Self-fulfilling Distortion and Ownership Structure
At the Dawn of the Japanese Capitalism*

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Abstract

Does the ownership structure affect performance? We first theoretically show that in an inefficient market, investors motivate managers to pursue a higher return on equity, the short-term performance indicator instead of a higher return on asset, the long-term indicator and encourage managers to distort the financial leverage. This self-fulfilling distortion implies that, in an inefficient market, a greater concentration of ownership improves long-term performance through containing the distortion. To test the prediction, we build a new data set of Japanese firms from 1878 to 1910. Then, we show that the Japanese market then was inefficient, that the bond flotation was distorted among low and mediocre performing firms, and that a greater concentration of ownership at the president improved the return on asset. These results are consistent with the tendency in contemporary non-Anglo-American advanced economies. A greater concentration of ownership offsets the adverse effects of a less efficient capital market.

Keywords: multitask moral hazard; ownership structure; financial leverage; self-fulfilling distortion; skewness adjusted variation coefficient.
JEL: G32; O16; K22.

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1 Introduction

Does the ownership structure affect firms' performance? If the ownership structure matters, under what conditions does it? The residual rights of control and residual claims have been defined as the rights of shareholders in the modern corporate law for a long time. The idea behind this legal structure is that with the residual control right over the object attached to the residual claimant, she/he would exert the residual control right to maximize the residual, which would, in turn, contribute to the improvement of resource allocation (Grossman and Hart (1986)).

As long as the shareholders, the residual claimants, directly perform the residual control right, the prospect surely holds. However, once a firm is established as a joint stock company, its shares are widely held, and its management is delegated to somebody else than dominant shareholders, good management is not secured anymore. The portion owned by a specific individual might be too small to monitor the management strictly, or diversified investment might even reduce shareholders' incentives of monitoring (Smith (1937[1776]), pp. 699–700).

Sharing the view with Smith (1937[1776]), Jensen and Meckling (1976) argued that a decrease in the stock holding ratio of the founding manager intrinsically increase the efficiency loss due to the moral hazard.

A remedy to mitigate the possible moral hazard is an active secondary market for corporate shares (Holmstrom and Tirole (1993)). The threat of acquisition and replacement of managers is expected to discipline the current managers, as argued since Jensen and Meckling (1976) and Fama (1980).

A question regarding the view is capsulated as whether the ownership structure matter for the corporate governance. The question has been a focal point of discussion on corporate governance and corporate finance. Demsetz and Lehn (1985) rejected a possibility of relations between the ownership concentration and performance for the major US listed firms, who were later supported by Himmelberg, Hubbard and Palia (1999) and Demsetz and Villalonga

(2001). Regarding the founding manager's ownership, Anderson and Reeb (2003) did not find any evidence for exploitation of minority shareholders by founding owner-managers, using the US data. Morck, Shleifer and Vishny (1988) using the US data found weak evidence that participation by founding family in the board might deteriorate performance. Davies, Hillier and McClogan (2005) using the British data also found a nonlinear relationship between the ownership structure and performance. However, such effects are, at greatest, co-deterministic as argued by Davies et al. (2005), instead of the dominant impact of the ownership structure. Helwege, Pirinsky and Stulz (2007) dynamically described the evolution of listed firms, using 1970–2001 initial public offering data in the US, finding that the better performers have become faster and more widely held after being listed and that agency costs do not significantly affect the evolution of the ownership structure.

As Shleifer and Vishny (1986), Bolton and Scharfstein (1996), Mahrt-Smith (2005), Gorton and Kahl (2008), Aslan and Kumar (2012), Dhillon and Rossetto (2015), and many other theoretical works argue, there do exist diversity of ownership structure among the US firms, and there must be a rationale of the diversity. Empirical results for the irrelevance of ownership structure do not contradict with those theoretical predictions. A point is how efficient the market is. If the market is sufficiently efficient, any distortion is quickly arbitraged by market participants either by selling or buying shares. Then, on the equilibrium paths, we see multiple types of ownership structure but do not find any statistical difference in performance among them. Indeed, using the US data, Gambola and Marciukaityte (2013) showed that the leverage is a choice under managerial discretion, and Ağca, Şenay and Mansi (2008) showed that with vast holding ratio of outside shareholders, managerial ownership rather increases financial leverage. Jiraporn and Gleason (2007) showed that leverage tends to be greater if shareholder rights are more restricted, using the US data. Furthermore, estimates by Ang, Cole and Lin (2000) showed that agency costs depend on ownership and management structure. Meanwhile, Francis, Hasan, Koetter and Wu (2012) showed that interest rates of bank loans price in the expected behavior of the board, using the US data.

Thus, in the US, there does exist strategic behavior by owner-managers, which could potentially distort the financial leverage. However, it appears that the US market is so sufficient that any possible distortion has been arbitraged and priced in, or effectively reined in by the banking sector's quick financial arrangements, and hence has left no statistically significant variance of performance. This inference isconsistent with the observed high performance of the US managers (Maloney and Sarrias (2017)).

Meanwhile, using the European data, Laeven and Levine (2008) showed that multiple block holders help prevent managers from exploiting small shareholders, which indicates that the ownership structure matters for performance. Ben-Nasr, Boubaker and Rouatbi (2015) demonstrated, using the French data, that the ownership structure does affect the financial leverage, that is, the greater divide between ownership and management is prone to a longer maturity of debt, while the presence of multiple block holders curbs such distortion. Although Julian and Mayer (2001) denies the effect of the ownership structure on performance using the German data, it does not reject the hypothesis by Laeven and Levine (2008), provided that block holders often control major German firms and that the banking sector dominates the German corporate finance.

Meanwhile, Driffield, Mahambare and Pal (2007) found that in East Asia excluding China and Japan, manager-owned firms better weathered the financial crisis in the late 1990s. Abdallah and Ismail (2017) showed that a smaller concentration of ownership should be accompanied by a better governance to beat the same performance, using the data from the Gulf Cooperative Council region. Furthermore, Lin, Ma, Malatesta and Xuan (2013) built a data set from 20 non-US advanced economies. Focusing on a gap between the control and cash-flow rights of controlling managers (Edwards and Weichenrieder (2009)), they found a possibility of the leverage distortion through over-reliance on the bond flotation, when a greater concentration of ownership implies a greater difference between the control and cash-flow rights of controlling managers.

