■論　文

Determinants of Capital Structure
― Evidence from Japan ―

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Abstract

This study empirically examines the factors that determine variation in leverage ratios of non-financial firms listed on the Tokyo Stock Exchange First and Second Section from 1980 to 2014. The study finds that leverage ratios of Japanese firms remain stable in the long term. High levered firms continue to be high levered and low levered firms continue to be low levered for at least two decades. A panel regression analysis shows that initial leverage ratio is significantly positively related to future leverage ratios. Although the marginal effect of time varying determinants is significant, majority of the variation in capital structure can be explained by time invariant factors. Moreover, Keiretsu membership is also found to have a significant positive impact on firms leverage ratios, which is more pronounced during the pre-bubble period.

Keyword： Capital structure, Leverage, Determinants, Stability, Japan

1 Introduction

Why do some firms prefer to take on more leverage than others? What factors influence firms' capital structure decisions? Financial researchers have proposed a large number of theories and ideas to explain the capital structure dynamics. Trade-off theory and pecking order theory are the two most prominent theories that explain the capital structure decisions. These theories assume factors relating to costs and benefits of financing and information asymmetry causes the heterogeneity in leverage ratios. Despite having many useful insights to capital structure decisions, none of these theories provide a unified framework that can simultaneously account for many empirical facts. More importantly, recent research (Lemmon et al. 2008) shows that firms leverage ratios remain stable over long term. Cross sectional variation in leverage ratios account for much of the variation in leverage ratios than time series variation. Therefore current capital structure theories that focus only on time varying determinants cannot explain majority of variation in capital structure. Firm-specific permanent components needed to be taken into consideration to understand the observed heterogeneity in capital structure.

The objective of this study is to examine the factors that determine the capital structure of Japanese firms. Since recent studies reveal that traditional capital structure theories cannot explain all the variation in leverage ratios, I investigate the determinants of capital structure in a different environment. Japan has some major differences as well as similarities with the US. Japanese firms traditionally relied on bank loans as a major source of financing. However, capital market began to play a major role since the financial big bang had been initiated. Japan also has a unique institutional settings characterized by Keiretsu form of industrial organization. All these justify Japan is unique to test whether same empirical regularities are observed in a different environment.

Sample firms include non-financial firms listed on the Tokyo Stock Exchange First and Second Section. Following Lemmon et al. (2008), four portfolios are formed based on leverage ratios to observe the changes in leverage ratios in the following twenty years. I carefully replicate their approach to find any significant differences. Leverage ratios of Japanese firms' exhibit convergence and persistency as observed in the US. The study finds cross-sectional dispersion in the initial period is very high. The range of average book (market) leverage is 50% (52%) when the portfolio is formed. Over time the differences in leverage ratios fall. After 20 years, the very high book leverage portfolio declined from 82% to 65%, whereas the low book leverage portfolio increased from 32% to 36%. Likewise, the very high market leverage portfolio also decreased from 74% to 66% and the low market leverage portfolio increased from 22% to 37%. Although leverage ratios of portfolios converge in the short run, the difference between these portfolios exists even twenty years after the portfolio is formed.

The persistency in leverage ratios implies that firm's future leverage ratios are anchored on its past leverage ratios. Regression analysis shows initial leverage ratios is significantly positively related to firms future leverage ratios. Even when other time varying determinants are included in the model the relationship remains highly significant. It implies that a certain part of initial leverage ratio remain fixed for long term. The adjusted R-squares from a regression of leverage on traditional capital structure determinants range from 25% to 39% based on model specifications. Conversely, adjusted R-square from a regression of leverage on firm fixed effect shows 70% of the variation in leverage ratios can be explained by the firm fixed effect only, which indicates most of the variations in leverage ratios is cross sectional which cannot be explained by the traditional capital structure determinants. The parameter estimates in pooled OLS regression fall by 40%, on an average, when fixed effect regression is used. Thus the parameter estimates in traditional leverage regression is inefficient where unobserved firm specific factors are ignored.

Among the time varying determinants, profitability is significantly negatively related to leverage which is consistent with the pecking order theory. Consistent with trade-off theory, leverage ratio is positively related to industry median leverage ratios, firm size and tangibility. Age is positively related to leverage, older firms have higher leverage than young firms. Keiretsu dummy, used as

an indicator of unique institutional characteristics of Japanese firms, shows that it indeed has a positive impact on firms future leverage ratio.

This study contributes to the existing literature in several ways. First, this study provides an evidence of a new feature of the capital structure of Japanese firms. Stability of capital structures that Lemmon et al.（2008）uncovered for US firms is almost equally applicable to Japanese firms. The robustness of the same empirical observation in a different environment justifies the inclusion of time-invariant factors in existing model to aid in better understanding of actual determinants of capital structure. The traditional model based only on time-varying determinants is not enough to understand the capital structure dynamics. Second, this study also relates leverage to the institutional characteristics of Japanese firms- Keiretsu firms generally have a higher leverage than that of a non-keiretsu firms. This relationship continues to exist even after financial deregulation took place. Although, Hirota（1999）, Hirota et al.（2007）studied the effect of institutional features and corporate culture on the capital structure decisions of Japanese firms, incorporating these features in a time invariant model is still missing. This study contributes to this gap. Moreover, a large sample period covering time period both before and after the financial big bang took place has been used. This study also pointed out age to be an important factor that is positively related to the leverage of Japanese firms.

This paper is organized as follows. Section 2 presents the literature review, section 3 describes sample selection and methodology, section 4 describes basic statistics followed by the analysis of the determinants of capital structure in section 5, and section 6 concludes this paper.

2 Literature review

Many theories have been developed over the years to explain the financing behavior of firms. According to the tradeoff theory（Modigliani and Miller, 1963）firms strive to achieve an optimal debt ratio by balancing the cost and benefit of debt financing. Much of the early empirical evidence is consistent with trade off theory predictions. Bradley et al.（1984）observe strong industry influences on cross-sectional leverage ratios which they interpret as evidence of static trade-off theory. Consistent with their view, Titman and Wessels（1988）find that firm's leverage ratio is negatively related to the uniqueness of product. Rajan and Zingales（1995）consider industry effect as fundamental for understanding firm's capital structure. Frank and Goyal（2009）find industry median leverage, tangibility, firm size, expected inflation are positively related to leverage, market-to-book ratio and profitability are negatively related to leverage.

An important implication of trade off theory is target leverage adjustment. In a survey, Graham and Harvey（2001）show that 71% of the CFOs in their sample responded to having a target range for their debt-equity ratio. Empirical evidence shows that leverage ratios generally exhibit a mean reversion（Hovakimian, Opler and Titman, 2001; Flannery and Rangan, 2006; Kayhan and Titman, 2007）. However, there is disagreement about the pace at which mean reversion takes place. Fama

and French（2002）reports that adjustment speed toward target leverage is very slow. On the other hand, Alti（2006）, Flannery and Rangan（2006）and Leary and Roberts（2005）report evidence that reversion is quite fast and is mostly accomplished in two to three years.

One of the shortcomings of the trade off theory is the negative relationship observed between leverage and profitability, which can be explained by pecking order theory（Myers and Majluf, 1984）. Pecking order theory states that because of adverse selection cost associated with information asymmetry firms prefer internal financing to external financing and if external financing is needed debt is more preferable to equity. Shyam-Sunder and Myers（1999）show that much of the time series variation in debt ratios can be explained by the pecking order rather than trade off model. However, their empirical evidence is challenged by whether same result could be observed for a sample of growth firms. Frank and Goyal（2003）find pecking order is only applicable to mature firms as oppose to growth firms. Chirinko and Singha（2000）question the ability of Shyam-Sunder and Myers（1999）test to distinguish among alternative hypotheses. Leary and Roberts（2010）also argue that pecking order determinants can explain only a small fraction of the variation in debt ratios. Fama and French（2005）agree that small firms frequently issue equity even higher than their debt issues. According to Lemmon and Zender（2010）finding small firms financing with equity is not contrary to the predictions of pecking order theory because of restrictive debt capacity.

