Listing and Financial Constraints

By

Kenichi Ueda, Akira Ishide, Yasuo Goto

April 2018

CENTER FOR RESEARCH AND EDUCATION FOR POLICY EVALUATION
DISCUSSION PAPER NO. 23

CENTER FOR RESEARCH AND EDUCATION FOR POLICY EVALUATION (CREPE)
THE UNIVERSITY OF TOKYO
http://www.crepe.e.u-tokyo.ac.jp/

February 2018

Listing and Financial Constraints

Kenichi Ueda (The University of Tokyo and TCER),
Akira Ishide (The University of Tokyo),
and Yasuo Goto (Seijo University and RIETI)*

Abstract

We confirm, with a twist, that listing to a stock exchange can mitigate financial constraints of firms, using Japanese firm-level data over 20 years, 1995-2014, controlling for main-bank relationship and majority owner influence. Compared to a similar unlisted firm, a listed firm has a lower marginal product of capital on average and more new borrowings in recessions. Theoretically, we argue that these are key pieces of evidence to indicate less tight financial constraints for the listed firms than the unlisted. However, the listed firms do not borrow more on average over time. They rather maintain the lower leverage so that they can mitigate the borrowing constraints. We also find that the listed firms do not face lower interest rates.

JEL Classification Numbers: G32, E22

Keywords: Listing, financial constraints, financial frictions, marginal product of capital

* The views expressed in this paper are those of the authors and should not be attributed any institutions that the authors have been affiliated with. This paper is conducted as a part of the project "Study on Corporate Finance and Firm Dynamics" undertaken at the Research Institute of Economy, Trade and Industry (RIETI). This work is also supported by the GraSPP Research Grant EGRM-20160 and the CARF at the University of Tokyo. We are grateful for helpful comments from Kaoru Hosono, Hajime Tomura, Iichiro Uesugi, Tsung-ming Yeh, and participants of the RIETI workshop and the Japanese Economic Association Meeting in Sophia University. We would also like to thank for Natsumi Aizawa and Ke Ji for her excellent research assistance.

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. Moreover, empirically, we find that the listed firms do not borrow more over time but that they 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 panel regressions and propensity score matching estimates.

With the availability of more detailed data and the computational powers, studies 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 financial constraint. After considering a simple theoretical framework, we focus our attention to relatively simple variables based on the corporate financial statements, that is, the marginal product of capital, borrowings, and leverage.

If we could utilize the stock price data to all the sample, we could estimate financial frictions in a shaper way, for example, following Claessens, Ueda, and Yafeh (2014). Unfortunately, using unlisted firms' data means that stock price data are not available. An alternative could be 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 investments to firm cash flows in regressions, while controlling for growth opportunities, often represented by 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 that 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 more 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 that the listing tightens financial constraints. This is 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, that is, they are less sensitive to growth opportunities, proxied by sales growth. And, this difference is larger for listed firms as their stock prices are more sensitive to their earnings reports. Sheen (2016) shows, based on panel regressions, that the US listing firms in chemical industries have a 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 even 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 show 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 control variables.[1]

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 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 from listing are rare among Japanese firms, which are our sample. Moreover, as we discuss in the next section on data and in the later section on robustness checks, we make sure that our analysis is free from entry and exit issues.

II. DATA

The firm-level balance sheet and income statement data are commercially provided by the Tokyo Shoko Research (TSR).[2] The original TSR database covers more than one million firms per year but includes lots of family operations. We restrict our sample to be broadly consistent with the *Kikatsu* database, which we also utilize and explain below. More specifically, our sample consists of relatively sizable firms, having 50 employees or more or capitalized with 30 million yen or more in some years in sample years. In our sample, moreover, because of frequent entries and exits of 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 about 200,000 firm-year observations.

A particular interest is the return on assets (*ROA,* %) as a 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

[1] While they use *Financial Statements Statistics of Corporations* (*Hojin Kigyo Tokei*) provided by the Ministry of Finance, which covers longer years than the databases we use. However, as discussed in the next section, the databases we use contain richer information than theirs so that we can use more variables as controls in the regressions.

[2] As a part of a RIETI project, the 2016 version of the TSR database 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).

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 (*ROK,* %) as another proxy for the marginal product of capital. The numerator for *ROA* and *ROK* is the earnings before interest and taxes (EBIT). In a later section, we investigate the role of the interest rate, which is proxied by interest expenses on bank loans divided by bank loan outstanding. As for the leverage, we used the debt to asset ratio (*D/A,* ratio). The new borrowings are measured by the annual difference (%) in the debt to asset ratio.

As a control variable, we use the value of 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. We also control for firm age since incorporation. Another control is industry. The industry classification of the TSR is the same as Japan's standard industry classifications, which is comparable to the international standard. Our sample include 63 sectors for the two-digit level and 381 sectors for the three-digit level for year 2014. The sector definitions and numbers varied somewhat over time, and we adjust each year's classification to be consistent with the 2014 classification as much as possible.

Moreover, we control for "main banks." Japanese financial system has been characterized by a bank-oriented system with strong influence on firms by their "main banks" (e.g., Okazaki and Okine-Fujiwara, 1999). Although anecdotal evidence may suggest that Japanese bank-oriented system has waned by some degrees due to its banking crisis from mid-1990s to early 2000s, the relationship banking appears still important and the main banks are likely influence availability of credit for client firms. The TSR database contains the information of names of banks whose loans firms mainly rely on. Using this information, we identify the main bank-to-firm relationship in borrowing.