In short, weakly monitored managers are suspected to leverage greater than optimal in

non-US markets. The bond market is more likely to be distorted because the risk of moral hazard is better priced in by the banking sector, as shown by Lin, Ma, Malatesta and Xuan (2011a), or the banking sector actively forms arrangements to curb moral hazard, as shown by Lin, Ma, Malatesta and Xuan (2012). San Martín and Saona (2017) reported a similar case in Chile where with pyramidical ownership structure the concentration of ownership tends to raise the leverage. Thus, the ownership structure does affect performance, likely through possible distortions in the bond flotation in non-US economies. These recent works supported prediction by Dyck and Zingales (2004), which argued that less developed judicial system and the financial media allow a greater private interest of block holders. By the same token, the private benefit of block holders might be an unavoidable social cost to make up a less efficient market.

These results contrasting between in the Anglo-American and non-Anglo-American cases indicate that as Jensen and Meckling (1976) and Fama (1980) inferred, the well-functioning stock market of the US level could offset possible negative effects of the diffusion and dilution of ownership. Then, a ramifying question arises. What happens along with own development paths in the other markets around the globe that are less efficient than their US counterpart, as implicitly addressed by Lin et al. (2011a, 2012, 2013), Ben-Nasr et al. (2015), Abdallah and Ismail (2017) and other recent works.

Japanese experience particularly in the period when the "separation of ownership and management" regarding Berle and Means (1933) and Chandler (1977) went under way, would be a promising case. It transformed itself from the samurai's nation to a modern capitalist economy without sharing most of the historical background with the West, as many emerging economies neither. After toppling the Shogunate in 1868, the new imperial government of Japan began its effort for modernization. In 1878, the Tokyo Stock Exchange and the Osaka Stock Exchange were established. Furthermore, the Commercial Code of 1899 explicitly stipulated legal requirements for a joint stock company and standardized the form of financial statements, which made more information publicly available and prompted a further expansion of the stock and

bond markets after that.

From the late nineteenth century, the Japanese corporate finance and governance experienced two distinctive phases. The first one was the entrepreneurial boom from the mid-1880s. The cotton-spinning, railway, and other modern industries raised large initial costs by taking the form of joint stock companies and issuing corporate shares while relying on the banking sector for debts. The second phase was a reduction in the bank loan reliance and an increase in the bond flotation from the late 1890s (Hoshi and Kashyap (2001), pp. 15–50). From the second phase, senior employees began to climb to management positions and be promoted to a board member from the late 1890s. Functional diversification of the board toward professional management meant that possibility of moral hazard by the management then faced the Japanese corporate sector.

This development suggests an opportunity to understand the interactions between variation in the ownership and management structure, the financial leverage, and the performance as an outcome. Therefore, we retrace the changes experienced by the Japanese corporate sector, focusing on the ownership structure, the financial leverage, the performance, and the market valuation on them. To do this, we construct an original panel data set of all firms listed on the Tokyo Stock Exchange from 1878 to 1910, by hand-collecting information published in financial statements. Japan in the late nineteenth century was one of the early cases of non-Anglo-American nations that succeeded in nurturing a well-functioning capital market.

Study on experiences of advanced nations in the nineteenth and early twentieth centuries also provide us with contemporary policy implications. Most regulations on the financial markets, which had been interventionist particularly until the 1980s, were introduced as a response to the collapse of the financial markets followed by the Great Depression in the 1930s. Amid the Great Depression, the great failure of the market, advanced nations tightened regulations on the corporate finance, reckoning serious distortion of the market due to asymmetric information. An example was what the US typically went through such as enactments of the Securities Act of 1933 and Securities Exchange Act of 1934, which created the Securities

and Exchange Commission, and the Generally Accepted Accounting Principles formed in the 1930s. Among advanced nations, regulations in Japan and Germany were particularly stringently tightened, and there the banking sector replaced the stock and bond markets as the primary source of corporate finance.

A half century later, responding to the development of information and communication technologies, advanced nations commenced structural reforms to revitalize the financial sector in the 1980s. In the reform efforts, a cornerstone has been deregulation of the stock market. In advanced nations, not least Japan and Germany, deregulations of the stock market and enhancement of direct finance mean recovery of the pre-regulated stock market in the pre-Great Depression time. Sharing the motivation, quantitative evaluations of that period have been presented by Borg, O. and Leeth (1989), Leeth and Borg (1994, 2000), and Banerjee and Eckard (2001) on the US, Franks, Mayer and Wagner (2006) and Kling (2006) on Germany, Hamano, Hoshi and Okazaki (2009) on Japan. Also, international cross-section overviews have been suggested as a reference for regulatory alternatives, such as La Porta, Lopez-de Silanes and Shleifer (2008). However, one of the most basic questions is not addressed; whether the market discipline worked or the ownership structure complemented a potentially imperfect market under lighter regulations.

Thus, most nations have implemented structural reforms to recover vibrant stock markets without being conscious about how much own market worked under lighter regulations, to what extent it was distorted due to asymmetric information, and to what extent the ownership structure complemented the potentially imperfect market in the pre-Great Depression period. It is almost a navigation to be back home without an own chart. Without the own chart, in practice, many nations simply have followed the US precedents for deregulation. This research attempts to place a building block for understanding the origin of the Japanese capital market with preceding works on pre-regulated markets from a long-sighted perspective. Reflection of Japan's experiences of changes in the ownership structure more than one century ago would still bring out meaningful lessons to Japan's ongoing structural reforms and other economies

also running reforms.

The rest of the paper is organized as follows. Section 2 presents a simple model to capture self-fulfilling distortion of the financial leverage to manipulate the return on equity under the "separation of ownership and management," and deducts a few hypotheses to be empirically tested. Then it introduces the data set we build. Section 3 examines whether the ownership structure affected performance, and how the market predicted the performance of firms. We also test whether enactment of the Commercial Code of 1899 affected the impact of the ownership structure on performance. Section 4 focuses on the financial leverage as a possible channel of governance distortion. Section 5 wraps up the results and discusses them.

2 Model and data

2.1 Model of self-fulfilling leverage distortion

Our focus is partly in line with that of Lin et al. (2011a, 2012, 2013), paying attention to possible distortion of the financial leverage. However, in this period, a greater concentration of ownership simply implied the lion's share against the total share and hence it did not imply a greater difference between the control rights and cash-flow rights of controlling managers (Edwards and Weichenrieder (2009)). Instead, suitable would be a more naive and classical inference of Israel (1992) that "more efficient managers use less debt" and that "firms with supermajority rules issue less debt."