Thus, the standard version of trade off theory and pecking order theory appear to be inadequate to explain all empirical evidence. A growing literature argues that empirical evidence is more consistent with dynamic trade-off model. Negative relationship observed between profitability and leverage could be explained by dynamic trade-off model（Fischer et al. 1989; Hovakimian et al. 2004）. Leary and Roberts（2005）find that adjustment costs may shy away a firm from its optimal leverage ratio and thus result in persistent effect in leverage. Goldstein et al.（2001）observe that the option to increase leverage in the future serves to reduce the otherwise optimal level of leverage today. Morellec et al.（2012）argues that cross-sectional differences in leverage ratios are due to differences in the agency conflicts across firms. Thus many of the empirical results inconsistent with static trade-off model could be explained by dynamic trade-off model.

Recent evidence shows that firms leverage ratios remain remarkably stable over long term（Lemmon et al. 2008）. Traditional capital structure theories cannot explain majority of variation in leverage ratios. Frank and Goyal（2007）provide some evidence that the persistence in leverage across firm may actually result from its correlation with the managerial team. Specifically, CEO's compensation contract is directly related to the level of leverage. Hackbarth（2008）shows that managerial characteristics contribute to significant variation in capital structure, although the underlying firms and industry characteristics are the same.

Most of the empirical studies are done in the context of US. The institutional and regulatory environment in Japan is quite different from the US. Hirota（1999）find that capital structure determinants derived from traditional theories are equally applicable to Japan as in the US. Unique institutional and regulatory environment in Japanese capital market also have an effect on capital structure decisions. Strength of main bank relationship and Keiretsu membership are positively related to leverage ratios. Rajan and Zingales（1995）report that factors identified in the US as important determinants of capital structure are also related with leverage in Japan. Nishioka and Baba（2004）find that governance structure has strong influence on the adjustment speed to target leverage. Firms in good credit standing retire more debt to reduce excess leverage than firms in lower credit standing. Hirota et al.（2007）report corporate culture has a strong influence on firms financing decisions.

Static theory suffers from empirical inconsistency. Negative relationship between profitability and leverage, more equity issues by small firms are some of the empirical inconsistencies found in the static version of trade-off and pecking order theory. When dynamic version of these theories are taken into considerations empirical evidence are more consistent with these theories. However dynamic theories consider firms will adjust leverage continuously over time but accounting information is available at fixed time interval only. A large part of the unexplained capital structure variation is captured by firm-specific, and largely time-invariant, characteristics which are missing from these models. A part of firm specific effect could be explained by factors such as managerial characteristics, corporate cultural differences. But identifying these factors requires careful considerations and may differ among researchers.

3 Sample Selection and Methodology

(1) Sample Selection

The sample consists of non-financial firms listed on the Tokyo Stock Exchange First Section and Second Section from 1980 to 2014. I exclude financial firms because their capital structure is strongly influenced by legal requirements. Moreover, differences in financial statements make it difficult to compare financial firms with non-financial firms. Firms with book leverage ratios higher than 1 are also excluded from the sample. Among the non-financial firms, I exclude those without continuous book leverage data and other variables during the study period that are required for regression analysis. In total, 45,419 firms year observations are included in the sample. The equity data and firm-specific variables were collected from the Nikkei-NEEDS database.

(2) Method

To examine the trend in leverage ratios, every year firms are sorted on the basis of book leverage and market leverage ratios and are divided into four equal portfolios. The leverage ratios for the

same portfolio are observed for the next twenty years. Finally, the leverage ratios are averaged across the event time to determine the leverage ratio trend over time. OLS regression models are used to find the factors that affect the leverage ratio. Both book and market leverages are regressed on firm-specific factors that have been identified as the most important factors correlated with leverage in previous empirical studies.

(3) Variable Definition and Measurement Issues

To examine the leverage ratio of non-financial firms in Japan, I used a number of firm-specific variables that were used in previous studies, including Titman and Wessels (1988), Rajan and Zingales (1995), Frank and Goyal (2009), Mackay and Phillips (2005) and Lemmon et al. (2008).

Leverage has been calculated using two different measures; book leverage and market leverage. Book leverage is defined as the ratio of (1- equity/total book value of assets). Market leverage is defined as the ratio of debt over sum of debt and market equity. Market equity is the product of end of year market price of shares times the number of shares outstanding.

Firm size is measured by the log of sales. Another widely used measure for firm size is log of total book value of assets. To avoid possible multicollinearity problem with the measure of tangibility, log of sales is used as a measure of firm size. Asset tangibility is measured as the ratio of net property, plant, and equipment to total book value of assets. Profitability is measured as the ratio of operating income before depreciation to total assets. Market-to-book value is the ratio of market value of total equity and total debt as a percentage of total book value of assets. Cash flow volatility is measured as the standard deviation of firms last three years' operating income. Age is the difference between the actual date of foundation and the current year.

Tokyo Stock Exchange industry classification has been used to classify the industry. In total twenty nine industries are identified. Industry median leverage is the median level of leverage for each industry calculated in every year.

Initial leverage is the first available data on leverage in the Nikkei-NEEDS database. Although the sample time period starts from 1980, initial leverage data is collected from the year 1965 and onwards according to the year of establishment and enlistment with the stock exchange of particular companies. Therefore, initial leverage is not the leverage value lagged just few years ago. It has been documented in several studies that institutional environment has an effect on firms capital structure (Rajan and Zingales, 1995; Fan et al. 2012). A unique characteristics of Japanese institutional structure is that many firms belong to an industrial group called Keiretsu. I use a dummy variable that equals 1 if a firm belongs to a Keiretsu. A firm is considered to have Keiretsu membership if it belongs to any of the six major groups (Mitsubishi, Mitsui, Sumitomo, Fuyo, Ichikan, and Sanwa) and participate in the president club.

4 Basic results

(1) Descriptive Statistics

Table 1 presents the summary statistics for the sample firms. The sample consists of all non-financial firms listed on the Tokyo Stock Exchange First Section and Second Section for the period 1980 through 2014. It is found that mean book leverage and market leverage ratio for the Japanese firms are 54% and 49% respectively. Average age of the firms is about 55 years, which is much higher than that of US firms.