Furthermore, in some specifications, we drop firms with a majority shareholder. This information is available from the *Kikatsu* database, which is based on firm surveys conducted by the Ministry of Economy, Trade, and Industry (METI).[3] This database contains useful

[3] 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,

auxiliary information on firm ownership. We merge this database to the TSR database. In particular, in the estimates that use the ownership information, we exclude firms that are owned by one entity with more than 50 percent shares. By doing so, we can purge potentially abnormal effects from concentrated ownership, which may increase firm performance by containing moral hazard due to dispersed ownership but may also decrease firm performance if the owner's priority is to maximize his own benefits (e.g., empire building). Also, any subsidiaries which are heavily controlled by the parent firms, may be subject to accounting manipulations to transfer to or from their headquarters, for example, to minimize taxes.

Listing status of firms barely changes over time in Japan.[4] 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 in our sample. 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*).[5]

Summary descriptions of our sample as well as the correlations are provided in Tables 1a and 1b, respectively. These statistics for listed sample are reported in Tables 1c and 1d, and those for unlisted firms in Tables 1e and 1f.[6] Salient features are the followings: The average *ROA* of listed firms are larger than that for the unlisted, while the opposite is true for *ROK*; The leverage is higher for the listed than for the unlisted; And, the listed firms are older on average than the unlisted.[7]

---

we use the firm-level data. Academic researchers have restrictive access to the firm-level database by a request to the METI. We are provided the 2016 version.

[4] Theoretically, this is consistent with a large (explicit and implicit) sunk cost for listing. A growing firm may wait until accumulating sufficient funds to cover the sunk cost, while old dying firms may remain listed until the annual costs of listing becomes much higher than the annual benefits, to avoid paying (again) the sunk cost for re-listing after delisted.

[5] It is well known that most of the delisting decisions by Japanese firms are based on passive decisions due to financial distresses—they are not active decisions like US firms' managing buyouts or US private equity funds' investments. 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*. Also, see the robustness check section below.

[6] See Appendix Table A1 for descriptive statistics after merging with the *Kikatsu* database and after eliminating firms with a majority owner.

[7] Fixed capital to total asset ratio for listed firms are about 50 percent, while those for the unlisted are about 40 percent (see Appendix Table A2).

III. BENCHMARK RESULTS

A. Simple Model Predictions

As long as diminishing marginal returns prevail, any financial constraints limiting investments raise the marginal product of capital of a firm 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 products of capital should be lower than the unlisted firms that have similar characteristics.

Following Abiad, Ueda, and Oomes (2008) and Klenow and Rodriguez-Clare (2009), 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

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

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 and with varying interest rates and wages. In this case, the marginal product of capital can be represented by an equation similar to (6), in which λ can be considered to represent the cost of external financing (see e.g., Gomes (2001) and Claessens, Ueda, and Yafeh (2014)). These more general dynamic models, due mostly to productivity shocks with associated transitional dynamics, do not necessarily show that simple marginal products of capital are perfectly equated among firms. However, we focus in this paper on the difference between the mean marginal product of capital of the listed firms and that of the unlisted. Thanks to the large number of observations in our sample, we should be able to average out remaining dispersions around the mean marginal product of capital for each category of 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.[8] Note that sample years, 1995-2014, contains Japanese banking crisis period, late 1990s and early 2000s, and global financial crisis period starting 2008. Unlike Orihara and Isobe (2004), we control for main banks (as in e.g., Gan, (2007)) in the context of bank lending), given the importance of relationship banking in the Japanese financial system.

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

[8] We use `reghdfe` command in STATA, which provides a consistent estimator with two-dimensional fixed effects in panel data.

listed and zero otherwise. The control variables are *Size*, proxied by total asset or by number of workers, and *Age*, which is years since incorporation. We also include lagged *Leverage* (i.e., debt to asset ratio) to control for possible default risks, debt overhang, and ROE targeting behaviors:

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

The estimation results validate our prediction that the listed firms face less financial frictions. Table 2a shows the results for nonfinancial firms, about 153,000 firm-year observation numbers as well as manufacturing only samples, about 45,000 observation numbers. The robust standard errors are reported with clustering at industry level. In both samples, the coefficient on listing is significantly negative.

C. New Borrowings

Compared to the marginal product of capital, new borrowings are not so clearly predicted by a simple theory as to whether 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. Here, our prediction is thus that the new borrowings should be larger by listed firms in recessions than the unlisted, while the effect is unclear in booms or on average over years.

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* and *Age.* We also include lagged *ROA* to control for profitability, which could also be regarded as a proxy for growth opportunity. We use the change in the debt to asset ratio in percent to represent the new borrowings:

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

The results for both nonfinancial 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 always borrow more, 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 may be the listed firms that can escape from the borrowing constraint by a better financial management through equity finance. In this case, the listed firms should have lower leverage on average than the unlisted firms. Regressions similar to (8) are conducted:

$$Leverage_{i,j,b,t} = \alpha^L_{j,t} + \alpha^L_{b,t} + \beta^L Listing_{i,j,b,t} + \gamma^L_1 Size_{i,j,b,t} + \gamma^L_2 Age_{i,j,b,t} + \gamma^L_3 L.ROA_{i,j,b,t-1} + \varepsilon^L_{i,j,b,t}. \quad (9)$$

Table 2b shows the significantly negative coefficients on *Listing* for the nonfinancial sector and manufacturing only sample. The listed firms maintain lower leverage, which does not appear to hit the prohibitive borrowing constraints, presumably by the availability of equity finance.