Motivated by such a view, we obtain a prediction applying the multitask principal agent model by Holmstrom and Milgrom (1991) to the context of the self-fulfilling undesirable equilibrium in the imperfect market (Diamond and Dybvig (1983); Goldstein and Pauzner (2004); and Kunieda and Shibata (2016)). Assume that there are two-dimensional tasks for a manager; the first dimension, t_1 is to increase the return on equity (ROE) and the second dimension, t_2 is to increase the return on asset (ROA). We standardize human resource endowment of the

manager as 1 such that $t_1 + t_2 = 1$. Let C denote the personal cost to be incurred by the manager. We assume that C is strictly convex such that $C_{11}C_{22} - C_{12}^2 > 0$ where $C_{11} \equiv \partial^2 C/\partial t_1^2$, $C_{22} \equiv \partial^2 C/\partial t_2^2$, and $C_{12} \equiv \partial^2/\partial t_1 \partial t_2$. Provided that the cost of efforts to increase the return on equity and the return on asset should be equivalent, we also assume that $C_{11} = C_{22}$, under which strict convexity assumption implies $C_{11} = C_{22} > C_{12}$. Note that we do not exclude a likely possibility that both efforts are complements such that $C_{12} < 0$.

Let B_1 and B_2 denote the marginal contribution of effort in each dimension such that $B_1 \equiv \partial \mathrm{ROE}/\partial t_1$ and $B_1 \equiv \partial \mathrm{ROA}/\partial t_2$. For simplicity, we assume that marginal contribution of the first best efforts for both ROA and ROE are equivalent and are standardized such that $B_1 = B_2 = 1$. The following theoretical predictions are held also when allowing $B_1 \neq B_2$. Given the random shock in the market, we assume that ROE and ROA are realized as

$$\mathrm{ROE} = t_1 + \epsilon_1, \tag{1}$$

and

$$\mathrm{ROA} = t_2 + \epsilon_2, \tag{2}$$

where $\epsilon_1 \sim N(0, \sigma_1^2)$, $\epsilon_2 \sim N(0, \sigma_2^2)$, and $\epsilon_1 \epsilon_2 \equiv \sigma_{12}$.

For simplicity, we assume a full "separation of ownership and management" where the manager does not own shares. Here we assume that the manager is risk-averse such that her/his utility function is approximated as

$$u\left(w - C\right) = -\exp\left[-r\left(w - C\right)\right], \tag{3}$$

where w is remuneration and r is the constant absolute risk-averse coefficient. Often managers are encouraged to be risk-tolerant in an armchair theory. However, as many empirical works have shown or criticized, managerial compensations in contemporary US firms are largely designed to reduce the risk imposed on managers (Blanchard, Lopez-de Silanes and Shleifer (1994); Murphy (1990); Kraft and Niederpr$\acute{}$um (1999) and Bertrand and Mullainathan (2001)). The most persuasive explanation is that managers are risk-averse as human beings (Murphy (2002)).

For simplicity to analyze the model, we temporarily assume that $\mathrm{E}\left[\mathrm{ROE}\right] = \mathrm{E}\left[\mathrm{ROA}\right]$. Then, in a perfect market under symmetric information, any distortion of the financial leverage is impossible and hence $\sigma_1^2 = \sigma_2^2$ and $\sigma_{12} = 1$, because random shock arises only in the current profit, the common numerator. However, in an imperfect market, managers can mechanically stabilize and/or increase the return on equity by manipulating leverage, withholding the information about the manipulation. If the return on equity is used as an indicator to evaluate managers in this inefficient market, then risk-averse managers would distort the distribution of the manipulable return on equity such that $\sigma_1^2 < \sigma_2^2$ and $\sigma_{12} < 1$. Another likely distortion in this inefficient market is to skew to the right the distribution of indicator by which the market evaluates them. Thus, suppose that the market evaluates managers by the return on equity as well as the return on asset that is not manipulable by the financial leverage and that the market is inefficient. Then managers would distort the distribution of the return on equity such that its variance should be smaller, its skewness should be greater, and its expected value should be greater than those of the return on asset.

Note that for shares to be actively traded and for sufficient liquidity to be maintained, there need to participate in the market the sufficient number of "uninformed" investors who know only publicly available information (Kyle (1985); Admati and R. (1988); and Collin-Dufresne and Fos (2016)). Otherwise, no trade would be an equilibrium (Milgrom and Stokey (1982)), because "informed" investors who know the manipulation of the leverage can arbitrage only if "uninformed" investors actively trade. Then, if investment by the "informed"is not sufficiently

competitive, a market with active trades is inevitably left distorted.

For this moment, for analytical simplicity, we proceed with holding the assumption that $\mathrm{E}[\mathrm{ROE}] = \mathrm{E}[\mathrm{ROA}]$, $\epsilon_1 \sim N(0, \sigma_1^2)$, and $\epsilon_2 \sim N(0, \sigma_2^2)$. Relying on the monitoring power of the liquid market (Holmstrom and Tirole (1993)), in order to motivate risk-averse managers, their compensations are designed to reflect stock prices, either directly by stock options or indirectly by bonuses. For simplicity, we standardize the compensation schedule as

$$w = \alpha + \mathrm{STP} = \alpha + \beta_1 \mathrm{ROE} + \beta_2 \mathrm{ROA} = \alpha + \beta_1(t_1 + \epsilon_1) + \beta_2(t_2 + \epsilon_2), \tag{4}$$

where STP is the firm's stock price, and α is the minimum transfer that satisfies the individual rationality constraint.