Table 1 Descriptive Statistics

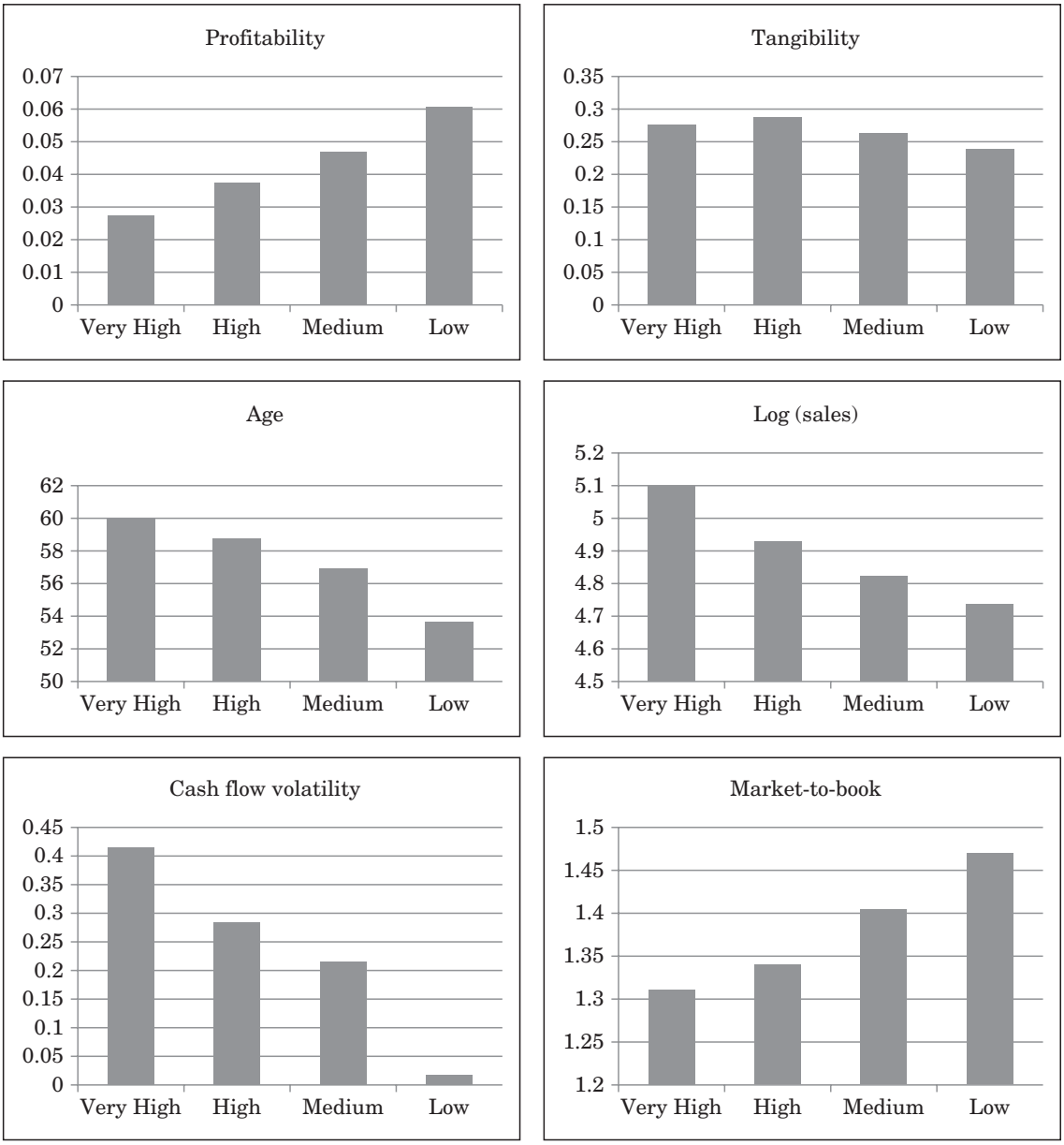
The sample consists of all non-financial firms listed on the Tokyo Stock Exchange First Section and Second Section from 1980 to 2014. Table 1 presents means, standard deviations (SD), maximum and minimum values of the variables used in the study for the entire sample. Variable definitions are provided in the sample selections and methodology sections.

Variable	Mean	SD	Min	Max
Book Leverage	0.54	0.20	0.00	0.99
Market Leverage	0.49	0.21	0.00	0.99
Log (sales)	6.20	2.22	1.79	12.73
Market-to-book	1.24	0 .87	0.02	34.00
Profitability	0.04	0.06	–7.50	0.58
Tangibility	0.26	0.16	0.00	0.94
Industry median leverage	0.57	0.09	0.31	0.91
Cash Flow Volatility	0.02	0.11	0.00	10.12
Age	54.71	20.97	2.00	132.00
Observations	45419			

Figure 1 shows the differences in firm characteristics depending on the degree of book leverage. Specifically, I observe how profitability, tangibility, age, firm size, volatility of earnings and market-to-book ratio changes across four groups based on leverage. At first, firms are sorted based on leverage ratios and divided into four equal groups. Then average the variables representing firm characteristics for each quartiles every year from 1980 to 2014. Finally again average the 35 sets of averages for each quartile and present the results in column figure.

The graph shows there are some major differences between firms with very high leverage and low leverage. In general profitability and market-to-book ratios are negatively related to leverage while firm size, tangibility, cash flow volatility and age are positively related to leverage. As can be seen from the graph that firms in very high leverage quartile have the lowest profitability. As I move to the right profitability increases and firms in the lowest leverage quartile have the highest

Figure 1 Firm Characteristics across Leverage Quartiles



The sample consists of all non-financial firms listed on the Tokyo Stock Exchange First and Second Section for the period 1980 to 2014. There are large differences in firm characteristics between very high and low leverage firms. Leverage in general is negatively related to profitability, market-to-book ratios and positively related to age, tangibility, firm size, cash flow volatility. However, some of the relationships are non-linear in nature. For example, although tangibility is positively related to leverage, very high leverage firms do not have the highest tangibility.

profitability. Likewise, market-to-book ratio is the lowest for very high leverage firms and the highest for the low leverage firms. However, for all variables this relationship is not precisely linear. Although tangibility in general shows a positive relationship, very high leverage firms do not have the highest tangibility.

For some variables differences between very high and low leverage firms are more pronounced than others. For example, very high and low leverage firms have large differences in terms of profitability and firm size. On the other hand, for tangibility little differences is observed between very high and low leverage quartiles.

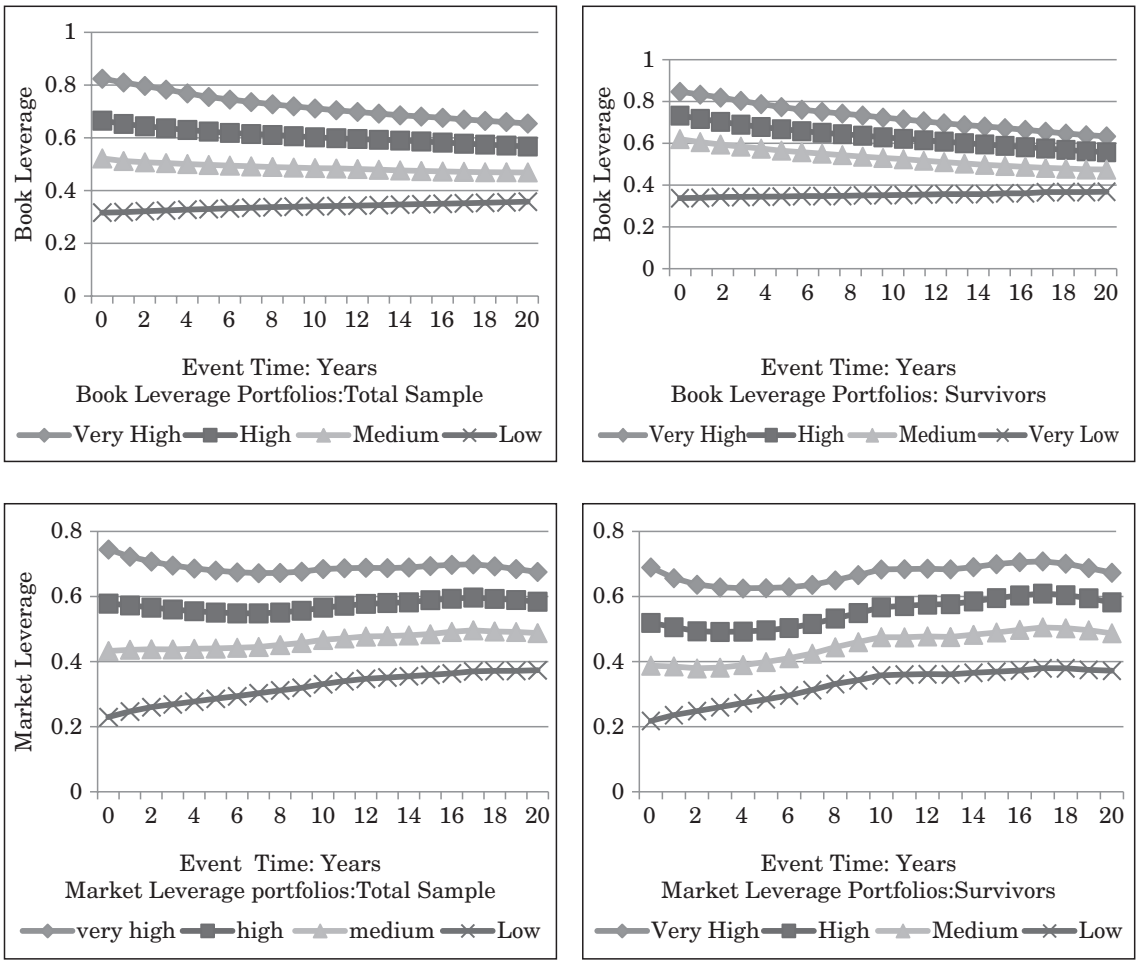
Leary and Roberts（2011）examines the US firm characteristics conditional on leverage. They find there are significant fundamental differences between high leverage firms and low leverage firms. High leverage firms are significantly larger, older, less profitable, have more fixed assets, lower market-to-book ratios and less cash flow volatility. In this criteria Japanese firms closely resembles to US firms except that the cash flow volatility is positively related to leverage for Japanese firm.

