bank loans in total debt and *Growth* conforms to the illustration in Fig. 1, a U-shaped curve bottoming out in the positive domain for *Growth*. The importance of bank loans as debt is at its lowest, as estimated unconditionally, for an MtB of 2.841, well inside the range of *Growth* present in the data.

As shown in Table 2, we also find clear evidence for a quadratic relationship in each of the two sub-periods, 1983–1990 and 1991–1997. The turning point, where the slope of relative demand for monitored debt as a function of *Growth* changes from negative to positive, is lower in the second half of the sample. For example, in the regression with control variables, it is at an MtB of 2.409, compared with 3.694 in the first half of the sample. The different turning points are likely to result from the general swing of MtB during the Japanese boom-and-bust period (shown in Fig. 3). Interestingly, irrespective of the general level of MtB's in the sub-periods, the positive-sloped section of the U-shaped curve always contains more than 10% of the firms. If we drop the top 1% of high-fliers in various sample periods, the corresponding turning points still stay inside the range of *Growth*.

The turning in the U-shaped curve indicates a shift of dominant asymmetric information about assets-in-place to dominant asymmetric information about growth opportunities. This turning reflects the shift from bonds to equity in external funding competition to restrain potential bank rent extraction for firms with very high growth – this explains the positive-sloped section of the U-shaped curve. We can show well-controlled regression results for such a shift. Unlike bank loans, which are insider finance, bonds and contributed equity (total equity minus retained earnings) are external finance that creates competition to bank financing. Thus, the bond-to-external-finance ratio measures the tradeoff between bonds and contributed equity in external finance.

The relationship between this ratio and growth, in a specification similar to regression (1), shows how growth status affects the mix of external finance. As shown in Table 3, for the total period for 1983–1997, the slope estimates for *Growth* and $Growth^2$ are 0.071 and −0.011, respectively. Both estimates are significant (p-values of 0.004 and 0.001). These estimates indicate an inverted U-shape, meaning that, as growth improves, the use of bonds as external finance initially increases relative to equity; after peaking at 3.118, bonds gives way their relative importance in external