Since

$$\begin{aligned} &\mathrm{E}[u(w - C)] \\ =& -\exp\left[-r\left(\mathrm{E}[w] - C - r\frac{\mathrm{V}[w]}{2}\right)\right] \\ =& -\exp\left[-r\left(\boldsymbol{\beta}^T\boldsymbol{t} - C(\boldsymbol{t}) - r\frac{\boldsymbol{\beta}^T\boldsymbol{\Sigma}\boldsymbol{\beta}}{2}\right)\right], \end{aligned}$$

where

$$\boldsymbol{t} = \begin{pmatrix} t_1 \\ t_2 \end{pmatrix}, \quad \boldsymbol{\beta} = \begin{pmatrix} \beta_1 \\ \beta_2 \end{pmatrix}, \quad \boldsymbol{\Sigma} = \begin{pmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{12} & \sigma_2^2 \end{pmatrix},$$

the manager chooses $\boldsymbol{t}$, given the remuneration schedule $\boldsymbol{\beta}$, such that

$$\boldsymbol{t} = \arg\max_{\boldsymbol{t}} \boldsymbol{\beta}^T\boldsymbol{t} - C(\boldsymbol{t}) - r\frac{\boldsymbol{\beta}^T\boldsymbol{\Sigma}\boldsymbol{\beta}}{2}, \tag{5}$$

whose first order condition is

$$\boldsymbol{\beta}^T = \frac{\partial C(\boldsymbol{t})}{\partial \boldsymbol{t}}. \tag{6}$$

Then, shareholder j of n total shareholders maximizes the total surplus multiplied by own share with subject to equation (6), the incentive compatibility constraint such that,

$$\max s_j \left[B(\boldsymbol{t}) - C(\boldsymbol{t}) - r\frac{\boldsymbol{\beta}^T \boldsymbol{\Sigma} \boldsymbol{\beta}}{2} \right], \tag{7}$$

where s_j denotes sock holding ratio of shareholder j, and $\sum_{j=1}^{j=n} s_j = 1$.

The first order condition of (7) gives the optimal vector of incentive weights,

$$\boldsymbol{\beta^*} = \frac{\partial B}{\partial \boldsymbol{t}} \left[\boldsymbol{I} + r\boldsymbol{\Sigma} \nabla C(\boldsymbol{t}) \right]^{-1}, \tag{8}$$

where $\boldsymbol{I}$ is unit matrix and $\nabla C(\boldsymbol{t})$ is Hessian matrix of $C(\boldsymbol{t})$. Therefore, under the assumptions $B_1 = B_2 = 1$ and $C_{11} = C_{22}$, we have optimal incentive vector $\boldsymbol{\beta}^*$ as follows.

$$\begin{aligned} \beta_1^* =& \frac{1 + r\left(\sigma_2^2 - \sigma_{12}\right)\left(C_{11} - C_{12}\right)}{1 + r\left[\left(\sigma_1^2 + \sigma_2^2\right) C_{11} + 2\sigma_{12} C_{12}\right] + r^2\left(\sigma_1^2 \sigma_2^2 - \sigma_{12}^2\right)\left(C_{11}^2 - C_{12}^2\right)}, \\ \beta_2^* =& \frac{1 + r\left(\sigma_1^2 - \sigma_{12}\right)\left(C_{11} - C_{12}\right)}{1 + r\left[\left(\sigma_1^2 + \sigma_2^2\right) C_{11} + 2\sigma_{12} C_{12}\right] + r^2\left(\sigma_1^2 \sigma_2^2 - \sigma_{12}^2\right)\left(C_{11}^2 - C_{12}^2\right)}. \end{aligned} \tag{9}$$

We immediately have the following lemma.

Lemma 1. *Self-fulfilling distortion:*

(i) In an efficient market, the incentive is not distorted.

(ii) In an inefficient market, the incentive is distorted toward an overemphasis on the return on equity.

(iii) Distortion is increasing in the degree of inefficiency of the market.

Proof. (i) In an efficient market, $\sigma_1^2 = \sigma_2^2$. This implies $\beta_1 = \beta_2$ that is the first best, provided that $B_1 = B_2$.

(ii) In an inefficient market, $\sigma_1^2 < \sigma_2^2$ due to the manipulated financial leverage. This implies $\beta_1^* > \beta_2^*$, which deviates from the first best incentive under $B_1 = B_2$.

(iii) The more inefficient is the market, the smaller is σ_{12}. Furthermore,

$$\frac{\partial\left(\beta_1/\beta_2\right)}{\partial\sigma_{12}} = \frac{r^2\left(\sigma_2^2 - \sigma_1^2\right)\left(C_{11} - C_{12}\right)^2}{\left[\left(r\sigma_1^2 - r\sigma_{12}\right)\left(C_{11} - C_{12}\right) + 1\right]^2} > 0,$$

in an inefficient market where $\sigma_1^2 < \sigma_2^2$.

□

Specifically, if the managers' distortion successfully reduces the risk of the return on equity with which they are burdened and skews the distribution of the return on equity to the right in an inefficient market, then $\sigma_1/\mathrm{E}\left[\mathrm{ROE}\right] < \sigma_2/\mathrm{E}\left[\mathrm{ROA}\right]$ and $\gamma_1 > \gamma_2$, where σ_1 and σ_2 are standard deviation and $\gamma_1 \equiv \mathrm{E}\left[\left(\mathrm{ROE} - \mathrm{E}\left[\mathrm{ROE}\right]\right)^3\right]/\sigma_1^3$ and $\gamma_2 \equiv \mathrm{E}\left[\left(\mathrm{ROA} - \mathrm{E}\left[\mathrm{ROA}\right]\right)^3\right]/\sigma_2^3$ are skewness of ROE and ROA respectively. Then our statement is described by variances standardized by the mean and the third-order central moment, or equivalently, by the skewness adjusted variation coefficients, instead of raw variances; if the market is perfectly efficient, then

$$\begin{aligned} \frac{\sigma_1^2}{\mathrm{E}\left[\mathrm{ROE}\right]} \times \frac{\sigma_1^2}{\mathrm{E}\left[\left(\mathrm{ROE} - \mathrm{E}\left[\mathrm{ROE}\right]\right)^3\right]} = & \\ \frac{\sigma_1/\mathrm{E}\left[\mathrm{ROE}\right]}{\gamma_1} = \frac{\sigma_2/\mathrm{E}\left[\mathrm{ROA}\right]}{\gamma_2} & \\ = \frac{\sigma_2^2}{\mathrm{E}\left[\mathrm{ROA}\right]} \times \frac{\sigma_2^2}{\mathrm{E}\left[\left(\mathrm{ROA} - \mathrm{E}\left[\mathrm{ROA}\right]\right)^3\right]}; & \end{aligned} \tag{10}$$

moreover, if the market is inefficient, then

$$\frac{\sigma_1/\mathrm{E}\left[\mathrm{ROE}\right]}{\gamma_1} < \frac{\sigma_2/\mathrm{E}\left[\mathrm{ROA}\right]}{\gamma_2}. \tag{11}$$