(2) Trends in Leverage Ratios

How the leverage ratio changes over the years can shed light on how firms determine these ratios. In this section, I examine the nature of the changes in the leverage ratio of Japanese firms from 1980 through 2014. First, I sort firms on the basis of their actual leverage ratios, and then divide them into four portfolios by taking one-fourth of the firms in each portfolio. These four portfolios are indicated as very high-, high-, medium-, and low-levered portfolios. Because I seek to reveal the long-term trends in leverage ratios, I observe their changes in the subsequent twenty years without changing the composition of any of the firms in the particular portfolios. I obtain 35 sets of event time averages for these portfolios. Event time is indicated as year 0 to 20. I then compute the average leverage of each portfolio across the 35 sets within each event year. Both book leverage and market leverage ratios are used to calculate portfolios' average leverage ratios. These event time averages are then plotted to obtain a trend line, as shown in Figure 2.

The graph reveals some interesting characteristics of leverage ratios of Japanese firms. At the beginning of the portfolio construction period（indicated as event time zero）a large gap exists in the leverage ratios among these four portfolios. At this point, the difference between the leverage ratios between the highest and lowest groups is the largest. The range of average leverage ratios is 50% for book and 52% for market leverage ratios. Over time, the gap shrinks as very high-, high-, and medium-levered portfolios' leverage ratios decline and low-levered firms' leverage ratios increase for the total sample groups. Noticeable convergence is observed among four portfolio averages over time. After 20 years, the very high book leverage portfolio declines from 82% to 65%, whereas the low book leverage portfolio increase from 32% to 36% for the total sample. Similarly, the very high market leverage portfolio decrease from 74% to 66% and the very low market leverage portfolio increase from 22% to 37%. However, the cross-sectional differences between

Figure 2 Trends in Book and Market Leverage Ratios



The sample consists of all non-financial firms listed on the Tokyo Stock Exchange First and Second Section for the period 1980 to 2014.The graph shows average book and market leverage ratios of four portfolios over a period of twenty years. Left panels present the graphs for total sample and right panels present the graphs for survivor firms for both book and market leverage. To get the figure, at first I rank firms based on their leverage ratios and divide it into four equal portfolios- very high, high, medium and low. The starting period is denoted as 0. I observe the leverage ratios of each portfolios without changing any of the constituents in the following twenty years. This process is repeated for every year for total sample and final result is the average of these 35 sets of averages across the event time.Survivor firms must have 20 years continuous leverage data.Thus, I repeat the process for survivor firms until 1994 and average these 15 sets of averages across the event time. Finally, the event time averages are plotted in a trend line on the graph.

these portfolios remain persistent. The average book leverage ratios of very high, high, medium and low leverage portfolios are 65%, 57%, 47% and 36% respectively. This difference is economically large when compared to average within firm standard deviation of book leverage 11.5%. The cross-sectional differences between these portfolios remain substantially large. We repeat the test on the survivor firms and found the similar results as for total sample. The long term trend in leverage ratios for Japanese firms are very similar to the findings of Lemmon et al.（2008）, for US firms. Lemmon et al. focus on two important characteristics of leverage-convergence and persistency.

Leverage ratios of Japanese firms also exhibit these similar features.The leverage ratios of high（low）leverage firms decrease（increase）over a period of twenty years. However, leverage ratios of four portfolios never coincides, i.e high（low）leverage firms remain high（low）leverage.

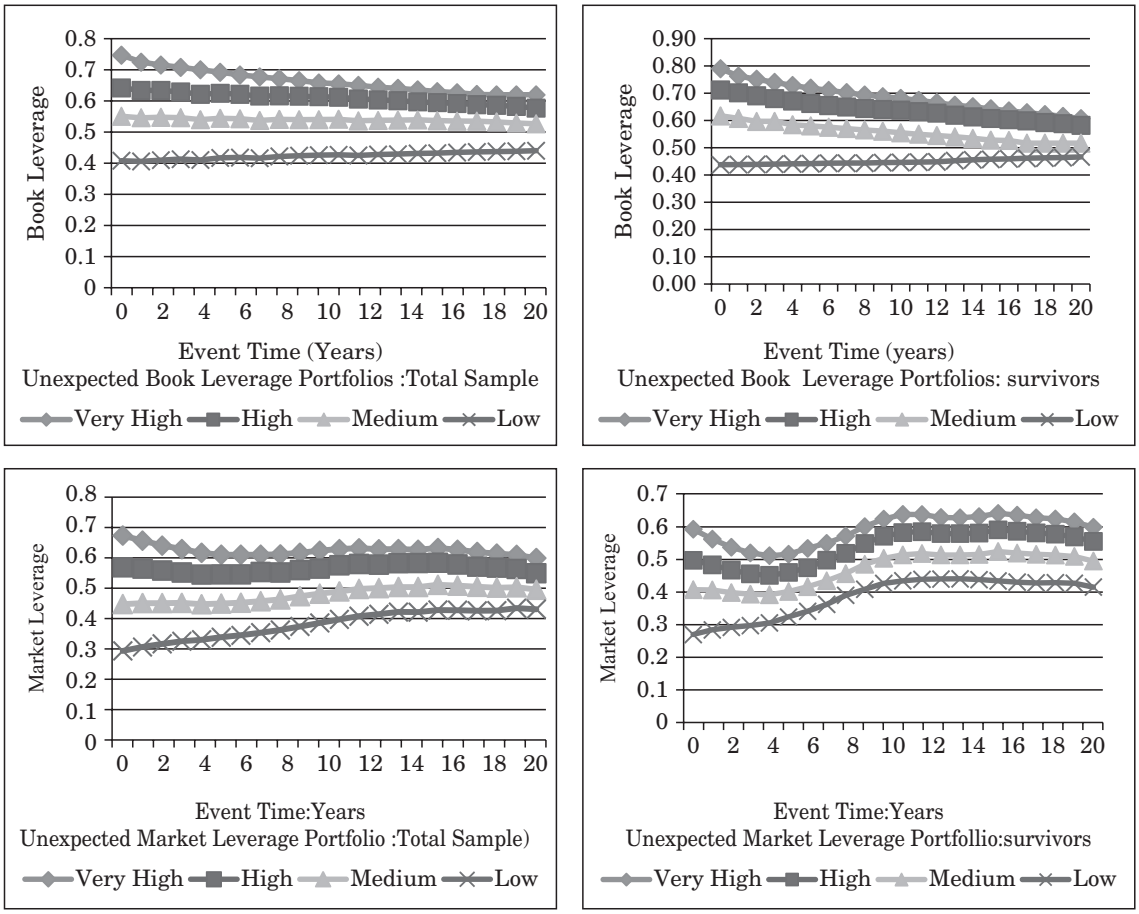
In general, the data indicates that Japanese firms' leverage ratios remain stable. What causes firms to maintain the same leverage ratio over the years? The cause may be firms' entry or exit processes. An exit is more common for highly levered firms in financial distress because they tend to be highly levered during their entire existence until bankruptcy. That some highly levered firms are prone to bankruptcy is highly likely. To ensure that this type of distressed firm does not influence the result, I separately analyze firms that have survived for 20 continuous years. This data also confirms that the trend in leverage is persistent over the years. The result is robust regardless of whether I include these firms in or exclude these firms from the sample that are not prone to bankruptcy. The trend in leverage ratios for survivor groups indicates the same feature.

