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UEDA Kenichi
University of Tokyo / TCER

ISHIDE Akira
Northwestern University

GOTO Yasuo
RIETI

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UEDA Kenichi (The University of Tokyo and TCER),
ISHIDE Akira (Northwestern University),
GOTO Yasuo (Seijo University and RIETI)

Abstract

We confirm, with a twist, that listing on a stock exchange can mitigate the financial constraints of firms, using Japanese firm-level data over the period 1995-2014, controlling for main bank relationships and majority owner influence. Compared to a similar unlisted firm, a listed firm has a lower marginal product of capital and more new borrowings during recessions. Theoretically, we argue that these are the most important variables to uncover differential financial frictions between listed and unlisted firms. However, on average, listed firms do not borrow more over time, but rather maintain lower leverage to mitigate the borrowing constraints.

Keywords: Listing, Financial constraints, Financial frictions, Marginal product of capital
JEL classification: G32, E22

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I. INTRODUCTION

We confirm that listing to a stock exchange can mitigate financial constraints of a firm, using Japanese firm-level data over 20 years, 1995-2014. Specifically, compared to a similar unlisted firm, a listed firm has a lower marginal product of capital and more new borrowings in recessions. Theoretically, we argue that these are the most important variables to uncover differential financial frictions between listed and unlisted firms. However, the listed firms do not borrow more over time, but rather maintain lower leverage on average to mitigate the borrowing constraints. These findings are stronger for manufacturing only sample, financially struggling firms, and firms without a majority owner in both fixed effect and propensity score matching estimates.

With the availability of more detailed data and the computational powers, the study on unlisted firms have been flourishing recently. A natural question is how the listed and the unlisted firms are different. Our interest in particular is the borrowing constraint. After considering theoretical foundations, we focus our attentions to relatively simple variables based on the balance sheet data, i.e., the marginal product of capital, borrowings, and leverage.

If we can utilize the stock price data, we can estimate financial frictions in a shaper way, e.g., following Claessens, Ueda, and Yafeh (2014). However, using unlisted firms data means that stock price data are not available. Other alternative is to run the so-called cash-flow-sensitivity regressions or its variants. However, we decided not to do so due to known identification problems. The cash-flow-sensitivity analysis is introduced by Fazzari, Hubbard, and Petersen (1988) and since then followed by many studies. They identify financing constraints as the sensitivity of investment to firm cash flows, while controlling for growth opportunities, often using Tobin's *Q*. However, as Gomes (2001) shows, in the presence of financial transaction costs, such regressions face serious identification problems because *Q* reflects not only growth opportunities but also frictions (e.g., external financing constraints). And, again, in our case we do not have stock price data. Moreover, with auto-correlated productivity shocks ("growth opportunities"), current profits contain information about future profitability, so that the sensitivity of investment to current profits may be a legitimate response to expected future profitability, not just reflecting difficulties in financing.

Some researchers find the listing enables firms to mitigate financial constraints. Gilje and Thaillard (2016) shows, based on panel regressions, that listed natural gas firms in the US have higher sensitivity on gas price movements (i.e., growth opportunities) than the unlisted rivals in the same industry. The difference is more pronounced in shale gas investments, which are capital intensive. For British firms, Saunders and Steffen (2011) find that the listed firms enjoy lower bank loan rates based on the propensity score matching estimates. In their European cross-country study, Mortal and Reisel (2013) reports that listed firms have higher investment sensitivity on growth opportunities and such tendencies are higher for countries with more developed stock markets. They find so based on propensity score matching primarily on total assets but, instead of *Q*, they use sales growth as a (presumably nosier) proxy for the growth opportunity.

Others find the listing tightens financial constraints, theoretically possible if agency problems worsen under sparse ownership (e.g., Stein, 1989). For US firms, Asker, Mensa, and Lyungqvist (2015) run the panel regressions and show that US listed firms are more short-termist, i.e., less sensitive to growth opportunities, proxied by sales growth. And, this difference is larger for listed firms whose stock prices are more sensitive to their earnings reports. Sheen (2016) reports, based on panel regressions, that the US listing firms in chemical industries have lower sensitivity of capacity investment on demand shocks, which are identified by joint movements in prices and quantities of specific products.

Mixed evidences sometimes are reported by the same authors. For British firms, Brav (2009) shows in his panel regressions that listed firms have lower leverage, but with lower fluctuations in capital structure likely because of lower equity issuance costs. In their European cross country study, Goyal, Nova, and Zanetti (2011) also reports, based on panel regressions, that listed firms have lower leverage, but with more active management on leverage (presumably by lower financing costs). They also find that this difference between the listed and the unlisted firms are more pronounced in countries with stronger creditor rights. For Japanese firms, Orihara (2014) presents univariate pictures that shows the listed firms have lower investments on average but with lower fluctuations in investment over business cycles. Orihara and Isobe (2014), based on panel regressions, report that the listed firms have lower leverage, though with minimal controls.