E. Propensity Score Matching Estimation

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

Here, we also conduct a propensity score matching estimation. Specifically, we first predict the probability of firms to be listed based on *Size* (total asset), *Age, Industry* (2-digit level), and *Region* (48 prefectures) for each year.[9] Second, we match the listed and the unlisted

[9] Due to too few matched samples when using main-bank information, we instead use the prefecture where a firm locates as a proxy for the main-bank relation in the propensity score

firms, one to one, if they share the (almost) same probability of being listed. We confirm that covariates are well balanced in matched 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 the propensity score matching method, variables to compute the 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.[10] An exception is a sudden drop of *Size*, leading to bankruptcy and delisting. However, these firms are already excluded from our sample after dropping outliers as explained above. 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 Borrowings,* and *Leverage*. All confirm the significance and signs of the benchmark fixed effect estimation results, except for an insignificant result on the nonfinancial firms' *ROA*.

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 when they should not be.

---

matching estimation. It is often the case that only a few to several banks are active in each prefecture in Japan. And, therefore, the prefectural level firm address can be regarded as a reasonable proxy for the main bank. Similarly, we use 2-digit level industry code since using 3-digit level industry creates too few matched samples.

[10] Note that *Size* is needed to predict the propensity scores because it is likely to affect the financial constraints regardless of listing status.

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. Overall, Table 3, columns 3-6, show the results similar to the all sample benchmark (Table 3, columns 1 and 2). However, among the firms with higher than 50 percent propensity score, the listing effects are more clearly consistent with our theoretical predictions. That is, the listing makes the *MPK* differential larger, except for the effect on *ROA* for the nonfinancial sector, which has opposite, positive sign. For *New Borrowings*, the listing effects are weaker particularly for manufacturing firms as the effect is no longer significant. But, this uncertain result is in line with our theoretical prediction. On the other hand, as for the firms with lower than 50 percent propensity score, the listing effects on *ROA* are weaker, insignificant for both nonfinancial firms and manufacturing firms. Still, the effects in this sample are similar to the benchmark effects regarding *ROK* as well as *New Borrowings* and *Leverage*.

In the next section of robustness check, we report 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 and Financially Distressed Firms

Quite a few Japanese firms are known to hold cash in their balance sheets, and do not need to borrow money. Among them, some firms may have just a good luck in their revenues in one year or two so that they hold cash temporarily. There exist other firms which are always cash rich throughout our sample years. Our estimation results could be marred with those always cash-rich firms because they are never financially constrained regardless of listing. To see if it is the case, we focus on the firms whose average current ratio over our sample years is lower than three. The current ratio captures the liquidity of a firm to cover the short-term liability due within a year, as it is the current assets divided by the current liabilities. Firms with current ratio higher than two are likely to have enough liquidity but those higher than three can be considered that they do not utilize their assets efficiently. We exclude the latter firms as cash rich throughout the sample years.

On the other side of the firm distribution locate the financially distressed firms. Among them, again, some firms may have just a bad luck in a specific year and temporarily distressed.

There are other firms which chronically heavily indebted throughout our sample years. These firms may behave abnormally due to debt overhang (e.g., Hennessy, 2004) and face unusually high interest rates.[11] We therefore restrict our sample further by excluding financially distressed firms in addition to cash-rich firms. Specifically, we exclude those firms whose average interest coverage ratio (ICR) over our sample years is lower than 1.5, which is usually considered for the threshold of being financially distressed.[12] Note that the interest coverage ratio is often-used accounting ratio, calculated as the earnings before interest and taxes (EBIT) divided by the interest expense.

It turns out that excluding cash-rich and financially distressed firms does not affect our results substantially. The fixed effect panel regression results are reported in Table 4a and 4b. After these two kinds of sample selections, the observation numbers shrink to about 114,000 from 153,000 for the nonfinancial sector and to about 33,000 from 45,000 for the manufacturing only sample. The results show almost the same as in the benchmark regressions (Tables 2a and 2b) in terms of signs and significance, although a bit smaller effects of *Listing* are obtained for all *ROA, ROK, New Borrowings,* and *Leverage*. In the propensity score matching estimates (Table 7, columns 1 and 2), the effects on *ROA* and *New Borrowings* for manufacturing sector are gone but otherwise the almost the same estimation results remain as in the benchmark case (Table 3).[13]

B. Excluding Firms in Oligopolistic Industries

While our simple theory predicts lower marginal product of capital and thus lower *ROA* and *ROK* for the listed firms than the unlisted, the profitability of a firm per capital can be higher if it can earn monopolistic rents. A priori, we do not know which firms, the listed or the unlisted, have more tendencies to earn monopolistic rents. But, if such rents are distributed

[11] Moreover, they may be about to go bankrupt or to be delisted—either case, it may be better to avoid these samples that may require us to deal with entry and exit issues.
[12] Because firm-specific demand fluctuations affect the profitability, the liquidity, and the indebtedness at the same time, an omitted variable bias would appear in the regressions using an annual liquidity measure and an annual indebtedness measure as regressors or as criteria to drop samples. Our use of sample-period average current ratio and ICR can avoid this problem.
[13] We also conduct the same econometric analysis after eliminating cash-rich firms only and find that the results are almost the same as the benchmark ones (report omitted). Hence, the slightly different results from the benchmark one stem mainly from exclusion of financially distressed firms.

unevenly, the estimated difference in *MPK* between the listed and the unlisted firms would be biased.

To see if the monopolistic rents, if any, alters our estimates, we drop the 3-digit level industries that have less than 10 firms in our sample. The observation numbers become lower to about 127,000 from 153,000 for the nonfinancial sector and to about 37,000 from 45,000 for the manufacturing only sample.