Investors can be aware that the variance of the return on equity is smaller than that of the return on asset by a cross-sectional comparison and hence can infer that some managers might have distorted the financial leverage to mechanically smooth and/or increase the return on equity. However, given own small share, individual investors do not have incentives to investigate what a specific firm is doing, and because of it, they rely on the market price to know firms' performance and to monitor firms. Evoked is a free-riding problem of investors in monitoring firms, as predicted by Smith (1937[1776]). The resulting distorted financial leverage implies that the variance of the return on asset is greater than that of the return on equity. Provided that, to save risk premium to be paid to risk-averse managers, investors increase the weight on the return on equity, which indeed induces overemphasis on the return on equity by managers, and distortion of the financial leverage mechanically attains an increase in the return on equity. The risk-averseness of managers in an inefficient market where managers can withhold information about their manipulation of the financial leverage implies that a distortion by the financial leverage is rather encouraged by the investors and arises in a self-fulfilling way. Although each investor reckons that emphasis on the short-term return on equity would distort the leverage and reduce the value of the firm in the long term, everybody is free riding on one another and does not cease myopic emphasis on the return on equity.

A way to almost remove the distortion is to have a dominant shareholder who holds own share in the long term. The negative effects on longer-term profitability of a distorted leverage intended to mechanically smooth and/or increase the return on equity become discernible only a few terms later when facing repayment of more than optimal debt. If an uninformed shareholder pursues short-term transactions, she/he would believe that she/he can successfully sell at a profit to another uninformed investor before the distortion is finally revealed, rather than make costly efforts to curb the distortion. Short-sighted investment by an uninformed investor pursuing a higher return on equity is an individually optimal response to one another, and hence a stable equilibrium strategy. Only if a dominant shareholder holds shares to explicitly seek long-term growth of the share price rather than a short-term uptick by the current

return on equity, she/he will help improve efficiency. However, the return on a commitment to long-term hold can be strictly greater only if she/he recognizes the short-term divergence between the share price and the fundamentals unknown to other market participants, which by definition means that she/he is an informed investor. The best position to be informed is to be on the board. If she/he manages the firm, she/he would better know the fundamentals of own business than outsiders. Then the agency problem would be reduced by the degree of the concentration of ownership at the manager because both of having a greater claim and of being better informed.

In the case of real firms, since expected leverages are positive, we standardize variance by variation coefficients with adjustment of skewness as in equations (10) and (11). Then, paraphrasing **Lemma 1** and its implications discussed above, our hypotheses to be empirically tested are as follows.

H1 In an inefficient market where the skewness adjusted variation coefficient of the return on equity is smaller than that of the return on asset, the stock prices are more responsive to and better predict the return on equity than the return on asset.

H2 In an inefficient market, a greater concentration of ownership at the president implies a smaller distortion of the financial leverage.

H3 In an inefficient market, a greater concentration of ownership at the president implies a better performance measured by the return on asset.

2.2 Structure of ownership

As Berle and Means (1933) and Chandler (1977) observed in US cases and Foreman-Peck and Hannah (2013) in the British cases, also in Japan, case studies such as Yui (1979, 1989, 1992), Miyamoto and Abe (1999), and Nakamura (2007) described prevailed promotion of senior employees and hiring of independent business men as “professional managers” among leading

companies from the 1890s to the 1900s. Furthermore, Miwa and Ramseyer (2002) showed that the "prominent" managers' participation in the board positively contributed to the performance of the firm in the early twentieth century. These studies, however, did not deal with possible implications of the changes in the structure of ownership within the board. To discriminate the ownership structure, we introduce two simple measures. The first is the stock holding ratio of the president, and the second is the product of the stock holding ratio of the president, and that of the board member whose stock holding ratio is the smallest within the board. The first measure is expected to capture the effect of moral hazard that a decrease in stock holding ratio of the founding manager would compound. In other words, the performance of a case firm is expected to increase in this measure (H2 and H3). The second measure is to examine how the degree of consolidation of ownership within management affects performance. When the structure of the board is closer to the representatives of shareholders as originally presumed, the value of the second measure is greater. Meanwhile, if an employee is promoted to a board member, the value of the second measure is expected to become smaller. The measure is to evaluate how the deviation from the original form of the board and the promotion of employees to board member could affect performance (H2 and H3).

In the entire Tokyo market, while shares were widely owned by small shareholders, ownership concentration was considerable in particular for institutions like banks. In total, the top 1 percent strong largest shareholders owned 53 percent of shares of listed firms as of 1897 (Table 1)

INSERT Table 1 HERE

Source Teranishi and Yuki (2017), p.142.

2.3 Data

Our sample covers all 95 firms (i) that were listed on the Tokyo Stock Exchange from the first half of 1878 to the second half of 1910 (t). The financial statements of the firms are available in the Business Archives of the Japan Digital Archives Center delivered by Maruzen-Yushodo.[1] Note that firms predominantly owned by conglomerates such as Mitsubishi and Mitsui were not listed. Possible distortion due to the heavy protection of the conglomerates by the government is irrelevant to our data set. We hand-collected information of financial statements and the stock holding to build a panel data set of the 95 firms. Financial state variables we use are sales ($\mathrm{SAL}_{i,t}$), total assets ($\mathrm{TAS}_{i,t}$), paid-in stock ($\mathrm{STK}_{i,t}$),[2] borrowing ($\mathrm{BOR}_{i,t}$), outstanding bond ($\mathrm{BND}_{i,t}$), profit in the current term ($\mathrm{PRF}_{i,t}$), total dividend ($\mathrm{DVD}_{i,t}$)[3], and balance brought forward ($\mathrm{BBF}_{i,t}$) for firm i in term t. Discrepancies of the total observation numbers come from not yet standardized financial statements, particularly before the enactment of the Commercial Code of 1899. As measures of the ownership structure, we calculate the stock holding ratio of the president ($\mathrm{SCEO}_{i,t}$), the stock holding ratio of the board member whose ratio is the smallest among the board members ($\mathrm{SMIN}_{i,t}$), and their product ($\mathrm{CNSL}_{i,t} \equiv \mathrm{SCEO}_{i,t} \times \mathrm{SMIN}_{i,t}$) for firm i in term t. Regarding the share prices, we use average prices $\mathrm{STP}_{i,t}$ for firm i in term t published in Tokyo Stock Exchange (1928).[4] The number of observations is fewer than that of financial states because over-the-counter trades off the exchange were active. To control for the financial market conditions when estimating determinants of borrowing and bond flotation, we use average bank interest rates in the prefecture of Tokyo surveyed by the Bank of Japan.[5] The series of interest rates is available only

[1] `https://j-dac.jp/top/eng/index.html` Last accessed: September 12, 2016.