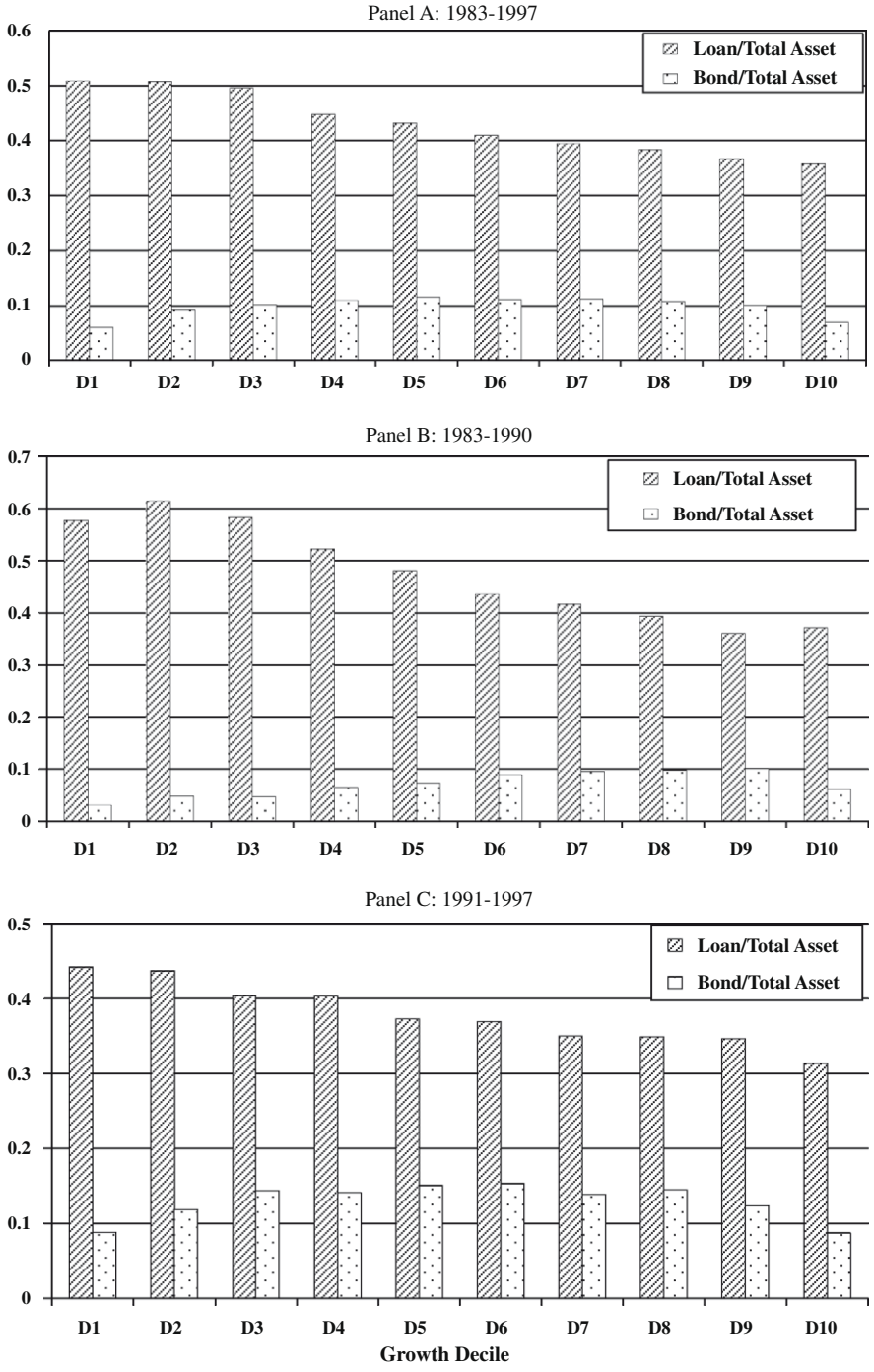

Fig. 2. Loan-to-assets and bond-to-assets ratios across growth deciles. The table reports intra-decile annual averages for 1983–1997 (Panel A), 1983–1990 (Panel B), and 1991–1997 (Panel C), respectively. Each year, we sort, by market-to-book ratios, MtB, (or Growth), Japanese firms into decile groups (from the lowest D1 to the highest D10); then, we average loan-to-assets and bond-to-assets ratios, respectively, within each decile group.

finance to equity for firms of very high growth. The results for the two sub-periods: 1983–1990 and 1991–1997 are similar. Thus, while firms of low-to-medium growth rely on competition from bonds, firms of very high growth turn to new equity to restrain the potential bank rent extraction.

The bond-to-equity shift in external funding competition underlies the U-shaped relationship between the debt-mix choice and growth. Supporting our key hypothesis, our regression results are robust, and appear under both hot and cold market conditions, and in periods of deregulation as well as in periods of post-deregulation.

5.3. Control variables

We focus on the main results for the hypothesized U-shaped relationship. We have noted that firms whose access to the public-debt market was constrained in the 1980s tend to exhibit higher growth do than other firms (Panel B and C of Table 1). Mixing all firms may induce a spurious correlation between growth and bank financing, reflecting regulation rather than borrower preferences. To address this concern, we include a dummy *CON* (indicating whether, or not, a firm faced regulatory restrictions in the 1980s