Overall, monopolistic rents, even if they may exist in some industries, do not matter much for our study. Tables 5a and 5b show the estimation results from the fixed effect panel regressions for the restricted sample. The results are almost the same as the benchmark regressions (Tables 2a and 2b). Not even signs and significance but also the estimated coefficients on *Listing* are more or less the same for all *ROA, ROK, New Borrowings,* and *Leverage*. Propensity score matching estimates are shown in Table 7 (columns 3 and 4). *Listing* effects on *ROA* are weakened from the benchmark case (Table 3), but those on *ROK, New Borrowings,* and *Leverage* are more or less the same.

C. Excluding Firms with 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 the *Kikatsu* database, which contains the parent companies' holding shares, we eliminate sample firms that have a majority owner, that is, one company who owns more than 50 percent of shares of a firm. The remaining sample should be less reliant on parent entities, though they still contain firms with minority-stake parents.

A caveat is that the merging the TSR database with the *Kikatsu* database makes the observation number to shrink to about a quarter of the benchmark sample size, that is, to about 38,000 from 153,000. 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 firms in the two databases are matched by their names and postal codes for each year.

Excluding firms with a majority owner does not alter our results much. Tables 6a and 6b shows results based on the panel regressions. The signs, magnitudes, and significance of estimated coefficients on *Listing* are about the same as the benchmark ones (Tables 2a and 2b) for *ROK, New Borrowings,* and *Leverage*, though its effects for *ROA* are insignificant for the nonfinancial sector and 10 percent significant for the manufacturing only sample. Estimates based on the propensity score matching (Table 7, column 5) also provide almost the same results as the benchmark (Table 3), perhaps except for a smaller effect on *ROK*.[14]

V. FURTHER INVESTIGATIONS

A. Booms and Recessions

Our prediction of the effect of listing on new borrowings is indeterminate or weak on average, though it is empirically estimated as positive. However, in recessions, if financial constraints become tighter for the unlisted firms, we predict that the listing effect on the new borrowings should become larger. To see this, we divide sample years into boom and recession periods according to Japanese government official business cycle dates, which are available up to December 2012 as of February 2017.[15]

The estimation results imply that listed firms are indeed borrow relatively more easily in recessions than the unlisted. Tables 8a and 8b shows the recession period estimates. As predicted, the coefficient estimates of *Listing* on *New Borrowings* (Table 8b) are about 1.3 for the nonfinancial sector, which is doubled from the benchmark result (Table 2b), and about 1.2 for the manufacturing only sample, which is tripled from the benchmark. The propensity score matching estimates also confirm the larger effects on *New Borrowings* (Table 9, columns 1 and 2) compared to the benchmark case (Table 3),

Also, in recessions, the estimation results suggest that the difference in the marginal product of capital between the listed and the unlisted are likely to be widened. Indeed, much larger, about doubled, effects are estimated for the listing effects on *ROA* and *ROK* (Table 8a), though the magnitude for *Leverage* appears only marginally larger (Table 8b). The signs and

[14] Note that we are able to conduct the propensity score matching estimation only for the nonfinancial sector because of smaller sample numbers.
[15] These dates are reported in the Japanese Government's Cabinet Office website: http://www.esri.cao.go.jp/jp/stat/di/150724hiduke.html

significance are almost the same as in the benchmark, though the significance for *ROK* for manufacturing only sample becomes weaker at 10 percent level. In the propensity score matching estimation (Table 9, columns 1 and 2), however, the effects for *ROA, ROK,* and *Leverage* are similar to those in the benchmark case.

In the boom period, on the other hand, the estimation results imply that the listed firms' advantages of facing less tight financial constraints are weakened. Tables 8c and 8d show the boom period estimates. Importantly, the effects of listing for *New Borrowings* becomes slightly smaller to about 0.6 for and 0.3 for the nonfinancial and manufacturing only sample, respectively, than the benchmark results (Table 2). There are almost no changes from the benchmark results for *Leverage*, but the results for *MPK* becomes weaker: an insignificant effect on *ROA* for manufacturing firms and, as for *ROK*, insignificant for nonfinancial firms and only 10 percent significant effect for manufacturing firms. Even significant, coefficients on *MPK* are smaller, about three quarters of those in the benchmark.

The propensity score matching estimates confirms the weakened results in booms even more clearly. Although the effects on *Leverage* is unchanged, the listing effects on *New Borrowings* is about half of the recession period for the nonfinancial sector and no longer significant for manufacturing only sample (Table 5, columns 3 and 4). The effects on *ROA* is even flipped to positive and significant for the nonfinancial sector and insignificant for the manufacturing only sample, though the effects on *ROK* is similar to the benchmark results.

B. Decomposing *MPK* differences into Price and Quantity Distortions

If there is discrimination against the unlisted firms in the loan market, it should appear as a higher *MPK* than the perfectly competitive interest rate by Lagrange multiplier λ on financial frictions in equation (6) in our simple theoretical exposition. In the data, a higher *MPK* may take a form of interest rate differential, credit rationing, or both. We measure the interest rate by the interest payments on bank loans divided by bank loan outstanding for each firm each year.[16] We drop observations with abnormal interest rate, that is, for those with negative measured interest rate or higher than 20 percent interest rate.[17]

[16] More specifically, the numerator is the interest paid to banks between the previous and the current fiscal year end, appearing in the income statements at the end of the current fiscal year end. The denominator is the average of the previous and current fiscal year end bank

We decompose empirically the *MPK* difference into price and quantity distortions. If the measured interest rates are significantly different across firms, price discrimination should be regarded as a cause for the difference in the *MPK* (i.e., *ROA* or *ROK*). We also construct the excess *MPK*, which is calculated as the *MPK* minus the measured interest rate. It is a shadow price component of the *MPK* difference, caused by the credit rationing (i.e., quantity distortions). It may be positive for some firms, even if all firms face the same interest rate but if those firms cannot obtain loans up to their demands at the prevailed interest rate.