[2] The Japanese Commercial Code then, as its counterparts in the West, required a joint stock company to specify the face value of its share and permitted partial payment at subscription and hence there existed two kinds of "capital" as legal terms; the capital stock registered, which was the total sum of face value of issued shares, and the paid-in capital, which was the amount really invested. Thus, the paid-in stock is the capital in an ordinary sense.

[3] The sum of ordinary dividend and special dividend in the term.

[4] Tokyo Stock Exchange (1928), "Sho tokei (Statistics)," pp. 125–261.

[5] Historical Statistics: Institute for Monetary and Economic Studies, Bank of Japan (`http://www.imes.boj.or.jp/hstat/`: Last accessed on September 18, 2016).

from the second half of 1886. Descriptive statistics are shown in Table 2.

INSERT Table 2 HERE

Source See the text.

Notes: All values are nominal terms.

As estimation method, we use cross-section fixed effects model to control for variables that were invariant during the sample period, such as the long-established routines, historical legacy, corporate culture, corporate philosophy, and other constant factors. Then we can identify the effect of changes in the ownership structure on financial leverage and the performance. When using cross-section fixed effects model, we need to control for exogenous, and often cyclical, shocks. As such control variable, we use the growth in real gross national product ($\Delta\mathrm{GNP}_t \equiv \mathrm{GNP}_t - \mathrm{GNP}_{t-1}$).[6]

3 Structure of ownership and efficiency of market

3.1 Responsiveness and prediction power of the market

We first evaluate whether the Japanese market from 1878 to 1910 was distorted due to the market inefficiency by our standard. The skewness adjusted variation coefficient of the return on equity ($\mathrm{ROE}_{i,t} \equiv \mathrm{PRF}_{i,t}/\left(\mathrm{STK}_{i,t} + \mathrm{BBF}_{i,t}\right)$), which is standard deviation divided by the mean and the skewness, is calculated as 0.8355 and that of the return on asset ($\mathrm{ROA}_{i,t} \equiv \mathrm{PRF}_{i,t}/\mathrm{TAS}_{I,t}$) is as 1.2643 from Table 1. The measure of the return on equity ($\mathrm{ROE}_{i,t}$) becomes smaller as managers mechanically smooth or raise the return on equity or make it riskier by distorting the leverage. The measure of the return on equity is substantially smaller

[6]The GNP series from 1877 to 1884 is from Teranishi (1983), p. 181 and those from 1885 to 1910 are from Ohkawa, Takamatsu and Yamamoto (1974), p. 225. The GNP series in those sources are the annual basis, and hence we produced bi-annual series by linear supplements.

than that of the return on asset. The greater measure of the return on equity means that the Tokyo market then was substantially inefficient to prompt managers to distort the leverage, in the sense of our hypothesis H1 on the difference in the skewness adjusted variation coefficients (Equation (11)) and the market inefficiency. This result is consistent with that of Hamano et al. (2009) who pointed out the low market liquidity from 1878 to 1910.

Then to test hypothesis H1 on the market responsiveness to the return on equity and the return on asset, we first simply regress the growth in the stock price ($\Delta \log(\mathrm{STP}_{i,t})$) on the growth in the return on equity ($\Delta\mathrm{ROA}_{i,t}$) and the growth in the return on asset ($\Delta\mathrm{ROA}_{i,t}$) in line with (4), with the growth in real gross national product ($\Delta\mathrm{GNP}_t$) to control for cyclical shocks common to all cross sections as follows.

$$\Delta \log(\mathrm{STP}_{i,t}) = \beta_0 + \beta_1 \Delta\mathrm{ROE}_{i,t} + \beta_2 \Delta\mathrm{ROA}_{i,t} + \beta_3 \Delta\mathrm{GNP}_t + \mu_i + \epsilon_{i,t}, \tag{12}$$

where μ_i is dummy variable for firm i and $\epsilon_{i,t}$ is error term.

Specification 2–1 in Table 2 shows that investors rewarded only the growth in the return on equity ($\Delta\mathrm{ROE}_{i,t}$). The return on equity ($\mathrm{ROE}_{i,t}$) and the return on asset ($\mathrm{ROA}_{i,t}$) share the common numerator, profit in the current term ($\mathrm{PRF}_{i,t}$). Thus, the result of equation (12) might be unstable unless the market was perfectly inefficient in our framework such that $\sigma_{12} = 0$. Therefore, we next regress separately the growth in stock prices ($\Delta \log(\mathrm{STP}_{i,t})$) on the growth in the return on equity ($\Delta\mathrm{ROE}_{i,t}$), growth in the return on asset ($\Delta\mathrm{ROA}_{i,t}$), and growth in the return on sales ($\Delta\mathrm{ROS}_{i,t} \equiv \Delta(\mathrm{PRF}_{i,t}/\mathrm{SAL}_{i,t})$). Here we also control for the growth in the total dividend over the total asset ($\Delta[\mathrm{TOD}_{i,t}/\mathrm{TAS}_{i,t}]$). If the market is sufficiently efficient that payout did not reveal additional information that has been privately withheld by the firm, this term is expected to have a significantly negative coefficient to keep the shareholders' value at constant as predicted by Miller and Modigliani (1961). If the growth in dividend reveals additional information to predict an increase in future cash flow, the term is expected to have

a significantly positive coefficient, as predicted by Sasson and Huffman (1986). Our estimate specifications thus are

$$\Delta \log\left(\mathrm{STP}_{i,t}\right) = \beta_0 + \beta_1 \Delta \mathrm{ROE}_{i,t} + \beta_2 \left[\frac{\mathrm{TOD}_{i,t}}{\mathrm{TAS}_{i,t}}\right] + \beta_3 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}, \tag{13}$$

$$\Delta \log\left(\mathrm{STP}_{i,t}\right) = \beta_0 + \beta_1 \Delta \mathrm{ROA}_{i,t} + \beta_2 \left[\frac{\mathrm{TOD}_{i,t}}{\mathrm{TAS}_{i,t}}\right] + \beta_3 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}, \tag{14}$$

and

$$\Delta \log\left(\mathrm{STP}_{i,t}\right) = \beta_0 + \beta_1 \Delta \mathrm{ROA}_{i,t} + \beta_2 \left[\frac{\mathrm{TOD}_{i,t}}{\mathrm{TAS}_{i,t}}\right] + \beta_3 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}. \tag{15}$$