Related literature studies IPOs. Above-mentioned Asker, Mensa, and Lyungqvist (2015) report no differences between recently listed companies and always listed companies during their sample years except for abnormal movements in a few years before and after the IPOs. For Japanese firms, Miyakawa and Takizawa (2013) and Hosono and Takizawa (2014) focus on IPOs and confirm that abnormal movements in profits and other variables in a few years before and after the IPOs. Also related is firm exits from listing. Bharath and Dittmar (2010) show that US firms actively decide to go private based on costs and benefits being publicly traded. Note, however, that active exits are anecdotally rare among Japanese firms, which are our samles.

II. DATA

The firm-level balance sheet and income statement data are commercially provided by the Tokyo Shoko Research (TSR).[1] Because of frequent entries and exits of small firms, we use the data from 1995 but restrict our attention to the firms with at least 10 years of data points to the latest 2014 observations. In total, our data contains over 200,000 firm-year observations.

A particular interest is the return on assets as the proxy for the marginal product of capital, which is known to be the same as the average product of capital in the case of typical production functions exhibiting constant returns to scale in factor inputs. To address measurement error issues (e.g., intangible asset values), we also use the return on fixed capital as another proxy for the marginal product of capital. As for the leverage, we used the debt to asset ratio. The new borrowings are measured by the annual change in the debt to asset ratio.

As for a control, we use total assets as a proxy for a firm size. We alternatively use the number of workers as another measure of the firm size but we omit reporting the results due to almost similar outcomes. Another control is industry. The industry classification of TSR is the same as Japan's standard industry classifications, which lists 63 sectors for the two-digit level and 381 sectors for the three-digit level in 2014. The sector numbers and definitions

[1] As a part of a RIETI project, the TSR data is provided by RIETI, who has an institutional contract with the TSR. In particular, we use the company information (i.e., firm characteristics) and the financial data (i.e., balance sheet and income statement information).

varied somewhat over time, and we try to represent sectors in our samples by the 2014 definition as much as possible. We also control for firm age since incorporation.

Moreover, we control for main banks. Main banks are likely influence availability of credit for client firms, if relationship banking is important as having noted in Japan (e.g., Okazaki and Okuno-Fujiwara, 1999) TSR data contains the information of names of banks whose loans firms mainly rely on. Using this, we identify the main bank-to-firm relationship in borrowing.

Furthermore, in some cases, we drop firms with a majority shareholder. The *Kikatsu* database is based on firm surveys conducted by the Ministry of Economy, Trade and Industry (METI).[2] The database contains useful auxiliary information on firm ownership. We match this database to TSR to use the ownership information. In particular, in the estimates that use this information, we exclude firms that are owned by one entity with more than 50 percent shares.

Listing status of firms barely changes over time. Since IPOs are known to produce transitional abnormal movements in our variables of interests (see the literature review above), we rather exclude these firms that changed listing status, which in any case represent only a tiny portion. Our sample therefore consists of firms consistently listed or unlisted. Moreover, to remove any effects from outliers, we drop samples showing larger or smaller values than three standard deviations from the averages in terms of the return on asset (ROA) and the return on fixed capital (ROK).[3] Summary descriptions of our sample as well as the correlations are provided in Table 1.

[2] The Kigyo Katsudo Kihon Chosa (*Kikatsu*) can be literally translated as the Basic Survey of Japanese Business Structure and Activities. While the aggregate data is available to public, we use the firm-level data. Academic researchers have restrictive access to the firm-level database by a request to the METI.

[3] It is well known that almost all the unlisting decisions by Japanese firms are based on passive decisions due to financial distresses (not active decisions like US firms). We do not investigate why this is the case, but we address with the exit-related issues by eliminating outliers of very low ROA and ROK.

III. BENCHMARK RESULTS

A. Financial Frictions

As long as diminishing marginal returns prevails, any financial constraints limiting investments raise the marginal product of capital more than its unconstrained level. This is our first prediction regarding the financial frictions. That is, the listing firms should be less financially constrained and therefore their marginal product of capital is lower than the unlisted firms.