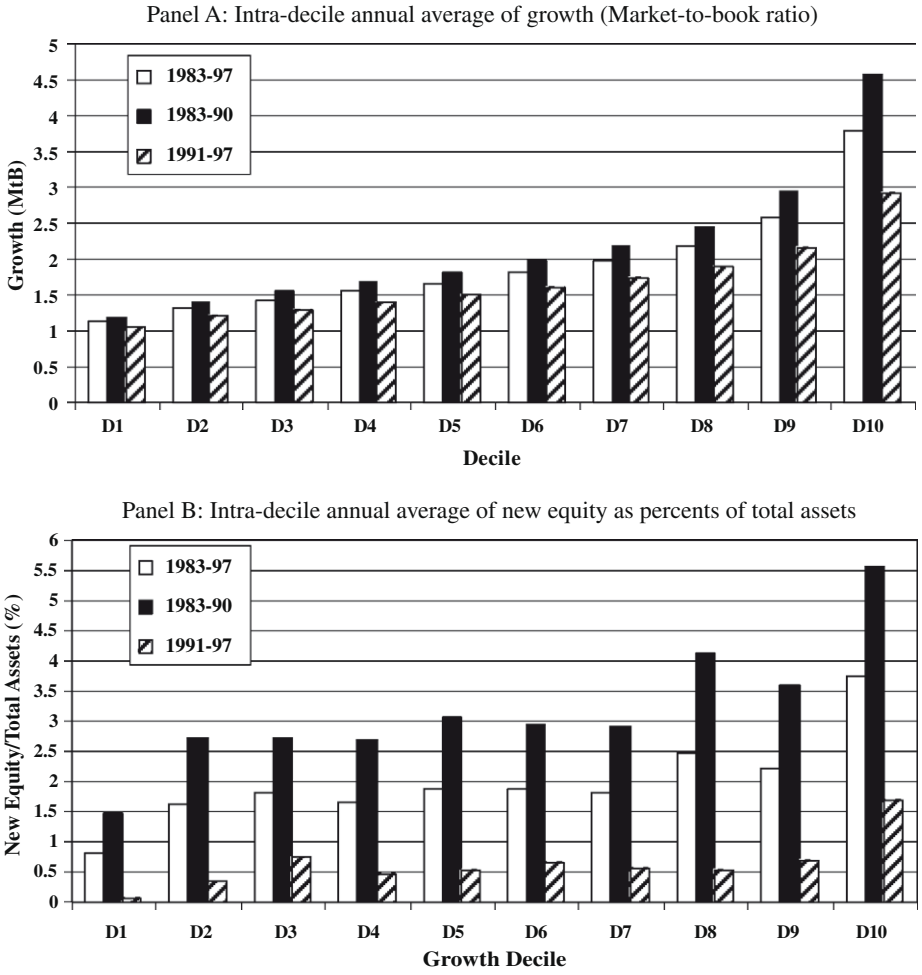

Fig. 3. Growth and new-equity-to-assets ratios across growth deciles. This table reports intra-decile annual averages for growth (Panel A) and new equity (Panel B), for 1983–1997 (total period), 1983–1990, and 1991–1997 (two sub-periods), respectively. Each year, we sort, by market-to-book, MtB, (or Growth), Japanese firms into decile groups (from the lowest D1 to the highest D10); then, we average MtB and new equity as percents of total assets, respectively, within each decile growth group.

when tapping the bond market) as a main effect and as interaction with *Growth* and $Growth^2$.

As shown in Table 2, the interactions of *CON* with *Growth* and $Growth^2$ are significant for the total period, with *p*-values of 0.012 and 0.076, respectively. The results seem to be driven by the first period (when the restrictions applied), with *p*-values of 0.009 and 0.038, respectively. For constrained firms, the linear slope in that period is less negative ($-0.133 + 0.130 = -0.003$, and the slope for $Growth^2$ is less positive ($0.018 - 0.015 = 0.003$). In short, constrained firms tend to flatten the U-shape, as one would expect if the U-shape represents optimal behavior but some firms are restricted in their movements.

In the unregulated second sub-period (1991–1997), the interactions of *CON* with *Growth* and $Growth^2$ become insignificant. This indicates that constrained firms, once freed from restrictions, tend to move freely on the U-shaped curve, much like unconstrained firms. Note that market-to-book ratios of constrained firms are as spread out as we see in Fig. 2 for all firms (available on request). Recall that (as shown in Panel B and C of Table 1), on average, the constrained firms show higher growth prospects than the unconstrained firms, especially in the 1990s. This higher growth, in view of a similarly U-shaped relationship between loan-to-debt ratios and *Growth*, means that more of the once-constrained firms are on the positive-sloping section of the curve, consistent with the findings in Anderson and Makhija (1999), which looks at the 1990 cross-section only. When we look at new equity issues by the constrained firms, their annual averages during 1991–1997 follow similar patterns as for other firms (plots in the style of Panel B of Fig. 3 are available on request). For example, the average annual issues for the lowest- and highest-growth deciles in the case of constrained firms amount to 0.32 and 2.75 percent of *Total Assets*, respectively. Notably, as our central hypotheses imply, an increased reliance on bank loans for high growth firms goes hand in hand with more new share issues.

Our main results in Table 2 also control for firm characteristics other than regulatory status that could have interfered in the relationship between loan-to-debt ratios and *Growth*. The results on the slope estimates for these control variables are largely consistent with the findings in the literature, especially regarding Japanese firms in Hoshi et al. (1993) and Anderson and Makhija (1999).