It turns out that listed firms can borrow funds with less rationing but with higher interest rates. Table 10a shows that the listed firms face higher interest rate on average. So, it is the listed firms, if any, that face price discrimination. However, the *MPK* is lower for the listed firms in the benchmark case (Table 2a), and consistently, the excess *MPK* (i.e., the *MPK* minus the interest rate) is much lower for the listed firms (Table 10a). Note that these results are obtained after controlling for the firm size and the lagged leverage, implying that size dependent policy interventions do not affect our results.[18] The empirical results do not change after dropping cash-rich and financially distressed firms from the sample (Table 10b).[19] Lastly, the propensity score matching estimates provide almost the same results (Table 11).

VI. CONCLUSION

The estimation results are consistent with a simple theoretical prediction that the listed firms face less financial constraints compared to the unlisted firms with similar characteristics. The

---

loan outstanding in the balance sheets. Note that for the interest coverage ratio (ICR), we also use the interest paid to corporate debt, which we approximate by the corporate debt outstanding multiplied by the bank loan interest rate measured as explained above.

[17] Our sample years are from 1995 to 2014. The long-term Japanese government bond yield has been less than 5 percent since 1995 and less than around 2 percent since 1998. Moreover, the Japan's usury law has been setting 20 percent as the maximum loan rate for borrowing throughout the sample years.

[18] For example, in Japan, bank loans to SMEs are mostly guaranteed by public loan guarantee schemes. However, such size dependent policies are also applicable to listed firms that meet size restrictions.

[19] We have also redone all variations of panel regressions explained here with an additional control of debt maturity, i.e., the share of long-term loans in the bank loans, which is a bit larger for the listed firms. The regression results are, however, almost identical to those without including this new control variable (reports omitted).

listed firms have lower marginal products of capital, while borrows more in recessions. However, they maintain better access to finance 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—if so, they should have higher leverage, which is not the case. The results are clearer for manufacturing firms, and robust to the restricted sample excluding cash-rich firms, financially distressed firms, oligopolistic firms, and firms influenced by a majority owner.

More importantly, the key results are more pronounced in recessions. On the other hand, in boom periods, the listed firms do not seem to enjoy clear advantages in financial constraints relative to the unlisted. Moreover, when we decompose the *MPK* differential into price and quantity distortions, we find that the unlisted firms face lower interest rates on average but cannot borrow as much as they want. This is a bit puzzling and a further study is warranted on underlying theoretical mechanisms as well as on the more precise estimates based on explicit theoretical models.

Reference

Abiad, Abdul, Nienke Oomes, and Kenichi Ueda (2008), "The Quality Effect: Does Financial Liberalization Improve the Allocation of Capital?" *Journal of Development Economics*, 82(2): 270-282.

Asker, John, Farre-Mensa, Joan, and Ljungqvist, Alexander (2015), "Corporate Investment and Stock Market Listing: A Puzzle?" *Review of Financial Studies,* 28(2), 342-390.

Bharath, Sreedhar T., and Amy K. Dittmar (2010), "Why Do Firms Use Private Equity to Opt Out of Public Markets?" *Review of Financial Studies,* 23(5):1771-1818.

Brav, Omer (2009), "Access to Capital, Capital Structure, and the Funding of the Firm," *Journal of Finance*, 64(1): 263-308.

Claessens, Stijn, Kenichi Ueda, and Yishay Yafeh (2014) "Institutions and Financial Frictions: Estimation with Structural Restrictions on Firm Value and Investment," *Journal of Development Economics,* 110: 107-122.

Fazzari, Steven, Glenn Hubbard, and Bruce Petersen (1988), "Financing Constraints and Corporate Investment," *Brookings Papers on Economic Activity*, 19(1): 141-206.

Gan, Jie, (2007), "The Real Effects of Asset Market Bubbles: Loan- and Firm-Level Evidence of a Lending Channel," *Review of Financial Studies,* 20: 1941-1973.

Gilje Erik P. and Jerome P. Taillard (2016), "Do Private Firms Invest Differently than Public Firms? Taking Cues from the Natural Gas Industry," *Journal of Finance,* 71(4): 1733-1778.

Gomes, Joao (2001), "Financing Investment," *American Economic Review*, 91(5): 1263-1285.

Goyal, Vidhan K., Nova, Alessandro, and Zanetti, Laura (2011), "Capital Market Access and Financing of Private Firms," *International Review of Finance*, 11(2): 155-179.

Hennessy, Christopher A., 2004, "Tobin's Q, Debt Overhang, and Investment," *Journal of Finance,* Vol. LIX, No. 4, pp. 1717-1742.

Hosono, Kaoru, and Miho Takizawa (2015), "Mijojo Kigyo niyoru IPO no Doki to Jojogono Kigyo Perfromance," *RIETI Discussion Paper Series*, 15-J-005.

Klenow, Pete, and Andrés Rodríguez-Clare (1997), "The Neoclassical Revival in Growth Economics: Has It Gone Too Far?" *NBER Macroeconomics Annual.*

Miyakawa, Daisuke, and Miho Takizawa (2013), "Performance of Newly Listed Firms: Evidence from Japanese firm and venture capital data," *RIETI Discussion Paper Series* 13-E-019.

Mortal, Sandra, and Natalia Reisel (2013), "Capital Allocation by Public and Private Firms," *Journal of Financial and Quantitative Analysis* 48, 77–103.