Following Klenow and Rodriguez-Clare (2008) and Abiad, Ueda, and Oomes (2008), we use the marginal product of capital (*MPK*) as the measure of distortion in credit allocation. From a point of view of the standard production theory, each firm has an optimal, industry-specific operating size. We thus write the profit function for a firm at time *t* as follows:

$$\pi(K_t, L_t) = f(K_t, L_t) - wL_t - \phi(I_t) - RK_t, \tag{1}$$

with a standard law of motion for capital:

$$K_t = (1-\delta)K_{t-1} + I_t, \tag{2}$$

where *K* denotes capital, *L* denotes labor, *w* is the real market wage, *I* is investment, and *R* is the gross interest rate. The function *f* is a constant-returns-to-scale (CRS) production function with partial derivatives $f_1>0$, $f_2>0$, $f_{11}<0$, $f_{22}<0$, and $f_{12}>0$. The function $\phi(I_t)$ measures the adjustment cost of investment, and satisfies $\phi' > 0$ and $\phi'' > 0$.

Profit maximization gives the unique steady state optimal policy *(K*, I*, L*)* by

$$f_1(K^*, L^*) - \phi'(I^*) = R, \tag{3}$$

$$f_2(K^*, L^*) = w, \quad \text{and} \tag{4}$$

$$\delta K^* = I^*. \tag{5}$$

Also, the transition path of *(K,L)* to the steady state is uniquely determined in this simple setup.

However, if credit is constrained and the investment amount *I* is limited by $\hat{I}$, then firms maximize their profit function (1) subject to (2) and the additional constraint $I = \hat{I}$. Letting

$\lambda>0$ denote the Lagrange multiplier associated with this constraint, the capital market condition (3) can then be rewritten as

$$f_1(K^{**}, L^{**}) - \phi'(\hat{I}) = R + \lambda. \tag{6}$$

In this case, obviously, the marginal product of capital *(MPK)* is higher than the case without credit constraint (3).

More generally, we can write the infinite-period maximization problem faced by a firm as a going concern. In this case, the marginal product of capital can be represented by an equation similar to (6), in which λ can be considered as the cost of external financing (see e.g., Gomez (2001) and Claessens, Ueda, and Yafeh (2014)). Though these more general models, due mostly to productivity shocks, do not necessarily show that simple marginal products of capital are perfectly equated among firms, we do have a large sample of firms to average out those noises around the mean marginal product of capital among similar firms.

B. Marginal Product of Capital

To test our prediction that the listing firms exhibits lower *MPK* than the unlisted firms, we first run the panel regressions with fixed effects. We use industry-year fixed effects to control for (3 digit level) industry specific business cycles and also main bank-year fixed effects to control for each bank's healthiness annually. Note that sample period, 1995-2014, contains Japanese banking crisis period, late 90s and early 2000s, and global financial crisis period starting 2008. If relationship banking is important, it would be better to control main banks or regions as a proxy (e.g., Gan, 2007, in the context of bank lending) unlike Orihara and Isobe (2004).

The dependent variable, *MPK*, is proxied by the return on asset (*ROA*) or the return on fixed capital (*ROK*). The important regressor is the binary variable *Listing*, taking value one if listed and zero otherwise. The control variable are *Size*, proxied by total asset or by number of workers, *Age*, years since incorporation, and lagged *Leverage* (i.e., debt to asset ratio):

$$MPK_{i,j,b,t} = \alpha^M_{j,t} + \alpha^M_{b,t} + \beta^M Listing_{i,j,b,t} + \gamma^M_1 Size_{i,j,b,t} + \gamma^M_2 Age_{i,j,b,t} + \gamma^M_3 Leverage_{i,j,b,t-1} + \varepsilon^M_{i,j,b,t}. \tag{7}$$

Table 2a shows the results for non-financial firms as well as manufacturing only samples. The robust standard errors are reported with clustering at industry level. In both samples, the coefficient on listing is significantly negative. This validates our prediction that the listed firms face less financial frictions.

C. New Borrowings

Compared to the marginal product of capital, new borrowings are not so clear if they should be always larger for less financially constrained firms. However, in recessions, more firms face lower revenues and naturally need more external finance than normal times. Our prediction is thus the new borrowings are larger by listed firms in recessions than the unlisted, while the effect is unclear in booms or on average.

Table 2b shows the estimation results based on fixed effects, similar to the one employed for analyzing the effects on the marginal product of capital. Namely, the control variables are *Size, Age,* and lagged *ROA.* As a proxy for the new borrowing, we use the change in the debt to asset ratio in percent:

$$NewBorrow_{i,j,b,t} = \alpha^B_{j,t} + \alpha^B_{b,t} + \beta^B Listing_{i,j,b,t} + \gamma^B_1 Size_{i,j,b,t} + \gamma^B_2 Age_{i,j,b,t} + \gamma^B_3 L.ROA_{i,j,b,t-1} + \varepsilon^B_{i,j,b,t}. \quad (8)$$

The results for both non-financial firms and manufacturing only samples are significantly positive but rather small effects (i.e., roughly around 0.005), consistent with our mixed predictions for the average effects. We come back to our predictions during recession periods, later.