In summary, the effects of market imperfections can work through firm characteristics other than measured growth prospects. After controlling for these effects, the main results in Table 2 remain consistent with our hypothesis as depicted in Fig. 1. More precisely, firms with improved growth prospects tend to rely on competition from public debt to curb bank rent extraction; but if firms' valuations stem mainly from growth opportunities, the associated asymmetric information hampers the use of public debt; yet

Table 2
Main regression results.

Y = Bank Loan/Debt	Total period: 1983–1997		Subperiod: 1983–1990		Subperiod: 1991–1997	
	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	1.237	2.242	1.238	2.254	0.995	2.116
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Growth	−0.125	−0.142	−0.134	−0.133	−0.223	−0.318
	0.000	*0.000*	*0.000*	*0.000*	*0.001*	*0.000*
Growth^2	0.022	0.020	0.022	0.018	0.049	0.066
	0.000	*0.000*	*0.000*	*0.000*	*0.001*	*0.000*
CON		0.011		−0.021		0.002
		0.859		*0.767*		*0.990*
CON∗Growth		0.121		0.130		0.183
		0.012		*0.009*		*0.173*
CON∗Growth^2		−0.013		−0.015		−0.037
		0.076		*0.038*		*0.208*
Logsize		−0.119		−0.127		−0.109
		0.000		*0.000*		*0.000*
Leverage		0.241		0.334		0.175
		0.000		*0.000*		*0.001*
Cov < 3		0.147		0.127		0.150
		0.000		*0.000*		*0.000*
Fixed asset		−0.071		−0.040		−0.092
		0.012		*0.285*		*0.026*
Volatility		0.001		0.000		0.004
		0.120		*0.344*		*0.013*
Turning point	2.841	3.550	3.045	3.694	2.276	2.409
(Growth decile)	(D9)	(D10)	(D9)	(D9)	(D9)	(D9)
Observations		4218		2109		2109

This table presents coefficient estimates and their corresponding *p*-values of cross-sectional regression of debt-mix choice on corporate growth for Japanese firms. We use a Tobit model in which the dependent variable – restricted within [0, 1] – is loan-to-debt ratio at the end of fiscal year *t*. We pool cross-sectional data across skipping years. The whole sample includes annual data for 1983, 1986, 1990, 1992, 1994, and 1997, which are then equally split: the 1980s (1983, 1986, and 1990) and the 1990s (1992, 1994, and 1997). All explanatory variables are lagged, observed at the end of previous fiscal year $t-1$, and include year dummies. Logsize is the log of total book assets. Leverage is debt divided by total assets. Growth is market-to-book ratio (MtB). Growth^2 is the square of the level. CON is dummy variable, equal one if a firm is a constrained one, and zero otherwise. Cov < 3 is another dummy variable, equal one if coverage ratio is less than three, and zero otherwise. Fixed Asset is net-fixed-assets ratio. Volatility is earnings volatility. See notes in Table 1 for more details. Estimates for year dummies are not reported for conciseness. "Turning point" is the value of Growth where the relationship with loan-to-debt ratio turns from negative to positive. D1 is the lowest Growth decile and D10 is the highest. *p*-Values are in italic below the corresponding estimates.

Table 3
Regression results for the shift from bonds to equity in external funding competition.

Y = Bond/(Bond + Contributed Equity)	Total period: 1983–1997	Subperiod: 1983–1990	Subperiod: 1991–1997
Intercept	−1.710	−1.841	−1.457
	0.000	*0.000*	*0.000*
Growth	0.071	0.057	0.231
	0.004	*0.064*	*0.001*
Growth^2	−0.011	−0.009	−0.053
	0.001	0.021	0.000
CON	−0.146	−0.227	−0.114
	0.020	*0.005*	*0.413*
CON∗Growth	−0.057	−0.017	−0.118
	0.248	*0.772*	*0.382*
CON∗Growth^2	0.005	0.002	0.027
	0.526	0.788	0.374
Logsize	0.150	0.171	0.128
	0.000	*0.000*	*0.000*
Leverage	0.242	0.057	0.375
	0.000	*0.318*	*0.000*
Cov < 3	−0.131	−0.113	−0.125
	0.000	*0.000*	*0.000*
Fixed asset	0.116	0.053	0.163
	0.001	*0.275*	*0.001*
Volatility	−0.001	−0.000	−0.006
	0.075	*0.390*	*0.001*
Turning point	3.118	3.080	2.195
(Growth decile)	(D9)	(D9)	(D9)
Observations	4218	2109	2109