Okazaki, Tetsuji, and Masahiro Okuno-Fujiwara, editors (1999), *The Japanese Economic System and Its Historical Origins*. Oxford University Press (Oxford).

Orihara, Masanori (2014), "Jojokigyo to Hijojokigyo no Setsubitoshi: Hojin Kigyo Tokei wo Katsuyo sita Kijutsu Tokei ni Motozuku Bunseki," *Finance*, September, 81-86.

Orihara, Masanori, and Shogo Isobe (2014), "Jojokigyo to Hijijokigyo no Shihon Kosei: Hojin Kigyo Tokei wo Katsuyo shita Bunseki," *PRI Discussion Paper Series* 14A-07.

Saunders, Anthony and Sascha Steffen (2011), "The Costs of Being Private : Evidence from the Loan Market," *Review of Financial Studies,* 24(12): 4091–4122.

Sheen, Albert (2016), "Do Public and Private Firms Behave Differently? An Examination of Investment in the Chemical Industry," *SSRN Electronic paper.*

Stein, Jeremy C. (1989), "Efficient Capital Markets, Inefficient Firms: A Model of Myopic Corporate Behavior," *Quarterly Journal of Economics*, 104 (4): 655-669

Table 1a. Descriptive Statistics after Eliminating Outliers

	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 (ratio)	198,840	0.658	0.230	0.000	1.000
Age (year)	198,814	40.165	17.756	1.000	132.000
Total Asset (yen)	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
Interest Rate (%)	152,384	2.465	1.757	0.000	20.000

Note: In all Tables 1a-f, samples with ROA and ROK outside of three-standard-deviation bands are elimiated. Moreover, for regressions using Interest Rate, samples with negative rate or with higher than 20% are dropped.

Table 1b. Correlation Table after Eliminating Outliers

	Listing	ROA	ROK	D/A	Age	Total Asset	Workers	Interest Rate
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	
Interest Rate	-0.023	0.045	0.030	0.087	-0.086	0.017	0.028	1.000

Table 1c. Descriptive Statistics Listed Firms after Eliminating Outliers

	Obs. Number	Mean	Std. Dev.	Min	Max
Listing (dummy)	13,280	1.000	0.000	1.000	1.000
ROA (%)	13,521	4.647	4.036	-14.181	22.674
ROK (%)	13,521	11.602	18.780	-366.557	1142.677
D/A (ratio)	13,521	0.520	0.210	0.002	0.998
Age (year)	13,521	58.99	19.19	2.00	132.00
Total Asset (yen)	13,521	2.26E+11	8.18E+11	367000000	1.51E+13
Number of Workers	13,521	1683.958	4410.007	2.000	71567.000
Interest Rate (%)	10,382	2.311	2.049	0.000	20.000

Table 1d. Listed Firms Correlation Table after Eliminating Outliers

	ROA	ROK	D/A	Age	Total Asset	Workers	Interest Rate
ROA	1.000						
ROK	0.572	1.000					
D/A	-0.295	-0.128	1.000				
Age	-0.117	-0.136	0.142	1.000			
Total Asset	0.003	-0.027	0.168	0.076	1.000		
Number of Workers	0.058	-0.017	0.081	0.095	0.743	1.000	
Interest Rate	0.029	0.004	0.026	-0.025	0.110	0.182	1.000

Table 1e. Descriptive Statistics UnListed Firms after Eliminating Outliers

	Obs. Number	Mean	Std. Dev.	Min	Max
Listing (dummy)	185,319	0.000	0.000	0.000	0.000
ROA (%)	185,560	3.996	4.625	-14.750	22.910
ROK (%)	185,560	19.902	57.871	-1261.838	1354.994
D/A (ratio)	185,560	0.668	0.228	0.000	1.000
Age (year)	185,534	38.79	16.84	1.00	124.00
Total Asset (yen)	185,560	6.02E+09	4.10E+10	1610000	5.10E+12
Number of Workers	185,560	119.175	330.430	2.000	50450.000
Interest Rate (%)	142,202	2.476	1.733	0.000	20.000

Table 1f. UnListed Firms Correlation Table after Eliminating Outliers

	ROA	ROK	D/A	Age	Total Asset	Workers	Interest Rate
ROA	1.000						
ROK	0.421	1.000					
D/A	-0.120	-0.025	1.000				
Age	-0.102	-0.156	-0.118	1.000			
Total Asset	-0.008	-0.008	0.018	0.042	1.000		
Number of Workers	0.045	-0.017	-0.003	0.131	0.559	1.000	
Interest Rate	0.047	0.031	0.089	-0.089	-0.050	-0.066	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 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
Pseudo R-squared	0.022	0.020	0.145	0.209	0.034	0.037

Table 4a. Panel Regressions, firms without Cash-rich and Distressed Firms

The dependent variable is MPK, proxied by ROA or ROK. Firms whose average current ratio is higher than 3 and average interest coverage ratio is less than 1.5 are excluded. 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	-0.280**	-0.460**	-2.190**	-2.040***
	(0.113)	(0.192)	(0.915)	(0.780)
L.Size	0.148***	0.182***	-0.565*	-0.387*
	(0.029)	(0.049)	(0.301)	(0.216)
Age	-0.032***	-0.026***	-0.438***	-0.119***
	(0.002)	(0.003)	(0.037)	(0.021)
L.D/A	-1.938***	-1.599***	-1.887	-3.742***
	(0.219)	(0.366)	(1.257)	(1.318)
Observations	113,884	32,709	113,884	32,709
R-squared	0.173	0.203	0.138	0.195