In short, this analysis reveals an interesting feature of the leverage ratio. The leverage ratios of firms indeed remain stationary in the long term—also an insight revealed by Lemmon et al.（2008）into firms in the United States. They find that the leverage ratio of U.S. firms remains remarkably stable over the long term, beginning from 1965 and going to 2003. Although they observe some convergence, it is transitory rather than permanent. Similar trends are also observed for Japanese firms. The leverage ratios of the very high, high, medium, and low portfolios change very little over time. Cross-sectional differences in the leverage ratios remain persistent even twenty years after the portfolio was formed. Little difference is observed between Japanese and U.S. firms, except that the convergence in U.S. firms is more noticeable than Japanese firms.

There is a potential concern which should be addressed. It is possible that Figure 1 is mainly resulted by cross-sectional variation of firm-specific variables, such as firm size, profitability, tangibility and market-to-book ratio. In order to remove the affects of these observable differences among firms, a cross-sectional regression of leverage on firm-specific variables is run for each year. Residuals from these regressions are then used to rank firms and form four equally weighted portfolios to observe future changes in leverage. The portfolios are called very high, high, medium, and low unexpected book and market leverage portfolios. The leverage ratios of these portfolios are observed in the subsequent 20 years. As before, this process results in 35 sets of event time averages and a new trend line for unexpected book and market leverage ratios of Japanese firms.

Figure 3 indicates the trends in leverage ratios for these portfolios. The range of average book leverage and market leverage for the very high and low portfolios are 34% and 38% respectively, during the formation period. The cross-sectional variation in leverage changes only slightly, indicating that most capital structure differences are found in the residual of existing specifications. The differences in leverage ratios between the very high and low portfolios are 18%（17%）for book（market）leverage, even 20 years after the portfolios are formed. The average leverage ratios of

Figure 3 Trends in Unexpected Book Leverage Portfolio



The sample consists of all non-fiinancial firms listed on the Tokyo Stock Exchange First and Second Section for the period 1980 to 2014. The graph shows average leverage ratios of firms for total sample and sub-sample of survivor firms for both book as well as market leverage. Every year I sort firms based on unexpected book (market) leverage ratios instead of total book (market) leverage ratios as in figure 2. Unexpected leverage ratio is the residuals from the cross sectional regression of leverage on traditional capital structure determinants. I then divide firms into four equal portfolios and observe how the leverage ratios changes over twenty years without changing any composition in the potfolio. I get 35 sets of averages which are then again averaged across the event time to get the final trend line for each portfolios. Survivors firms must have at least 20 years data. Thus, I repeat the process for survivor firms until 1994 and average these 15 sets of averages across the event time.

highly levered firms remain higher than that of other portfolios and the average leverage ratios of low-levered firms remain lower than that of any other portfolio.

This feature in the leverage ratio is similar to the findings of Lemmon et al.（2008）for U.S. firms. They find that differences in leverage ratios exist even after removing all observable differences across firms. Highly levered firms remain highly levered and low-levered firms remain low levered, indicating that the differences in the leverage ratios cannot be explained by traditional capital structure theories.

5 Capital Structure Determinants

(1) The Role of Initial Leverage on Future Leverage

The main feature of Figures 2 and 3 is that the leverage ratios remain stable over time. This stability indicates that there may be some time-invariant factors which keep the leverage ratios remain stable over long term. I examine this possibility by analyzing the relationship between firms' initial leverage ratio and future leverage ratios. I assume a positive relationship exists between initial leverage and future leverage ratios and use the following regression equation to determine whether or not the relationship actually exists.

$$Leverage_{it} = \alpha + \beta X_{it\text{-}1} + \gamma Leverage_{i0} + v_t + \varepsilon_{it} \quad (1)$$

α is the constant, leverage_{i0} is the firm's initial leverage, X represents 1-year lagged control variables, v_t is the time-fixed effect, ε_{it} is the random error term assumed to be possibly heteroskedastic and correlated within firms, i indexes firms and t indexes year respectively. β is the coefficient of control variables and γ is the coefficient of the main variable, initial leverage. The first observation of each firm is excluded from the regression to avoid an identity at time zero. To understand the relationship between initial leverage and future leverage, the value and significance of γ must be observed. The first available data of firms leverage in the Nikkei- NEEDS database is used as a proxy for initial leverage.

Table 2 reports the regression coefficient for two models. First column shows the regression coefficient when initial leverage is taken as the sole explanatory variable. In the second column controls variables motivated by Rajan and Zingales (1995), Frank and Goyal (2009) and Lemmon et al. (2008) are included in addition to initial leverage. Age is also included as an explanatory variable. Results are presented for book and market leverage ratios.

As can be seen from column one, significant positive relationship exists between book leverage and initial leverage ratio. For one standard deviation change in the initial leverage ratios book leverage (market leverage) changes by 8% (6%). Adjusted R-square from regression analysis shows that 16% (10%) of the variation in book (market) leverage could be explained by the initial leverage ratios only. In column two, I include conventional capital structure determinants which are proved to have a consistent relationship with leverage in empirical studies, along with the initial leverage ratios. Surprisingly, initial leverage has the single largest effect on book leverage even after time-varying determinants are taken into considerations. Moreover, including the conventional capital structure determinants increases the adjusted R-square from 16% to 28%, a magnitude of only 12% increase. . Findings are consistent with Lemmon et al. (2008) who find a significant positive relationship between initial leverage and firms' future leverage ratios for US firms and this relationship remain existent even after traditional capital structure determinants are taken into considerations.

Table 2 The Effect of Initial Leverage on Future Leverage

The sample consists of all non-financial firms listed on Tokyo Stock Exchange First and Second Section for the period 1980 to 2014. The table presents standardized regression coefficients from panel OLS regression of book leverage and market leverage on two different specifications. The scaled regression coefficients indicate the percentage change in leverage for one standard deviation change in the independent variables. For example, regression coefficients in column one shows 8% percent of the variation in book leverage can be explained by initial leverage ratios only. Year fixed effect indicates whether calendar year fixed effects are included in the model. Adjusted R^2 measure the percentage of variation in leverage ratios that can be explained by each model specifications. For example, R^2 corresponding to column one shows 16% of the variation in leverage ratios can be explained by initial leverage ratios only. t-stats are presented in the parentheses. The variable definitions are provided in the methodology section.

Variables	Book Leverage		Market Leverage	
Initial Leverage	0.08***	0.06***	.06***	0.04***
	(21.60)	(68.27)	(62.18)	(47.36)
Log(sales)		0.02***		0.01***
		(30.71)		(17.38)
Market-to-book		-0.00***		-0.03***
		(-4.40)		(-39.98)
Profitability		-0.03***		-0.05***
		(-33.77)		(-56.69)
Tangibility		0.00***		0.01***
		(3.77)		(13.72)
Industry median lev.		0.05***		0.06***
		(56.18)		(62.83)
Cash flow volatility		0.01***		0.00***
		(13.57)		(2.36)
Age		0.03***		0.03***
		(32.36)		(26.03)
Year fixed effects		Yes		Yes
Adj. R^2	16%	28%	10%	37%
Observations	38557	38557	38557	38557

*** indicates significance at 1% level and ** indicates significance at 5% level

Among the control variables, industry median leverage generates the largest effect on leverage in this specification. For one standard deviation increase in industry median leverage, book leverage（market leverage）increases by 5%（6%）. Firms in a particular industry tend to follow a similar target capital structure which is consistent with the tradeoff theory.