This table presents coefficient estimates and their corresponding *p*-values (in italic) of cross-sectional regression of bond-to-external-finance ratio on corporate growth for Japanese firms. The regression is the same as regression (1) used in Table 2 except that the dependent variable of a Tobit model is bond (or public debt JAF35 + JAF50 + JAF51) divided by external finance, which is equal to the sum of bond and contributed equity (total equity, BAL21 minus, retained equity, BAL20) at the end of fiscal year *t*. See notes in Table 2.

Table 4
Piecewise linear regression results.

Y = Bank Loan/Debt	Panel A: Unconditional sort on growth			Panel B: Conditional sort on growth		
	1983–1997	1983–1990	1991–1997	1983–1997	1983–1990	1991–1997
Intercept	1.893	1.860	1.494	1.971	2.007	1.493
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
LOW	0.386	0.407	0.583	0.264	0.214	0.588
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Growth	0.041	0.046	0.110	0.029	0.023	0.111
	0.002	*0.002*	*0.006*	*0.012*	*0.054*	*0.001*
LOW∗Growth	−0.183	−0.163	−0.313	−0.130	−0.099	−0.318
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
CON	0.308	0.264	0.549	0.161	0.149	0.313
	0.003	*0.047*	*0.009*	*0.030*	*0.194*	*0.056*
CON∗LOW	−0.343	−0.357	−0.474	−0.145	−0.139	−0.322
	0.005	*0.019*	*0.046*	*0.099*	*0.282*	*0.111*
CON∗Growth	−0.019	−0.015	−0.119	0.010	0.008	−0.049
	0.485	*0.631*	*0.122*	*0.664*	*0.777*	*0.464*
CON∗LOW∗Growth	0.150	0.168	0.197	0.088	0.076	0.191
	0.003	*0.002*	*0.068*	*0.015*	*0.059*	*0.071*
Logsize	−0.119	−0.126	−0.108	−0.120	−0.128	−0.108
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Leverage	0.243	0.333	0.177	0.248	0.345	0.176
	0.000	*0.000*	*0.001*	*0.000*	*0.000*	*0.001*
Cov < 3	0.141	0.119	0.149	0.146	0.129	0.147
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Fixed assets	−0.069	−0.038	−0.086	−0.070	−0.038	−0.089
	0.014	*0.312*	*0.036*	*0.014*	*0.312*	*0.031*
Volatility	0.001	0.000	0.004	0.001	0.000	0.004
	0.119	*0.339*	*0.016*	*0.122*	*0.351*	*0.012*

This table reports coefficient estimates and corresponding *p*-values (in italic) of regression using a piecewise linear specification in Growth instead of the non-linear specification of Growth in Table 2. LOW is dummy variable, equal one if a firm has a growth below the top 20 percentile of a sort and zero otherwise. Estimations use either an Unconditional Sort on Growth (Panel A) for the pooled cross sections in each test period or a Conditional Sort on Growth (Panel B) for every cross section in the test period. Otherwise, the regression is the same as in Table 2.

new equity arises to help keep bank behavior in continued check.[3] We also find that regulatory restrictions on bond issuance in the 1980s clearly interact with growth in debt-mix decisions. Interestingly, while constrained high-growth firms look like obvious holdup victims, they continued to use bank loans heavily even after the liberalization of the bond issuance regulations in 1990. Not surprisingly, they raised more equity than did other comparable firms.

5.4. More robustness checks

We address two more robustness issues: a piecewise linear function in *Growth* rather than a quadratic, and an alternative proxy for growth prospects.

5.4.1. The positive-sloped section of the nonlinear relationship

It is possible that the significant quadratic term in the non-linear specification only reflects convexity in a negative-sloped curve. The turning point, as shown in Table 2, turns out to be well within the range of *Growth* in the data. However, to make sure that a significant positive-sloped section of the curve indeed exists, we also ran tests using piecewise linear regressions breaking at the top 20 percentile of market-to-book ratios (MtB or *Growth*). The results in Table 4 are for unconditional and conditional sorts on MtB. An unconditional sort selects the top-20% growers from all pooled data, while a conditional sort selects the top-20% in each cross-section (year) in the sample period. In light of the drastic swings over time in the MtB numbers, the sorting method may affect the results. In both cases, the dummy variable, *LOW*, takes the value of one if a firm does not belong to the top growth league; otherwise *LOW* equals zero.