Table 4b. Panel Regressions, firms without Cash-rich and Distressed Firms

The dependent variable is New Borrowings (the change in the debt to asset ratio in %) or Leverage (the debt to asset ratio). Firms whose average current ratio is higher than 3 and average interest coverage ratio is less than 1.5 are excluded. 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	0.580***	0.294***	-0.117***	-0.114***
	(0.063)	(0.080)	(0.012)	(0.014)
L.Size	-0.095***	0.006	0.009***	0.001
	(0.024)	(0.023)	(0.002)	(0.003)
Age	0.002	-0.001	-0.001***	-0.001***
	(0.001)	(0.002)	(0.000)	(0.000)
L.ROA	-0.147***	-0.009***	-0.010***	-0.196***
	(0.011)	(0.001)	(0.001)	(0.022)
Observations	113,884	32,709	113,884	32,709
R-squared	0.099	0.167	0.242	0.272

Table 5a. Excluding Oligopolistic Industries: Panel Regressions

3-digit level industries whose number of firms is less than 10 at 2005 is excluded from the sample. 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	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Listing	-0.406***	-0.626***	-3.086**	-2.314**
	(0.125)	(0.214)	(1.196)	(0.895)
L.Size	0.380***	0.475***	0.0642	0.419
	(0.034)	(0.049)	(0.363)	(0.263)
Age	-0.043***	-0.039***	-0.511***	-0.181***
	(0.003)	(0.003)	(0.0409)	(0.022)
L.D/A	-1.704***	-1.216***	-4.001***	-4.588***
	(0.226)	(0.282)	(1.038)	(1.126)
Observations	127,050	36,739	127,050	36,739
R-squared	0.171	0.200	0.119	0.181

Table 5b. Excluding Oligopolistic Industries: Panel Regressions

3-digit level industries whose number of firms is less than 10 at 2005 is excluded from the sample. 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%.

	New Borrowings		Leverage	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Listing	0.658***	0.395***	-0.139***	-0.137***
	(0.064)	(0.080)	(0.013)	(0.016)
L.Size	-0.140***	-0.002	0.014***	0.001
	(0.029)	(0.024)	(0.002)	(0.004)
Age	0.003**	-0.002	-0.002***	-0.001**
	(0.002)	(0.002)	(0.000)	(0.000)
L.ROA	-0.160***	-0.204***	-0.010***	-0.009***
	(0.009)	(0.009)	(0.001)	(0.001)
Observations	127,050	36,739	127,050	36,739
R-squared	0.092	0.156	0.241	0.244

Table 6a. Excluding Firms with a Majority Owner: 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	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Listing	-0.270	-0.411*	-2.232***	-2.172***
	(0.157)	(0.229)	(0.410)	(0.572)
L.Size	0.258***	0.393***	0.345***	0.473***
	(0.046)	(0.068)	(0.134)	(0.180)
Age	-0.027***	-0.024***	-0.062***	-0.038***
	(0.003)	(0.005)	(0.010)	(0.0138)
L.D/A	-1.955***	-1.270***	-5.090***	-3.548***
	(0.228)	(0.317)	(0.562)	(0.853)
Observations	22,154	12,186	22,154	12,186
R-squared	0.304	0.322	0.308	0.315

Table 6b. Excluding Firms with a Majority Owner: 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%.

	New Borrowings		Leverage	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Listing	0.464***	0.402***	-0.141***	-0.132***
	(0.101)	(0.131)	(0.010)	(0.015)
L.Size	-0.078***	-0.069	-0.006	-0.019***
	(0.029)	(0.043)	(0.003)	(0.005)
Age	-0.003	-0.002	-0.000	0.001*
	(0.002)	(0.003)	(0.000)	(0.000)
L.ROA	-0.212***	-0.220***	-0.013***	-0.011***
	(0.012)	(0.015)	(0.000)	(0.001)
Observations	22,154	12,186	22,154	12,186
R-squared	0.237	0.258	0.365	0.379

Table 7. Robustness Check: 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%.

	Excluding Cash-rich and distressed		Excluding Oligopolistic Industries		Without Majority Owner
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing	Nonfinancial
	(1)	(2)	(3)	(4)	(5)
Differences in					
ROA	0.067	-0.044	0.163*	-0.143	0.094
	(0.084)	(0.246)	(0.085)	(0.252)	(0.144)
ROK	-7.291***	-3.753***	-3.760***	-3.804***	-1.522**
	(0.654)	(0.975)	(0.621)	(1.03)	(0.604)
New Borrowings	0.452***	-0.262	0.193*	0.566**	0.564***
	(0.102)	(0.272)	(0.100)	(0.259)	(0.153)
Leverage	-0.128***	-0.107***	-0.147***	-0.142***	-0.147***
	(0.005)	(0.012)	(0.004)	(0.013)	(0.009)
Obs. Untreated (on support)	120,816	33,165	138,672	33,159	20,365
Obs. Treated (on support)	7,362	2,737	7,793	2,642	1,543
Obs. Untreated (off support)	0	0	0	0	0
Obs. Treated (off support)	5,254	3,871	5,236	3,689	2,642

Table 8a. 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 8b. 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 8c. 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 8d. 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 9. Recessions and Booms: 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%.