D. Leverage

Regarding the leverage, we have two opposite predictions. On the one hand, if listed firms can borrow more literally, they should have higher leverage on average than the unlisted firms. On the other hand, in case that the borrowing constraint is equally applicable for both listed and unlisted firms, it is the listed firms that can escape from the borrowing constraint by issuing equity. In this case, the listed firms should have lower leverage on average than the unlisted firms. Regressions similar to (8) are conducted:

$$Leverage_{i,j,b,t} = \alpha^L_{j,t} + \alpha^L_{b,t} + \beta^L Listing_{i,j,b,t} + \gamma^L_1 Size_{i,j,b,t} + \gamma^L_2 Age_{i,j,b,t} + \gamma^L_3 L.ROA_{i,j,b,t-1} + \varepsilon^L_{i,j,b,t}.$$

(9)

Table 2b shows the significantly negative coefficients on *Listing* for non-financial firms as well as manufacturing firms. The listed firms maintain lower leverage, not to hit the prohibitive borrowing constraints, presumably by the availability of equity financing.

E. Propensity Score Matching

A caution may be needed for applying fixed effect estimations in our sample. Apparently, the listed firms are skewed towards larger ones while the unlisted are towards smaller ones. This potentially gives a bias to fixed effect regressions as the error terms of listed and unlisted might not be randomly distributed even with *Listing* binary variable and other control variables are used in the regression.

Here, to compare the effect of listing, we also employ a propensity score matching estimate. In this procedure, we first predict the probability of firms to be listed. Second, we match the listed and the unlisted firms, one to one, for having the almost equal probability of listing, depending on *Size* (total asset), *Age*, *Industry* (2 digit), and *Region* (48 prefectures), each year. We confirm that covariates are well balanced in match samples (report omitted). Third, we compare the difference in the variables of interest (i.e., *ROA, ROK, New Borrowings,* and *Leverage*) between two matched samples to determine the effects of listing.

A caveat applies to the propensity score matching estimates, too. Although *Listing* status never changes in our sample, to be consistent with propensity score matching method, the variables to compute propensity scores need to be pre-determined before listing status. *Age* and *Industry* can be regarded as pre-determined or almost exogenous to firm manager's decision on *Listing*. *Size* (total asset) is endogenous to *Listing* but it is a slow moving variable, unlikely affect *Listing* decision in each year. An exception is a sudden drop of *Size*, leading to bankruptcy and unlisting. However, these firms are already excluded from our refined sample. Still, due to this caveat regarding potential endogeneity, we would like to show our results by propensity score matching with some reservations.

Table 3 columns 1 and 2 show the results for *ROA*, *ROK*, *New Borrowing,* and *Leverage*. All confirm the significance and signs of the benchmark fixed effect estimation results, except for an insignificant result on the non-financial firms' *ROA*.

However, the treated and the controlled are switched in a sense at 50 percent probability of being listed. For firms higher than 50 percent score, they should be listed according to the statistical model. The difference between the listed and the unlisted can be interpreted as the opportunity loss for the unlisted not being listed, though they should be. On the other hand, for firms lower than 50 percent score, they should not be listed according to the statistical model. The difference between the listed and the unlisted in this case can be interpreted as the extra benefits of being listed though they should not be.

We thus investigate whether the effects are similar between those firms with more than 50 percent propensity scores and those with less than that threshold. Table 3 columns 3-6 show the results. The results are almost the same as the benchmark. A slight difference is that the effects on *ROA* are weaker: opposite sign for non-financial firms having higher than 50 percent propensity score; insignificant for both non-financial firms and manufacturing firms having less than 50 percent propensity score. However, the effects on *ROK* still firmly exist. Also, for manufacturing firms, listing effects on *New Borrowings* are no longer significant for those with higher than 50 percent propensity score, but this result is in line with our theoretical predictions.

In the next section of robustness check, we also keep reporting the results of propensity score matching estimates based on all sample firms, along with the fixed effect estimates.

IV. ROBUSTNESS CHECK

A. Excluding Cash Rich Firms

Quite a few Japanese firms are known to hold cash in their balance sheets, and do not need to borrow money. Our results may be marred with those cash rich firms. Here, we focus sample whose current ratio is lower than three. As the current ratio is the current assets divided by the current liabilities, it captures the liquidity of a firm to cover the short-term liability due within a year. A firm with current ratio lower than three does not mean financially distressed but it is not likely called as cash rich.

The estimation results by fixed effects and propensity score matching are all almost the same as the benchmark results (report omitted).