As shown in Table 4, for the unconditional sort (the left-hand side of the table), the slope estimates for *Growth* are significantly positive, and the slope estimates for *LOW∗Growth* are always significantly negative (*p*-values < 0.006). For example, for the 1991–1997 period, the sum of the two estimates remains significantly negative, −0.203 (=0.110–0.313). This indicates that for the top-20% of firms in terms of growth, the relationship between loan-to-debt ratio and growth is indeed significantly positive. While for the lower tier 80% of firms, the relationship is significantly negative. This is consistent with the main results in Table 2. The conditional sort results in Table 4 (the right-hand side of the table) are qualitatively similar. There is an unambiguously U-shaped relationship between debt-mix choice and growth.

It may be possible that shifts in the regression variables over several years, as firms slowly adapt to deregulation and the post market crash environment of the early 1990s, spuriously cause the U-shaped relationship. To rule out this possibility, we also looked at a single cross section in 1997 (free of any disturbance caused by the Asian financial crisis since the data end in March). The results for the 1997 data are very similar to those for the period for 1991–1997 in both Table 2 and 4 (detailed results are available on request).

5.4.2. Sales growth as an alternative proxy for growth

We have so far used a firm's market-to-book ratio (MtB) to proxy for the firm's growth prospects. Actually, MtB is an amalgam of management's ability to add value, the earnings potential or quality of assets-in-place, the firm's likely future investment opportunities, and reliability (risk). In the literature, it is standard to call this variable "growth", even though MtB is nonlinear in the

[3] Alternatively, multiple banking can also potentially curb bank rent extraction (Houston and James, 1996). However, in every growth decile across various periods (as in Fig. 2 and 3), a typical firm borrows from some 20 different banks every year (not reported in tables but available on request). If multiple banking completely solved the holdup problem, we would not have observed the evidence for the negative-sloping section of Fig. 1 according to the standard interpretation in the literature. Thus, a Japanese firm's access to multiple sources of monitored debt seems to be insufficient to curb bank rent extraction.

Table 5
Measuring growth by past sales growth instead of MtB.

Y = Bank Loan/Debt	Total period: '83–97		Subperiod: '83–90		Subperiod: '91–97	
	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	1.234	2.122	1.236	2.155	0.874	1.802
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
SalesGrowth	−2.593	−1.291	−2.592	−1.150	−2.637	−1.360
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
SalesGrowth^2	9.366	5.173	8.106	4.987	11.847	5.214
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.003*
CON		0.170		0.159		0.190
		0.000		*0.000*		*0.000*
CON∗SalesGrowth		0.190		0.181		−0.062
		0.597		*0.733*		*0.905*
CON∗SalesGrowth^2		−1.419		−2.156		0.538
		0.462		*0.359*		*0.871*
Logsize		−0.117		−0.128		−0.103
		0.000		*0.000*		*0.000*
Leverage		0.271		0.369		0.181
		0.000		*0.000*		*0.000*
Cov < 3		0.135		0.123		0.139
		0.000		*0.000*		*0.000*
Fixed asset		−0.084		−0.047		−0.111
		0.004		*0.223*		*0.008*
Volatility		0.001		0.000		0.003
		0.176		*0.393*		*0.050*

This table reports results of robustness check on the growth proxy using the market-to-book ratio, MtB. We replace MtB by annual sales growth averaged over the past five years, SalesGrowth, in the regressions. Otherwise, the regression is the same as in Table 2. Sales are data item INC1 in the PACAP database for Japan. *p*-Values are in italic below the corresponding estimates.

growth rate, and contains the normalized return on investment (assets) and the risk premium.[4] One may ask the question: to what extent does the variable *Growth* (MtB) really measure growth? In addition, the variable may induce simultaneity bias as it includes a market value.