	Recession Periods		Boom Periods	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)
Differences in				
ROA	0.127	-0.456*	0.283***	-0.158
	(0.158)	(0.275)	(0.104)	(0.186)
ROK	-2.675***	-3.193**	-6.554***	-1.779**
	(0.775)	(1.288)	(1.245)	(0.768)
New Borrowings	0.629***	0.671***	0.364***	0.111
	(0.178)	(0.187)	(0.117)	(2.092)
Leverage	-0.158***	-0.128***	-0.155***	-0.138***
	(0.008)	(0.014)	(0.005)	(0.010)
Obs. Untreated (on support)	48,187	14,023	113,118	33,060
Obs. Treated (on support)	2,338	780	4,956	1,572
Obs. Untreated (off support)	0	0	0	0
Obs. Treated (off support)	2,076	1,657	3,689	3,048

Table 10a. Interest Rate and MPK: Panel Regressions

The dependent variables are Interest Rate; ROA minus Interest Rate and ROK minus Interest Rate. 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%.

	Interest Rate		ROA - Interest Rate		ROK - Interest Rate	
	Nonfinancial	Mnufacturing	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)
Listing	0.217***	0.363***	-0.667***	-0.850***	-1.818**	-2.019***
	(0.060)	(0.078)	(0.127)	(0.204)	(0.869)	(0.702)
L.Size	-0.096***	-0.110***	0.449***	0.499***	0.072	0.109
	(0.013)	(0.020)	(0.030)	(0.041)	(0.240)	(0.147)
Age	0.001	-0.002	-0.040***	-0.035***	-0.377***	-0.135***
	(0.001)	(0.002)	(0.003)	(0.003)	(0.034)	(0.016)
L.D/A	0.781***	0.740***	-2.422***	-1.976***	-2.214*	-3.499***
	(0.083)	(0.087)	(0.243)	(0.279)	(1.147)	(1.067)
Observations	120,027	37,301	120,027	37,301	120,027	37,301
R-squared	0.157	0.208	0.188	0.220	0.120	0.184

Table 10b. Interest Rate and MPK (without Cash-rich and Distressed Firms): Panel Regressions

The dependent variables are Interest Rate; ROA minus Interest Rate and ROK minus Interest Rate. Firms whose average current ratio is higher than 3 and average interest coverage ratio is less than 1.5 are excluded. 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%.

	Interest Rate		ROA - Interest Rate		ROK - Interest Rate	
	Nonfinancial	Mnufacturing	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)
Listing	0.242***	0.410***	-0.524***	-0.745***	-1.288*	-1.874**
	(0.067)	(0.087)	(0.128)	(0.225)	(0.752)	(0.742)
L.Size	-0.101***	-0.095***	0.240***	0.272***	-0.490**	-0.327**
	(0.014)	(0.023)	(0.026)	(0.049)	(0.232)	(0.161)
Age	0.001	-0.003	-0.031***	-0.024***	-0.325***	-0.084***
	(0.001)	(0.002)	(0.002)	(0.004)	(0.032)	(0.016)
L.D/A	0.777***	0.759***	-2.568***	-2.142***	0.155	-2.382*
	(0.099)	(0.118)	(0.256)	(0.400)	(1.285)	(1.351)
Observations	91,116	27,708	91,116	27,708	90,780	27,708
R-squared	0.174	0.222	0.195	0.225	0.146	0.204

Table 11. Interest Rate and MPK: 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 Interest Rate, ROA minus Interest Rate, ROK minus Interest Rate are reported. The standard errors are reported in the parenthesis: * denotes significant at 10%; ** at 5%; and *** at 1%.

	All Sample		Without Cash-rich and Distressed	
	Nonfinancial	Manufacturing	Nonfinancial	Manufacturing
	(1)	(2)	(1)	(2)
Differences in				
Interest Rate	0.118***	0.232***	0.111***	0.260***
	(0.040)	(0.085)	(0.042)	(0.106)
ROA - Interest Rate	-0.309***	-0.696***	-0.090	-0.958***
	(0.089)	(0.197)	(0.091)	(0.227)
ROK - Interest Rate	-7.683***	-5.002***	-2.385***	-3.703***
	(1.181)	(0.719)	(0.560)	(0.784)
Obs. Untreated (on support)	148,266	44,576	109,126	31,498
Obs. Treated (on support)	7,423	2,706	6,279	2,261
Obs. Untreated (off support)	0	0	0	0
Obs. Treated (off support)	5,389	4,195	5,175	3,845

Appendix Tables

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 (ratio)	38,075	0.660	0.217	0.018	1.000
Age (year)	38,075	47.971	16.226	1.000	124.000
Total Asset (yen)	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
Interest Rate (%)	30,598	2.298	1.740	0.000	20.000

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 (ratio)	32,372	0.655	0.218	0.018	1.000
Age (year)	32,372	49.394	15.655	1.000	124.000
Total Asset (yen)	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
Interest Rate (%)	26,532	2.368	1.762	0.000	20.000

Table A1c. Correlation Table after Merging with Kikatsu Data

	Listing	ROA	ROK	D/A	Age	Total Asset	Workers	Interest Rate
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	
Interest Rate	0.022	0.038	0.006	0.058	0.042	0.065	-0.031	1.000

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

	Listing	ROA	ROK	D/A	Age	Total Asset	Workers	Interest Rate
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	
Interest Rate	0.012	0.044	0.031	0.060	0.044	0.067	-0.052	1.000

Table A2. Descriptive Statistics of Fixed Capital to Total Asset Ratio (%)

	Obs. Number	Mean	Std. Dev.	Min	Max
NonFinancial					
Listed Firms	13,521	50.127	19.592	0.549	99.352
Unlisted Firms	185,560	39.282	21.228	-1.169	99.976
Manufacturing					
Listed Firms	6,918	48.692	13.769	9.702	86.197
Unlisted Firms	53,211	41.997	16.963	0.300	98.807

Note: Samples with ROA and ROK outside of three-standard-deviation bands are elimiated.