B. Booms and Recessions

Our prediction on new borrowing is indeterminate on average and empirically estimated as insignificant as explained above. However, in recessions, our prediction on new borrowing is larger for less financially constrained firms in recessions. Here, we divide sample periods into boom and recession periods according to Japanese government official business cycle dates, which are available up to December 2012 as of February 2017.[4]

Table 4a shows the recession period estimates for *MPK* and Table 4b for *New Borrowings* and *Leverage*. For *New Borrowings*, as predicted, the coefficient estimate for *Listing* now becomes significantly positive for both non-financial firms and manufacturing only samples. The benchmark estimates hold for *MPK* and *Leverage* though the result for *ROK* for manufacturing only sample becomes weaker at 10 percent level of significance. Propensity score matching estimates also confirm those results, though the result for *ROA* for non-financial firms becomes insignificant (Table 6, columns 1 and 2).

Table 4c shows the boom period estimates for *MPK* and Table 4d for *New Borrowings* and *Leverage*. There are almost no changes from the benchmark results for *Leverage*, but the results for *MPK* becomes weaker: insignificant effect on *ROA* for manufacturing firms and, as for *ROK*, insignificant for non-financial firms and only 10 percent significance for manufacturing firms. Even significant, coefficients on *MPK* show smaller effects. Moreover, the effects for *New Borrowings* are significant but much smaller, close to zero, than those for all periods. These results imply that listed firms' advantages of not facing financial constraints weaken during the boom period.

Propensity score matching estimates again confirms the weakened results in booms even more clearly. In the boom periods, listing effects on *ROA* and *ROK* are no longer significant for both non-financial and manufacturing samples. The effects on *New Borrowing* is also no longer significant for manufacturing firms (Table 5, columns 3 and 4).

[4] These dates are reported in the Japanese Government's Cabinet Office website: http://www.esri.cao.go.jp/jp/stat/di/150724hiduke.html

C. Firms without a Majority Owner

Firms with strong parent entities may not become liquidity constrained as parent entities would be willing to provide credits in distressed periods. Using Kikatsu database, which contains the parent companies' holding shares, we eliminate sample firms that have a majority owner, i.e., one company who owns more than 50 percent of shares of a sample firm. Though the remaining samples still contain firms with minority-stake parents, the final samples should be less reliant on parent entities.

A caveat is that the matching TSR data with Kikatsu database shrink the sample number to be about a fifth, about 38,000. Moreover, it shrinks to about 32,000 after eliminating firms with a majority owner, and to a bit more than 20,000 in regressions due to availability of variables. See Appendix Table 1 for descriptive statistics and correlation tables. Note that merging two databases is done by the firm name, year, and postal code.

Table 5 shows results based on the panel regressions. Because of smaller sample numbers, we estimate only for non-financial firms. The result is about the same as the benchmark ones though without significant effects for *ROA*. Estimates based on the propensity score matching also provides almost the same results as the benchmark, except for an insignificant effect on *ROA* (Table 6 column 5).

V. CONCLUSION

The estimation results are consistent with our predictions that the listed firms face less financial constraints, but with a twist. The listed firms have lower marginal products of capital, while borrows more in recessions. However, they maintain such characteristics by keeping leverage low, presumably by equity finance. This result is not consistent with a simple view that listed firms can borrow easily and cheaply—i.e., if so, they should have higher leverage, which is not the case.

These results are clearer for manufacturing firms, and more importantly during recessions. On the other hand, in boom periods, listed firms do not seem to enjoy clear advantages in financial constrains relative to unlisted ones.

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Table 1a. Descriptive Statistics after Eliminating Outliers (3 std. dev. ROA and ROK)

	Obs. Number	Mean	Std. Dev.	Min	Max
Listing (dummy)	198,599	0.067	0.250	0.000	1.000
ROA	198,840	4.036	4.588	-14.750	22.910
ROK	198,840	19.334	56.151	-1261.838	1354.994
D/A	198,840	0.658	0.230	0.000	1.000
Age	198,814	40.165	17.756	1.000	132.000
Total Asset	198,840	2.09E+10	2.24E+11	1610000	1.51E+13
Number of Workers	198,840	224.880	1256.392	2.000	71567.000

Table 1b. Correlation Table after Eliminating Outliers (3 std. dev. ROA and ROK)

	Listing	ROA	ROK	D/A	Age	Total Asset	Workers
Listing (dummy)	1.000						
ROA	0.033	1.000					
ROK	-0.038	0.418	1.000				
D/A	-0.161	-0.133	-0.021	1.000			
Age	0.289	-0.089	-0.156	-0.141	1.000		
Total Asset	0.249	0.007	-0.013	0.001	0.099	1.000	
Number of Workers	0.315	0.033	-0.018	-0.034	0.146	0.751	1.000

Table 2a. Benchmark Panel Regressions for MPK

The dependent variable is MPK, proxied by ROA or ROK. Listing is a binary variable, taking the value of one if a firm is listed. L.Size is the logarithm of the lagged total assets. Age is the years since incorporation. L.D/A is the lagged debt to asset ratio. Industry-year and main bank-year fixed effects are included but not reported. The robust standard errors are reported in the parenthesis corrected for clustering at the industry level: * denotes significant at 10%; ** at 5%; and *** at 1%.