Despite the limitation of sample numbers due to a smaller number of formal transactions within the exchange and a greater number of off-exchange trades then, we again find that the stock prices responded only to the return on equity, to neither the return on asset nor the return on sales. The market was not sufficiently efficient to respond to the return on asset, the long-haul predictor of the asset usage efficiency and profitability, or the return sales, a measure of the operational efficiency. Significantly positive coefficients of the dividend payout ratio in all specifications 3–2, 3–3, and 3–4 indicate that payouts provided investors with additional information to predict an increase in future cash flow, which is consistent with our overall evaluation of the market inefficiency. Our hypothesis H1 on the short-sighted emphasis by an inefficient market on the return on equity is supported.

INSERT Table 3 HERE

Notes ***, **, and * denote significance of 1 percent, 5 percent, and 10 percent levels respectively.

To check the other side of the same coin, we estimate how the market predicted future profitability, by regressing the return on equity ($\mathrm{ROE}_{i,t}$) and that on asset ($\mathrm{ROA}_{i,t}$) on the changes in the past stock prices ($\Delta \log(\mathrm{STP}_{i,t-k}), k = 1, 2, 3$),

$$
\begin{aligned}
\mathrm{ROE}_{i,t} = \beta_0 &+ \beta_1 \Delta \log(\mathrm{STP}_{i,t-1}) + \beta_2 \Delta \log(\mathrm{STP}_{i,t-2}) + \beta_3 \Delta \log(\mathrm{STP}_{i,t-3}) \\
&+ \beta_4 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}, \\
\mathrm{ROA}_{i,t} = \beta_0 &+ \beta_1 \Delta \log(\mathrm{STP}_{i,t-1}) + \beta_2 \Delta \log(\mathrm{STP}_{i,t-2}) + \beta_3 \Delta \log(\mathrm{STP}_{i,t-3}) \\
&+ \beta_4 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}.
\end{aligned} \tag{16}
$$

The results in Table 4 again provide a clear finding that the stock prices predicted only the return on equity half or one year later and never predicted the return on asset.

INSERT Table 4 HERE

Notes ***, **, and * denote significance of 1 percent, 5 percent, and 10 percent levels respectively.

The market failed to predict the return on asset and priced in and predicted only the return on equity. Again, our hypothesis H1 on the short-sighted emphasis by an inefficient market on the return on equity is supported.

3.2 Ownership structure and performance

We second analyze possible relations between the ownership structure and performance. We regress the return on equity ($\mathrm{ROE}_{i,t}$), the return on asset ($\mathrm{ROA}_{i,t}$), which captures efficiency in using firm's total asset, and the return on sales ($\mathrm{ROS}_{i,t}$), which measures how large the margin is and/or how operational costs are saved, on two measures of the ownership structure: 1) the stock holding ratio of the president, $\mathrm{SCEO}_{i,t}$, and 2) the measure of the ownership consolidation within the board characterized as $\mathrm{CNSL}_{i,t} = \mathrm{SCEO}_{i,t} \times \mathrm{SMIN}_{i,t}$, where $\mathrm{SMIN}_{i,t}$ denotes the stock holding ratio of the board member whose stock holding ratio is the smallest among the board members. The first measure directly captures how much controllable the firm is by the president, often the founding owner-manager in the period. The second measure captures whether the board functions as the consolidated representative of shareholders. If the ownership structure was diffused or employees were promoted as board members, then the measure is expected to decrease. A decrease in $\mathrm{CNSL}_{i,t}$ implies that the board becomes less representative of shareholders and hence that the board might more likely deviate from the maximization of the shareholders' value. We also insert the sales ($\mathrm{SAL}_{i,t}$) as a regressor to control for cyclical but heterogeneous changes in business volumes.

Thus, for the return on equity ($\mathrm{ROE}_{i,t}$), we run

$$
\begin{aligned}
\mathrm{ROE}_{i,t} &= \beta_0 + \beta_1 \mathrm{SCEO}_{i,t} + \beta_2 \mathrm{SAL}_{i,t} + \beta_3 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}, \\
\mathrm{ROE}_{i,t} &= \beta_0 + \beta_1 \mathrm{CNSL} i,t + \beta_2 \mathrm{SAL}_{i,t} + \beta_3 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t},
\end{aligned} \tag{17}
$$

for the return on asset ($\mathrm{ROA}_{i,t}$),

$$
\begin{aligned}
\mathrm{ROA}_{i,t} &= \beta_0 + \beta_1 \mathrm{SCEO}_{i,t} + \beta_2 \mathrm{SAL}_{i,t} + \beta_3 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}, \\
\mathrm{ROA}_{i,t} &= \beta_0 + \beta_1 \mathrm{CNSL}_{i,t} + \beta_2 \mathrm{SAL}_{i,t} + \beta_3 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t},
\end{aligned} \tag{18}
$$

and for the return on sales ($\mathrm{ROS}_{i,t}$), dropping the sales from regressors,

$$
\begin{aligned}
\mathrm{ROS}_{i,t} &= \beta_0 + \beta_1 \mathrm{SCEO}_{i,t} + \beta_2 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}, \\
\mathrm{ROS}_{i,t} &= \beta_0 + \beta_1 \mathrm{CNSL}_{i,t} + \beta_2 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}.
\end{aligned} \tag{19}
$$

The results are in Table 5. We find that the ownership concentration at the president ($\mathrm{SCEO}_{i,t}$) did not significantly improve the return on equity ($\mathrm{ROE}_{i,t}$, specification 5–1), but strongly improved the return on asset ($\mathrm{ROA}_{i,t}$, specification 5–3) and the return on sales ($\mathrm{ROS}_{i,t}$, specification 5–5). Furthermore, a greater consolidation of ownership within the board ($\mathrm{CNSL}_{i,t}$) improved all of the returns on equity, asset, and sales (specifications 5–2, 5–4, and 5–6).