Firm size and leverage are significantly positively related which is also consistent with the trade-off theory. For one standard deviation increase in firm size, book leverage（market leverage）increases by 2%（1%）. Large firms are more diversified, thus have the low risk of failure. Besides,

cost of issuing debt is also lower for large firms.Tangibility is also significantly positively related to leverage, indicating the importance of collateral in the case of borrowing. In the event of default, collateralized assets could be sold to recover the loaned money, which increases the creditworthiness of firms with high tangible assets. Rajan and Zingales（1995）have reported positive effects of tangibility and firm size on leverage for Japanese firms. Profitability is significantly negatively related to leverage which is consistent with the pecking order theory（Myers and Majluf, 1984）. Rajan and Zingales（1995）and Wald（1999）have also reported a significant negative relationship between profitability and leverage for Japan. Market-to-book ratio is significantly negatively correlated with leverage. High growth firms prefer less debt to maintain financial slack to take advantage of future investment opportunities. Besides risk of financial distress is also high for such firms. Alternatively, this could be related to the timing of equity issuance because firms prefer to issue more equity when market price is high.

Surprisingly, a significant positive relationship is observed between book leverage and cash flow volatility. Keiretsu firms, because of their interlocking shareholdings and relationships with the main bank, can undertake riskier activities than nonmember firms, which may lead to a positive relationship between leverage and cash flow volatility. Wald（1999）also reports a positive relationship between leverage ratio and cash flow volatility for Japan.

Age is significantly positively related to leverage. Debt is used in mature firms as a disciplining device to check on agency problems. However, because of unique institutional setting, agency problem in Japan is considered low. Japanese firms has been using bank loan as the prime source of financing. It is not until 90`s that capital market began to play a major role in financing. If firms stick to their initial leverage ratio older firms must have a higher leverage ratio.

(1) Keiretsu versus non-keiretsu firms

One of the unique characteristics of Japanese industrial organization is the keiretsu form of business organization. Most of the Japanese firms are member of the six major industrial groups Mitsubishi, Mitsui, Sumitomo, Fuyo, Dai-ichi Kangyo, and Sanwa. Keiretsu firms are firms which are member of these six major industrial groups and participate in the president club. The rest are non-keiretsu firms. The data for keiretsu firms is obtained from *the Kigyo Keiretsu Soran*. Every year 20-25% firms are included in the keiretsu firms.

Table 3 provides summary statistics about keiretsu and non-keiretsu firms. The table shows that keiretsu firms have higher book and market leverage than that of non-keiretsu firms. Market-to-book value, size, cash flow volatility and age of keiretsu firms are also higher than that of non-keiretsu firms. Profitability and tangibility of keiretsu firms are lower than that of non-keiretsu firms.

Table 3 Descriptive Statistics: Keiretsu and non-keiretsu Firms

Sample firms include all firms listed on the Tokyo Stock Exchange First and Second Section for the period 1980 to 2014. Table 1 presents means, standard deviations (SD), of the variables used in the study for keiretsu and non-keiretsu firms. Variable definitions are provided in the sample selections and methodology sections.

	Keiretsu		Non-keiretsu	
Variables	Mean	SD	Mean	SD
Book Leverage	0.63	0.17	0.57	0.15
Market Leverage	0.52	0.20	0.49	0.21
Profitability	0.03	0.03	0.04	0.06
Tangibility	0.25	0.20	0.27	0.69
Market-to-book	1.37	1.2	1.22	1.05
Log(sales)	5.18	0.63	4.82	2.40
Cash flow volatility	0.02	0.04	0.01	0.12
Age	65	19	52	18
Observations	8868		36551	

Table 4 shows results of the regression analysis when leverage is regressed on initial leverage, control variables and keiretsu dummy. A unique characteristic of Japanese firms is keiretsu. I made an analysis to find out whether keiretsu firms have an effect on firm's future leverage. For this purpose, a dummy variable is used in the regression analysis to indicate whether a firm is a keiretsu firm or not. Firms included in the keiretsu are changed from time to time. For example, keiretsu firms dummy from 1980 to 1983 are based on the information published in 1973. Again in the year 1984 there has been a change in the composition of keiretsu firms. So the keiretsu dummy in the following years is based on this information until new keiretsu firms list is published. The same process has been used to indicate the keiretsu and non-keiretsu firms every time a new list of keiretsu firms is published. Since there has been no publication after 2000, keiretsu dummy in the following years are assumed to be the same as prior year.

Results of the regression analysis are presented for two sub-periods- the pre-bubble period and the post bubble period. In the pre-bubble period, during 1970s and 1980s Japan' s economy was growing very quickly. Bank loan had been the major source of financing for firms. After the burst of the bubble in 1990, financial system had been deregulated and market started to play a role in financing.

Regression result shows that initial leverage is significantly positively related to future leverage. Control variables maintain the same sign and significance as regression analysis in table 2. The main variable of interest keiretsu dummy is significantly positive which means that keiretsu firms have higher leverage than the non-keiretsu firms. Keiretsu firms are characterized by cross shareholdings and have special relationship with the main bank. Because of this, keiretsu firms

Table 4 Leverage of keiretsu and non-keiretsu firms in the pre- and post-bubble periods

The sample consists of all non-financial firms listed on Tokyo Stock Exchange First and Second Section for the period 1980 to 2014. The table presents standardized regression coefficients from panel OLS regression of book leverage and market leverage on firm's initial leverage, control variables and keiretsu dummy. Keiretsu dummy is equal to 1 for keiretsu firms and o otherwise. Results are presented for both pre-bubble (1980-1989) and post-bubble (1990-2014) period. The scaled regression coefficients indicate the percentage change in leverage for one standard deviation change in the independent variables. Year fixed effect indicates whether calendar year fixed effects are included in the model. Adjusted R^2 measure the percentage of variation in leverage ratios that can be explained by the model specifications. t-stats are presented in the parentheses. The variable definitions are provided in the methodology section.

Variables	Pre-bubble Book Lev.	Pre-bubble Market Lev.	Post-bubble Book Lev.	Post-bubble Market Lev.
Initial Leverage	0.04***	0.04***	0.03***	0.02***
	(20.33)	(21.22)	(20.33)	(20.15)
Industry Median Lev.	0.04***	0.06***	0.07***	0.09***
	(20.56)	(33.25)	(51.84)	(57.45)
Profitability	-0.08***	-0.08***	-0.06***	-0.07***
	(-38.59)	(-39.04)	(-37.84)	(-40.72)
Tangibility	0.01***	0.04***	0.00***	0.00***
	(7.90)	(4.99)	(2.97)	(2.79)
Market-to-book	-0.01***	-0.01***	0.01*	-0.09***
	(-3.99)	(-15.81)	(1.68)	(-49.07)
Log (sales)	0.01**	0.07***	0.08***	0.02***
	(1.99)	(9.83)	(16.13)	(4.08)
Cash flow volatility	0.01***	0.01***	0.00***	0.00*
	(4.40)	(3.35)	(4.05)	(1.81)
Age	0.02***	0.01***	0.03***	0.02***
	(12.56)	(7.30)	(22.79)	(17.14)
Keiretsu	0.02***	0.01***	0.01**	0.01***
	(7.31)	(5.87)	(2.20)	(4.75)
R^2	21%	33%	27%	40%
Observations	11,016	27,540	11,016	27,540

can take on more leverage than the non-keiretsu firms. Nakatani (1984) and Hirota (1999) have also reported that keiretsu firms have higher leverage than non-keiretsu firms. Moreover, keiretsu dummy is significantly positive irrespective of the time period taken into account. Guo (2007) finds that keiretsu affiliations are beneficial to firms, even in the latter period.

(2) Variance Decomposition of Leverage

Regression analysis shows a time-invariant factor is missing from existing capital structure

specifications that have a significant influence on firms' future leverage ratios. To find out how important the unobserved factor is compare to the time varying factors, I perform a variance decomposition of leverage ratios. Within firm and between firms variation in book leverage ratio is 11.50% and 17.18% respectively. For market leverage the estimates are 13% and 17.38% respectively. Between firm variations in book leverage (market leverage) is 50% (33%) larger than that of within firm variation. This finding suggests that firms leverage ratios varies more across firms than over time which is consistent with figure 2. An unobserved factor(s) keeps the cross sectional differences in leverage ratios remain persistent over long term. Next, I perform an analysis of covariance (ANCOVA), to examine the contribution of time varying and unobserved factors in the variation of leverage ratios. The analysis is based on following regression model :

$$Leverage_{it} = \alpha + \beta X_{it\text{-}1} + \eta_i + v_t + \varepsilon_{it} \qquad (2)$$

Where α is the constant, X represents 1-year lagged control variables, v_t is the time-fixed effect, η_i is firm fixed-effect, ε_{it} is the random error term, i indexes firms and t indexes year respectively.