	ROA		ROK	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Listing	-0.393***	-0.490**	-3.465***	-2.332***
	(0.116)	(0.190)	(1.327)	(0.866)
L.Size	0.379***	0.428***	0.392	0.461*
	(-0.033)	(0.041)	(0.460)	(0.274)
Age	-0.042***	-0.0396***	-0.595***	-0.219***
	(-0.002)	(0.003)	(0.052)	(0.022)
L.D/A	-1.628***	-1.303***	-3.362**	-4.732***
	(-0.204)	(0.270)	(1.598)	(1.295)
Observations	153,278	44,930	157,004	45,826
R-squared	0.167	0.194	0.108	0.172

Table 2b. Benchmark Panel Regressions for Borowings and Leverage

The dependent variable is New Borrowings (the change in the debt to asset ratio in %) or Leverage (the debt to asset ratio). Listing is a binary variable, taking the value of one if a firm is listed. L.Size is the logarithm of the lagged total assets. Age is the years since incorporation. L.ROA is the lagged return on assets. Industry-year and main bank-year fixed effects are included but not reported. The robust standard errors are reported in the parenthesis corrected for clustering at the industry level: * denotes significant at 10%; ** at 5%; and *** at 1%.

	New Borrowings		Leverage	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Listing	0.687***	0.375***	-0.139***	-0.139***
	(0.062)	(0.081)	(0.012)	(0.013)
L.Size	-0.144***	-0.016	0.014***	0.002
	(0.028)	(0.021)	(0.002)	(0.003)
Age	0.003**	-0.000	-0.002***	-0.001***
	(0.001)	(0.002)	(0.000)	(0.000)
L.ROA	-0.155***	-0.202***	-0.009***	-0.009***
	(0.008)	(0.008)	(0.001)	(0.001)
Observations	153,278	44,930	153,278	44,930
R-squared	0.090	0.153	0.234	0.251

Table 3. Propensity Score Matching Estimates

Propensity scores for the listing probability are used to match the treated (i.e., the listed) to the controlled (i.e., the unlisted), based on one-to-one nearest neighbor matching restricting to the common support. Size (the logarithm of the total assets), Age (the years since incorporation), and Industry (2 digit level) are used to compute the propensity scores. Difference between the treated from the controlled in MPK (ROA and ROK), New Borrowings (the change in debt to asset ratio in %) and Leverage (the debt to asset ratio) are reported. The standard errors are reported in the parenthesis: * denotes significant at 10%; ** at 5%; and *** at 1%.

	All Sample		Propensity Score >= 50%		Propensity Score < 50%	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)
Differences in						
ROA	0.007	-0.411***	0.299**	-0.586**	0.029	-0.155
	(0.081)	(0.146)	(0.145)	(0.271)	(0.095)	(0.156)
ROK	-5.998***	-2.286***	-9.924**	-3.006***	-4.099***	-2.147***
	(1.358)	(0.558)	(3.883)	(1.433)	(0.737)	(0.623)
New Borrowings	0.400***	0.409**	0.570***	0.363	0.268**	0.411**
	(0.090)	(0.160)	(0.180)	(0.290)	(0.112)	(0.174)
Leverage	-0.149***	-0.140***	-0.133***	-0.097***	-0.143***	-0.162***
	(0.004)	(0.008)	(0.008)	(0.014)	(0.005)	(0.008)
Obs. Untreated (on support)	169,562	49,189	2,363	1,153	167,037	47,904
Obs. Treated (on support)	8,927	2,951	3,113	1,174	5,823	1,787
Obs. Untreated (off support)	0	0	0	0	0	0
Obs. Treated (off support)	6,118	5,187	5,476	4,521	489	648

Table 4a. Recession Periods: Panel Regressions for MPK

The dependent variable is MPK, proxied by ROA or ROK. Listing is a binary variable, taking the value of one if a firm is listed. L.Size is the logarithm of the lagged total assets. Age is the years since incorporation. L.D/A is the lagged debt to asset ratio. Industry-year and main bank-year fixed effects are included but not reported. The robust standard errors are reported in the parenthesis corrected for clustering at the industry level: * denotes significant at 10%; ** at 5%; and *** at 1%.