In Table 5, to proxy for *Growth*, we replace MtB with sales growth (*SalesGrowth*) over the past five years. The regression results are still very similar to those from Table 2. In each sample, there is a significantly negative coefficient for *SalesGrowth* and a significantly positive coefficient for *SalesGrowth* squared. In addition, when using *SalesGrowth* as an instrumental variable in 2SLS estimation using MtB, we get similar results (details available on request). Thus, our main conclusions are not affected by, neither MtB's non-linear transformation of growth, the mixing of growth with other components in MtB, nor a possible simultaneity bias.

5.5. Keiretsu effect

Japanese Keiretsu is a diversified cluster of firms with a main bank as its center (Aoki et al., 1994). With reciprocal equity holdings within the Keiretsu, Berglof and Perotti (1994) argue that the Keiretsu governance and finance structure is able to mitigate problems of both incentive conflicts and information asymmetries. Recent studies, however, have often pointed to a dark side of Japanese Keiretsu and the main-bank system (Weinstein and Yafeh, 1998; Morck et al., 2000; Inoue et al., 2008).

In a theoretical analysis, Wu and Yao (2006) suggest that bank rent extraction facilitates overinvestment when self-interested main banks take a hands-on role in corporate governance and investment, but only when loanable funds become abundant. Dewatripont and Maskin (1995) argue that centralized credit markets like Japan's suffer from the "soft-budget-constraint" problem of persisting with unprofitable projects. Consistent with the overinvestment view, Wu and Xu (2005) show that value information from bank financing for Keiretsu firms is negative in the 1980s, and suggest that Keiretsu banks, with their strong influence, were able to holdup and prod their member firms to overinvest, to generate interest income for the banks to the detriment of the member firms' profitability.

In view of this development in the literature, bank rent extraction at Keiretsu firms may become intricate. With both potentially high benefits and costs of intense ties with banks at Keiretsu firms, one may expect a pronounced U-shape. In effect, there may be a deregulation-like effect as well. Not only did many Keiretsu firms gain access to bond markets, but also the main banks, under government order, had to reduce their shareholdings to five percent or less of each client firm's equity by 1987.

To test for the presence of a Keiretsu effect, we included a Keiretsu membership dummy, K ($K = 1$, if a Keiretsu member, $K = 0$ otherwise).[5] We also included interaction terms with *Growth* and *Growth*^{2}. The results are in Table 6. For the period from 1983 to 1990, when Keiretsu banks held more sway (Column 2), the coefficient for K is positive, the slope estimate for K∗*Growth* is significantly negative and the slope estimate for K∗*Growth*^{2} is marginally significantly positive. This can be seen most clearly, when the public-debt restrictions are also accounted for (Panel B). For non-Keiretsu firms, we still have the usual U-shape. The significant slope for K∗*Growth* tells us that, in the 1980s, Keiretsu firms were more eager to replace bank loans with public debt than were their non-Keiretsu peers.

These findings are partly consistent with the results reported by Hoshi et al. (1993). They find a significantly negative relationship between loan-to-debt ratio and growth for Keiretsu firms, and interpret this as evidence of bank holdup behavior. Our findings, however, provide additional information. The positive coefficient for K∗*Growth*^{2} implies that, with sufficiently high growth pros-

[4] The Gordon growth model predicts that $MtB_t = E_t(ROI_{t+1})/(R_f + RP - g)$, where ROI denotes cash flow over book value of assets, $E_t(\cdot)$ the expectation at t, R_f the risk-free rate, RP the risk premium, and g the (perpetual) growth rate of cash flows.

[5] The big-six horizontal Keiretsu are Mitsui, Mitsubishi, Sumitomo, Fuyo, Sanwa, and Dai-ichi Kangyo groups. The Keiretsu firms in our sample either meet the classification by Nakatani (1984), or are closely affiliated members (with the degree of the 2-, 3-, and 4-star inclination) to the six groups classified in the 1992/1993 edition of *Industrial Groupings in Japan – the Anatomy of the "Keiretsu"*. By implication, then, our non-Keiretsu firms are either unaffiliated firms or weakly related members (a 1-star affinity to the six groups).

Table 6
Results controlled for Keiretsu membership.