Table 5 reports the result of analysis of covariance (ANCOVA). Each Column in the table present different model specifications using conventional capital structure variables and firm-specific effects. The numbers in the body of the table except the last row report the partial sum of square for each factor in the model. To get this figure, we calculate the partial sum of square of every model and normalize the effect for each factor. The sum of each column is 1. The normalized partial sum of square corresponding to each factor indicate the percentage of variation in leverage ratios that can be explained by that factor. For example, in column (d) the value corresponding to profitability is 0.13, meaning 13% of the variation in leverage ratios can be explained by profitability. When only one factor is taken into considerations, the total variation in leverage ratios is attributable to that factor. For example, in column (a) and (b) when only firm-specific effect and time effect are examined, a value of 1are assigned to that factors.

The adjusted R-square reported at the bottom row of the table shows percentage of the variation in leverage ratios that can be explained by each model. Adjusted R-square corresponding to Column (a) shows about 70% (57%) of the variation in book leverage (market leverage) ratios can be explained by the firm fixed effect only. Whereas column (b) shows only 7% (15%) of the variation in book leverage (market leverage) ratios can be explained by time fixed effect. This finding implies that cross sectional variation in leverage ratios explain most of the variation in leverage ratios than time series variation. This result is also consistent with the figure 2 which shows leverage ratios of Japanese firms remain stable over long term but cross sectional differences remain persistent.

In order to find out the predictability of traditional capital structure determinants I include time varying determinants inspired by Rajan and Zingales (1995), Frank and Goyal (2009). Column (d) shows R-square from this specification is 25%. However, adding firm-fixed effect to this model increases the adjusted R-square from 25% to 75%. For market leverage the value of

Table 5 Variance Decomposition Analysis

The sample consists of all non-financial firms listed on the Tokyo Stock Exchange First and Second Section for the period 1980-2014. The table presents the variance decompositions for various model specificatioins. I calculate the partial sum of square for each model specifications and normalize the effect of each factor by dividing it by the total sum of square.Thus the sum of all effects in a column will be 1. Firm FE are firm fixed effects and Year FE are calendar year fixed effects.The adjusted R2 in the bottom of the table shows how much of the variation in leverage ratios can be explained by these factors. For example, R2 corresponding to column (g) shows 77% (67%) of the variation in leverage ratios can be explained by this model specifications.The number in the body of the table indicate the sum of square explained by each factor. For example, in column (g) 6% (4%) of the variation in leverage ratios can be explaind by the factor profitability.

Panel A: Book Leverage							
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Firm FE	1.00		0.77		0.85		0.82
Year FE		1.00	0.33	0.41	0.03	0.39	0.03
Log (sales)				0.07	0.01	0.04	0.00
Market-to-book				0.00	0.00	0.01	0.00
Profitability				0.13	0.04	0.21	0.06
Tangibility				0.01	0.03	0.02	0.05
Industry med lev				0.37	0.04	0.27	0.01
Cash flow volatility				0.01	0.00	0.00	0.00
Age						0.03	0.02
Keiretsu						0.03	0.01
Adj. R^2	0.70	0.07	0.76	0.25	0.75	0.39	0.77
Panel B: Market Leverage							
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Firm FE	1.00		0.70		0.67		0.63
Year FE		1.00	0.30	0.34	0.17	0.30	0.20
Log (sales)				0.01	0.04	0.01	0.01
Market-to-book				0.09	0.05	0.07	0.07
Profitability				0.21	0.03	0.22	0.04
Tangibility				0.01	0.01	0.01	0.01
Industry med lev				0.34	0.03	0.35	0.01
Cash flow volatility				0.00	0.00	0.00	0.00
Age						0.02	0.02
Keiretsu						0.01	0.01
Adj. R^2	0.57	0.15	0.60	0.41	0.64	0.48	0.67

R-square increases from 41% to 64%.This implies that time varying determinants cannot explain all the variation in leverage ratios. Rather unobserved factors have more explanatory power than traditional capital structure determinants.

In column (f) and (g), I add keiretsu and age as a unique characteristics of Japanese firms. This model specification shows time varying factors can explain 39% (48%) of the variation in book (market) leverage whereas 77% (67%) of the variation in book (market) leverage ratios can be explained when firm effect is added to the model. Adding firm effect in this model also increases the adjusted R-square substantially. In sum, in all specifications unobserved factors explain a significant fraction of the variation in leverage ratios. Time varying factors derived from traditional capital structure theories cannot explain majority of the variation in leverage ratios.

Results are analogues to Lemmon, Roberts and Zender (2008), who find that most of the variation in leverage ratios is cross sectional as oppose to time series variation. Firm-fixed effect alone can explain 60% of the variation in leverage ratios for US firms whereas only 1% of the variation in leverage ratios can be explained by time varying factors.They conclude that an important unobserved factor is missing from the existing model and this factor has more explanatory power than any other traditional capital structure determinants.

(3) Short Run versus Long Run Effects

The existence of adjustment costs often prevent firm from immediately adjusting to target leverage ratio. In such a case firms may allow the leverage ratios to move around a range which could result in persistent effect in leverage ratios. The variability in leverage ratios cannot be completely explained by taking only one year lag in the determinants, if there is any delay in the adjustment to target leverage ratio. To account for such a possibility, a distributed lag model is used to capture the long-term changes in capital structure. I estimate the following leverage model using a six-year lag:

$$Leverage_{it} = \alpha + \beta_s X_{it-s} + \gamma Leverage_{i0} + v_t + \varepsilon_{it} \quad (3)$$

Where, $Leverage_{i0}$ is the firm's initial leverage, X represents the control variables, v_t is the time-fixed effect, and ε is the error term. ε is assumed to be potentially heteroskedastic and correlated within firms. Using the Akaike Information Criterion (AIC), the coefficient estimates are calculated for one-year through six-year lag control variables. I present regression coefficient using six year lag instead of presenting all regression coefficients. Table 6 compares the short-term and long-term regression coefficients for book leverage and for market leverage. The first and second columns indicate the changes in leverage in response to the short-run and long-run changes in the leverage determinants, respectively. Short-run changes in leverage are measured using one-year lagged explanatory variables and long-run changes in leverage are measured using six-year lagged control variables. To enable comparability, each regression coefficient is multiplied by the corresponding variable's standard deviation. The scaled regression coefficients indicate the percentage changes in leverage for one standard deviation changes in the leverage determinants.

Table 6 shows positive relationship between leverage and firms' initial leverage remains in

Table 6 Short Run versus Long Run Effects

The sample consists of all non-financial firms listed on the Tokyo Stock Exchange First and Second Section for the period 1980 to 2014. The table presents the parameter eatimates under both short run and long run lag in the determinants. Parameter estimates under short run is calculated using 1-year lag in the determinants.Parameter estimates under long run is calculated using 6-year lag in the determinants.The scaled regression coefficient derived by multiplying regression coefficients by corresponding standard deviations, indicate the percentages changes in the dependent variable for one standard deviation changes in the independent variable. Year fixed effects indicate whether calendar year fixed effects are included in the model.The t-statistics for corresponding regression coefficients are reported in the parenthesis. Variable definitions are provided in the methodology section.