	ROA		ROK	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Listing	-0.858***	-1.222***	-7.269***	-3.123*
	(0.216)	(0.370)	(2.062)	(1.720)
L.Size	0.413***	0.418***	1.585**	0.193
	(0.055)	(0.113)	(0.648)	(0.672)
Age	-0.040***	-0.032***	-0.513***	-0.245***
	(0.004)	(0.007)	(0.065)	(0.055)
L.D/A	-2.505***	-2.029***	-2.459	-5.095*
	(0.323)	(0.665)	(3.166)	(3.068)
Observations	8,607	2,546	8,773	2,591
R-squared	0.229	0.254	0.170	0.237

Table 4b. Recessions Periods: Panel Regressions for Borowings and Leverage

The dependent variable is New Borrowings (the change in the debt to asset ratio in %) or Leverage (the debt to asset ratio). Listing is a binary variable, taking the value of one if a firm is listed. L.Size is the logarithm of the lagged total assets. Age is the years since incorporation. L.ROA is the lagged return on assets. Industry-year and main bank-year fixed effects are included but not reported. The robust standard errors are reported in the parenthesis corrected for clustering at the industry level: * denotes significant at 10%; ** at 5%; and *** at 1%.

	New Borrowings		Leverage	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Listing	1.310***	1.180***	-0.154***	-0.150***
	(0.262)	(0.406)	(0.013)	(0.017)
L.Size	-0.147**	0.100	0.017***	0.003
	(0.000)	(0.132)	(0.002)	(0.004)
Age	0.004	-0.002	-0.001***	-0.000*
	(0.005)	(0.008)	(0.000)	(0.000)
L.ROA	-0.214***	-0.301***	-0.012***	-0.013***
	(0.002)	(0.122)	(0.000)	(0.001)
Observations	8,607	2,546	8,607	2,546
R-squared	0.169	0.265	0.324	0.368

Table 4c. Boom Periods: Panel Regressions for MPK

The dependent variable is MPK, proxied by ROA or ROK. Listing is a binary variable, taking the value of one if a firm is listed. L.Size is the logarithm of the lagged total assets. Age is the years since incorporation. L.D/A is the lagged debt to asset ratio. Industry-year and main bank-year fixed effects are included but not reported. The robust standard errors are reported in the parenthesis corrected for clustering at the industry level: * denotes significant at 10%; ** at 5%; and *** at 1%.

	ROA		ROK	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Listing	-0.279**	-0.346	-1.261	-1.736*
	(0.139)	(0.229)	(1.692)	(0.888)
L.Size	0.385***	0.461***	0.026	0.252
	(0.036)	(0.053)	(0.511)	(0.248)
Age	-0.045***	-0.041***	-0.644***	-0.187***
	(0.003)	(0.004)	(0.058)	(0.021)
L.D/A	-1.524***	-1.205***	-3.105*	-5.034***
	(0.228)	(0.293)	(1.813)	(1.512)
Observations	66,870	19,193	68,506	19,529
R-squared	0.183	0.213	0.114	0.200

Table 4d. Boom Periods: Panel Regressions for Borowings and Leverage

The dependent variable is New Borrowings (the change in the debt to asset ratio in %) or Leverage (the debt to asset ratio). Listing is a binary variable, taking the value of one if a firm is listed. L.Size is the logarithm of the lagged total assets. Age is the years since incorporation. L.ROA is the lagged return on assets. Industry-year and main bank-year fixed effects are included but not reported. The robust standard errors are reported in the parenthesis corrected for clustering at the industry level: * denotes significant at 10%; ** at 5%; and *** at 1%.

	New Borrowings		Debt to Asset Ratio	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Listing	0.579***	0.295**	-0.146***	-0.152***
	(0.101)	(0.138)	(0.014)	(0.014)
L.Size	-0.163***	-0.101**	0.013***	0.001
	(0.031)	(0.043)	(0.002)	(0.004)
Age	0.003**	0.002	-0.002***	-0.001***
	(0.002)	(0.002)	(0.000)	(0.000)
L.ROA	-0.140***	-0.167***	-0.008***	-0.007***
	(0.010)	(0.011)	(0.001)	(0.001)
Observations	66,870	19,193	66,870	19,193
R-squared	0.096	0.158	0.232	0.250

Table 5. Excluding Firms with Majority Owners: Panel Regressions

The dependent variables are MPK, proxied by ROA or ROK; New Borrowings (the change in debt to asset ratio in %) and leverage (the debt to asset ratio). Listing is a binary variable, taking the value of one if a firm is listed. L.Size is the logarithm of the lagged total assets. Age is the years since incorporation. L.D/A is the lagged debt to asset ratio. L.ROA is the lagged return on assets. Industry-year and main bank-year fixed effects are included but not reported. The robust standard errors are reported in the parenthesis corrected for clustering at the industry level: * denotes significant at 10%; ** at 5%; and *** at 1%.