Y = Bank Loan/Debt	Panel A: All firms			Panel B: Constrained firms excluded		
	'83–97	'83–90	'91–97	'83–97	'83–90	'91–97
Intercept	2.168	2.189	2.019	2.114	2.134	1.909
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Growth	−0.100	−0.081	−0.258	−0.094	−0.085	−0.223
	0.000	*0.004*	*0.000*	*0.001*	*0.007*	*0.005*
Growth^2	0.015	0.012	0.051	0.015	0.013	0.046
	0.000	*0.001*	*0.001*	*0.000*	*0.001*	*0.006*
K	0.022	0.124	−0.027	0.090	0.183	0.114
	0.665	*0.048*	*0.824*	*0.113*	*0.011*	*0.403*
K*Growth	−0.040	−0.093	−0.039	−0.091	−0.132	−0.169
	0.320	*0.043*	*0.752*	*0.045*	*0.012*	*0.229*
K*Growth^2	0.006	0.012	0.015	0.012	0.016	0.037
	0.392	*0.093*	*0.592*	*0.118*	*0.045*	*0.253*

This table presents coefficient estimates and their corresponding p-values (in italic) of cross-sectional relationship between debt-mix choice and growth, controlling for Keiretsu membership, according to the big-six horizontal Keiretsu: Mitsui, Mitsubishi, Sumitomo, Fuyo, Sanwa, and Dai-ichi Kangyo groups. K is dummy variable, equal to one if a firm is the Keiretsu member and zero otherwise. In Panel A, we introduce K as a main effect, let both the slopes of Growth and Growth^2 depend on K instead of CON as in Table 2 and run Tobit regressions for all firms. In Panel B, we use data excluding constrained firms. Estimates for other explanatory variables and year dummies are not reported for conciseness. See Table 2 for details.

pects, Keiretsu firms again became keen users of relationship banking. In other words, the more pronounced U-shape for Keiretsu firms reflect both higher benefits and higher costs of relationship-based debt, at least for the 1980s. However, our results show that the Keiretsu effect becomes insignificant during the 1990s.

Wu and Xu (2005) also find a significant Keiretsu effect holding only for the 1980s. Specifically, they find that in the earlier years, the valuation reactions to financial decisions like bank financing were significantly different for large Keiretsu versus non-Keiretsu firms, with an adverse Keiretsu effect; but in the 1990s, the difference was no longer clear. Taken together, the Keiretsu effect seems to be history.

6. Conclusion

In the literature, monitored debt (bank financing) brings many benefits to both low- and high-growth firms. The bank holdup theory recognizes bank rent extraction when firm growth prospects improve and it predicts a *negative* relationship between the loan-to-debt ratio and growth. In contrast, the information production literature emphasizes the benefits of monitored debt for firms exhibiting asymmetric information especially with respect to growth opportunities and it predicts a *positive* relationship between the loan-to-debt ratio and growth.

The literature is silent about the seemingly contradictory predictions. As firm growth prospects and reputations improve, the holdup theory suggests that increased competition from public debt helps curb bank holdup behavior, but it has ignored the fact that growth-based firm valuations tend to hamper the use of public debt. On the other hand, the information production literature has ignored the warning presented by the holdup theory that bank rent extraction especially hurts high growth firms.

This paper shows that high growth firms can use new equity as external finance to deter bank rent extraction. We test our hypothesized U-shaped relationship between debt-mix decisions and growth using Japanese data for 1983–1997. We find that the cross-sectional relationship between the loan-to-debt ratio and growth starts significantly *negative* from the bottom end of the growth spectrum. This means that firms tend to diversify away from bank loans to public debt as growth prospects improve, consistent with the holdup theory. However, towards the high end of the growth spectrum, this relationship turns significantly *positive*. In other words, for very high growth firms, bank loans regain dominance in the debt-mix.

We suggest that the shift from bonds to equity in external funding competition, to curb bank holdup behavior, explains the U-shaped relationship. Befitting high growth firms, asymmetric information about growth opportunities does not inhibit, but rather facilitates, new equity issuance, consistent with the generalized Myers–Majluf framework. We confirm that high growth firms raise more new equity than do other firms and use more equity relative to bonds in external finance. We find that the cross-sectional relationship between the bond-to-external-finance ratio (which measures the tradeoff between bonds and contributed equity) and growth is significantly *positive* for firms of low-to-medium growth, but turns significantly *negative* for firms of very high growth. This indicates that because of competition from new equity, bank rent extraction is unlikely to become a major factor offsetting the benefits of bank financing for high growth firms. The findings of this paper reconcile the two opposing predictions offered in the literature.

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