	Book Leverage		Market Leverage	
Variable	Short Run	Long Run	Short Run	Long Run
Initial Leverage	0.03***	0.02***	0.03***	0.07***
	(26.58)	(19.05)	(27.68)	(59.66)
Log(sales)	0.07***	0.07***	0.08***	-0.01**
	(15.93)	(12.83)	(4.96)	(-2.13)
Market-to-book	-0.00	-0.00	-0.03***	-0.02***
	(-0.57)	(-0.73)	(-36.49)	(-11.12)
Profitability	-0.09***	-0.09***	-0.07***	-0.06***
	(-50.19)	(-44.25)	(-58.39)	(-35.35)
Tangibility	0.00***	0.00*	0.01***	0.00
	(3.59)	(1.99)	(3.70)	(1.25)
Industry median leverage	0.06***	0.06***	0.07***	0.07***
	(48.78)	(40.98)	(57.71)	(59.66)
Cash flow volatility	0.00***	0.01***	0.00	0.00***
	(5.99)	(8.42)	(1.34)	(3.67)
Age	0.03***	0.02***	0.01***	0.02***
	(26.19)	(20.33)	(17.75)	(13.91)
Keiretsu	0.02***	0.01***	0.01***	0.01***
	(19.82)	(15.39)	(12.29)	(10.35)
Year fixed effects	Yes		Yes	
Adj. R^2	34%		41%	
Observations	38,557		38,557	

***indicates significance at 1% and ** indicates significance at 5% level

existence even if long run lag in leverage determinants is taken. This finding is complementary to the long term trend in leverage ratio for Japanese firms that a high levered firm continues to maintain high leverage and a low levered firm continues to maintain low leverage for long term. Among the time varying determinants profitability has the most significant impact followed by industry median leverage both in the short term as well as in the long term. No significant differences exist in the direction and magnitude of the coefficient estimates for short-run and long-

run shifts in the determinants of leverage.

(4) Effect of Unobserved Firm-Specific Variables on Leverage

From previous analysis, it is clear that an unobserved factor is missing from the existing model of capital structure. Firm specific factor (s) explain a large fraction of the variation in leverage ratios. This finding is in line with Lemmon et al. (2008) that majority of the variation in leverage ratios is cross sectional as oppose to time varying. Existence of unobserved factors like culture, technology, managerial characteristics has also been documented in other studies. For example, Hirota et al. (2007) report culture has a significant effect on firms leverage ratios. Hackbarth (2008) reports a significant impact of managerial characteristics on firms' capital structure. If the unobserved factor is not accounted for in the capital structure model, the coefficient estimates will be biased. Pooled Ordinary Least Square regression ignores firm-specific effects and serial correlation in the errors structure whereas fixed effects regression is a powerful tool for removing omitted variables.

Table 7 presents the coefficient estimates from the pooled OLS regression, the fixed effect regression and the GMM method regression. Pooled OLS assumes errors are possibly heteroskedastic and equicorrelated within firms. Fxed effect method regression is estimated using the following equations:

$$Leverage_{it} = \alpha + \beta X_{it\text{-}1} + \eta_i + v_t + \mu_{it} \tag{4}$$

$$\mu_{it} = \rho\mu_{it\text{-}1} + \omega_{it} \tag{5}$$

where α is the constant, X represents 1-year lagged control variables, η_i is firm fixed-effec, v_t is the time-fixed effect. μ is assumed to be stationary and ω is assmumed to be serially and crosssectionally uncorrelated but possibly heteroskedastic.

The marginal effect of all variables is statistically significant in OLS and fixed-effect model specifications except for age. Leverage is significantly positively related to age when between firm variations in leverage is taken into considerations in pooled OLS regression. However, when only within firm variation is taken into considerations in fixed effect regression leverage turns insignificantly negative. Possibly old firms have higher level of debt than young firms but over time the old firm may itself be reducing its leverage. Although statistically significant, other variables show significant decline in coefficient value from pool OLS to fixed effect regression. Some of the variables fall by 100% or more than that. On an average both book and market leverage estimates fall by 40% when fixed effect method is used. Estimated serial correlation coefficient for book and market leverage is 0.70 and 0.65 repectively which indicates there may be serial correlation in the error structure.The differences in regression coefficients from pooled OLS to fixed effect regression could be attributed to unobserved firms-specific effects.

Endogeneity could affect the results of this study if unobservable factors affect the leverage of the firm and other firm-specific characteristics. Additionally, reverse causality between leverage and independent variables could also contribute to endogeneity problem. Since this study finds

Table 7 Coefficient Estimates in OLS, Fixed Effect and GMM Model Specifications

The sample consists of non-financial firms listed on the Tokyo Stock Exchange First and Second Section from the period 1980 through 2014. The table presents the parameter estimates for both book and market leverage under pooled OLS, fixed effect, and GMM method regressions. t-values for corresponding regression coefficients are reported in the parentheses. AR(1) is the first-order serial correlation coefficient estimate.

Variable	Book-Leverage (Pooled OLS)	Book-Leverage (fixed-effect)	Book Leverage (GMM)	Market-Leverage (Pooled OLS)	Market-Leverage (fixed-effect)	Market Leverage (GMM)
Initial Leverage	0.03***		0.02***	0.03***		0.03***
	(17.59)		(16.48)	(17.68)		(21.51)
Profitability	-0.09***	-0.04***	-0.06***	-0.06***	-0.04***	-0.07***
	(-50.77)	(-39.49)	(-27.67)	(-60.46)	(-46.60)	(-25.12)
Tangibility	0.002***	-0.00***	0.00	0.00***	0.00***	0.00
	(3.39)	(-0.06)	(0.93)	(3.54)	(6.16)	(1.21)
Market-to-book	-0.002	0.00***	0.02***	-0.03***	-0.02***	-0.03***
	(-1.39)	(6.87)	(6.34)	(-34.42)	(-29.85)	(-8.00)
Log (sales)	0.09***	0.08***	0.07***	0.03***	0.05***	0.01***
	(20.22)	(14.22)	(13.12)	(9.71)	(18.57)	(3.46)
Industry Median Lev.	0.07***	0.03***	0.06***	0.07***	-0.04***	0.07***
	(61.86)	(3.29)	(56.15)	(76.31)	(-2.46)	(50.35)
Cash-flow volatility	0.004***	0.00	0.00	-0.00	-0.00	0.00***
	(3.82)	(1.54)	(0.82)	(-1.03)	(-1.64)	(6.67)
Age	0.02***	-0.00	0.01***	0.01***	-0.00	0.01***
	(21.76)	(-1.26)	(27.50)	(12.14)	(-0.01)	(6.67)
Keiretsu	0.02***	-0.00***	0.03***	0.01***	0.00**	0.02***
	(19.69)	(5.32)	(27.50)	(11.98)	(2.16)	(15.62)
R^2	32%	75%		39%	62%	
AR(1)		0.70			0.67	
Observations	38,557	38,557	38,557	38,557	38,557	38,557

***indicates significance at 1% and ** indicates significance at 5% level.

that firm's past leverage is associated with current leverage GMM is used to examine whether endogeneity affects the results of this study.Column three shows that all coefficient estimates remain statistically significant in GMM method regression.Coefficient estimates are unlikely to be tainted by the endogeneity problem.

6 Conclusions

Motivated by the inconclusive evidence on capital structure determinants and recent evidence on the persistence in leverage ratios over the long term (Lemmon et al., 2008), this study examines

the determinants of capital structure of non-financial firms listed on the Tokyo Stock Exchange. This study demonstrates that the capital structure of Japanese firms remains largely unchanged over long periods. Highly levered firms remain highly levered and low levered firms remain low levered for the long term despite some convergence in the short term. Time varying determinants explain only a small part of the variations in the leverage ratios. The persistent effect in the leverage ratios cannot be explained using traditional theories. It appears that some unobserved factors are missing from existing specifications. The regression results show a significant positive relationship between initial leverage and future leverage ratios. The relationship holds whether we take into account other time varying leverage determinants, which indicates that firms' future leverage ratios are closely related to past financing activities. The fixed effect regression also shows that removing unobserved factors from the regression analysis causes the value of the coefficient estimates to decline. These unobserved factors remain constant over the long term, causing firms' leverage ratios to remain persistent for decades. Current capital structure theories consider only time varying determinants and ignore important time invariant component（s）. Additionally, this study finds that old firms have higher leverage than young firms and keiretsu member firms have a significantly higher leverage than non-keiretsu firms.

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