	ROA	ROK	New Borrowings	Leverage
	Nonfinancial	Nonfinancial	Nonfinancial	Nonfinancial
	(1)	(2)	(3)	(4)
Listing	-0.270	-2.232***	0.464***	-0.141***
	(0.157)	(0.410)	(0.101)	(0.010)
L.Size	0.258***	0.345***	-0.078***	-0.006
	(0.046)	(0.134)	(0.029)	(0.003)
Age	-0.027***	-0.062***	-0.003	-0.000
	(0.003)	(0.010)	(0.002)	(0.000)
L.D/A	-1.955***	-5.090***	-	-
	(0.228)	(0.562)	-	-
L.ROA	-	-	-0.212***	-0.013***
	-	-	(0.012)	(0.000)
Observations	22,154	22,154	22,154	22,154
R-squared	0.304	0.308	0.237	0.365

Table 6. Propensity Score Matching Estimates

Propensity scores for the listing probability are used to match the treated (i.e., the listed) to the controlled (i.e., the unlisted), based on one-to-one nearest neighbor matching restricting to the common support. Size (the logarithm of the total assets), Age (the years since incorporation), and Industry (2 digit level) are used to compute the propensity scores. Difference between the treated from the controlled in MPK (ROA and ROK), New Borrowings (the change in debt to asset ratio) and Leverage (the debt to asset ratio) are reported. The standard errors are reported in the parenthesis: * denotes significant at 10%; ** at 5%; and *** at 1%.

	Recession Periods		Boom Periods		Without Majority Owners
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing	Nonfinancial
	(1)	(2)	(3)	(4)	(5)
Differences in					
ROA	0.127	-0.456*	0.283***	-0.158	0.094
	(0.158)	(0.275)	(0.104)	(0.186)	(0.144)
ROK	-2.675***	-3.193**	-6.554***	-1.779**	-1.522**
	(0.775)	(1.288)	(1.245)	(0.768)	(0.604)
New Borrowings	0.629***	0.671***	0.364***	0.111	0.564***
	(0.178)	(0.187)	(0.117)	(2.092)	(0.153)
Leverage	-0.158***	-0.128***	-0.155***	-0.138***	-0.147***
	(0.008)	(0.014)	(0.005)	(0.010)	(0.009)
Obs. Untreated (on support)	48,187	14,023	113,118	33,060	20,365
Obs. Treated (on support)	2,338	780	4,956	1,572	1,543
Obs. Untreated (off support)	0	0	0	0	0
Obs. Treated (off support)	2,076	1,657	3,689	3,048	2,642

Appendix

Table A1a. Descriptive Statistics after Merging with Kikatsu Data

	Obs. Number	Mean	Std. Dev.	Min	Max
Listing (dummy)	37,978	0.128	0.334	0.000	1.000
ROA	38,075	4.207	3.657	-8.857	17.563
ROK	38,075	14.529	53.965	-126.204	5720.020
D/A	38,075	0.660	0.217	0.018	1.000
Age	38,075	47.971	16.226	1.000	124.000
Total Asset	38,075	2.39E+10	2.73E+11	8.37E+07	1.51E+13
Number of Workers	38,075	294.310	901.167	5.000	39061.000

Table A1b. Descriptive Statistics after Eliminating Firms with a Majority Owner

	Obs. Number	Mean	Std. Dev.	Min	Max
Listing (dummy)	32,276	0.146	0.353	0.000	1.000
ROA	32,372	4.126	3.561	-8.857	17.563
ROK	32,372	12.231	16.374	-126.204	465.274
D/A	32,372	0.655	0.218	0.018	1.000
Age	32,372	49.394	15.655	1.000	124.000
Total Asset	32,372	2.60E+10	2.95E+11	8.37E+07	1.51E+13
Number of Workers	32,372	302.294	964.022	5.000	39061.000

Table A1c. Correlation Table after Merging with Kikatsu Data

	Listing	ROA	ROK	D/A	Age	Total Asset	Workers
Listing (dummy)	1.000						
ROA	0.029	1.000					
ROK	-0.027	0.223	1.000				
D/A	-0.264	-0.194	-0.010	1.000			
Age	0.138	-0.007	-0.008	0.008	1.000		
Total Asset	0.205	-0.098	-0.087	-0.136	0.053	1.000	
Number of Workers	0.282	0.030	-0.013	-0.046	0.851	0.119	1.000

Table A1d. Correlation Table after Eliminating Firms with a Majority Owner

	Listing	ROA	ROK	D/A	Age	Total Asset	Workers
Listing (dummy)	1.000						
ROA	0.045	1.000					
ROK	-0.036	0.637	1.000				
D/A	-0.277	-0.186	-0.094	1.000			
Age	0.138	-0.005	-0.020	0.009	1.000		
Total Asset	0.193	-0.101	-0.088	-0.110	0.054	1.000	
Number of Workers	0.285	0.033	-0.025	-0.047	0.860	0.124	1.000