INSERT Table 5 HERE

Notes ***, **, and * denote significance of 1 percent, 5 percent, and 10 percent levels respectively.

Thus, we can conclude that the greater concentration of ownership at the president and/or greater consolidation of ownership within the board contributed to the long-term growth and profitability by raising efficiency in asset usage and operations. Our hypothesis H3 on the positive impact of the ownership concentration at the president on the return on asset is supported.

3.3 Impact of enactment of the Commercial Code of 1899

In 1899, the long-awaited Commercial Code came into force and obliged joint stock companies to disclose its financial status in detail by the standardized form. It made more information about financial status of firms publicly available and might have reduced distortion due to asymmetric information. To examine a possible effect, we insert the interaction term between

the dummy variable of enactment ($\mathrm{d1899}$), which takes value 1 if the year is 1899 or later and 0 otherwise, and the ownership structure variables, and the dummy variable itself into specifications (17), (18), and (19).

The results are in Table 6. Specification 6–1 shows that the enactment of the Commercial Code did not affect the return on equity ($\mathrm{ROE}_{i,t}$). Specifications 6–3 and 6–4 show that the enactment of the Commercial Code did not affect the return on asset ($\mathrm{ROA}_{i,t}$). Specification 6–5 indicates that the ownership concentration and the enactment of the Commercial Code might have a complementary positive effect on the operating efficiency captured by the return on sales ($\mathrm{ROS}_{i,t}$). In sum, the enactment of the Commercial Code did not affect the performance of the firms whose ownership was concentrated and which thus had been well disciplined by the ownership. However, it helped the firms whose ownership structure was not necessarily concentrated but consolidated improve the performance.

INSERT Table 6 HERE

Notes ***, **, and * denote significance of 1 percent, 5 percent, and 10 percent levels respectively.

Given the results in Table 5 and Table 6, we conclude that the ownership structure was relevant, differently from modern US firms. The results indicate that the Japanese market then was not sufficiently efficient and left the room of self-fulfilling distortion predicted by **Lemma 1**. A greater concentration of ownership helped offset the adverse effect, and our hypothesis H3 on the relevance of the concentrated ownership to a greater return on asset is supported.

4 Distorted financial leverage

4.1 Financial leverage and performance

Our results so far indicate that, in the case where the concentration of ownership at the president was not sufficient, due to a weak discipline from the inefficient market, distortion somehow arose. Our prediction and the results of Lin et al. (2013) suggest that such distortion is likely to emerge in the financial leverage. We first regress the return on equity ($\mathrm{ROE}_{i,t}$) on the financial leverages, the borrowing ($\mathrm{BOR}_{i,t}$) and the outstanding bond ($\mathrm{BND}_{i,t}$) over the paid-in capital ($\mathrm{STK}_{i,t}$) and balance brought forward ($\mathrm{BBF}_{i,t}$),

$$\begin{aligned}\mathrm{ROE}_{i,t} = \beta_0 + \beta_1 \frac{\mathrm{BOR}_{i,t}}{\mathrm{STK}_{i,t} + \mathrm{BBF}_{i,t}} + \beta_2 \frac{\mathrm{BND}_{i,t}}{\mathrm{STK}_{i,t} + \mathrm{BBF}_{i,t}} \\ + \beta_3 \mathrm{SAL}_{i,t} + \beta_4 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}.\end{aligned} \tag{20}$$

The results are shown in Table 7. Specification 7–1, including the entire sample, does not show a significant tendency. The result hints that the effects were diverse depending on the profitability of firms. Thus, specifications 7–2, 7–3, 7–4, 7–5, and 7–6 separate the sample into the return on equity ranges less than 0 percent, 0 percent to 10 percent, 10 percent to 20 percent, 20 percent to 30 percent, and greater than 30 percent, respectively. Then, for the subsample where the return on equity is less than 0 and less than 10 percent (specifications 7–2 and 7–3), we see that the leverage by the outstanding bond strongly contributed to the return on equity. For subsample between 20 percent and 30 percent of the return on equity, the outstanding bond weakly contributed to the return on equity (specification 7–5).

INSERT Table 7 HERE

Notes ***, **, and * denote significance of 1 percent, 5 percent, and 10 percent levels respectively.

To further inquire effects of the leverage, we next regress the return on asset ($\mathrm{ROA}_{i,t}$) on the financial leverages,

$$\begin{aligned}\mathrm{ROA}_{i,t} = \beta_0 + \beta_1 \frac{\mathrm{BOR}_{i,t}}{\mathrm{STK}_{i,t} + \mathrm{BBF}_{i,t}} + \beta_2 \frac{\mathrm{BND}_{i,t}}{\mathrm{STK}_{i,t} + \mathrm{BBF}_{i,t}} \\ + \beta_3 \mathrm{SAL}_{i,t} + \beta_4 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}.\end{aligned} \tag{21}$$

The results are in Table 8, which show that only for the range of the return on equity greater than 30 percent (specification 8–6), the outstanding bond positively contributed to the return on asset. Thus, except for the most profitable firms, financial leverages did not improve efficiency in using assets.

INSERT Table 8 HERE

Notes ***, **, and * denote significance of 1 percent, 5 percent, and 10 percent levels respectively.

Next, we regress the return on sales ($\mathrm{ROS}_{i,t}$) on the leverages,

$$\mathrm{ROS}_{i,t} = \beta_0 + \beta_1 \frac{\mathrm{BOR}_{i,t}}{\mathrm{STK}_{i,t} + \mathrm{BBF}_{i,t}} + \beta_2 \frac{\mathrm{BND}_{i,t}}{\mathrm{STK}_{i,t} + \mathrm{BBF}_{i,t}} + \beta_3 \Delta \mathrm{GNP}_t + \mu_i + \epsilon_{i,t}, \tag{22}$$

where we drop $\mathrm{SAL}_{i,t}$ from the regressors to avoid a mechanical correlation. The results are in Table 9. We see that in the ranges of the return on equity between 0 and 10 percent and between 10 percent and 20 percent (specifications 9–3 and 9–4), the outstanding bond adversely affected. Meanwhile, the results for the borrowing are mixed on depending on the ranges, showing a negative impact in the range between 10 percent and 20 percent (specification 9–4)

and a positive one between 0 percent and 10 percent (specification 9–3).

INSERT Table 9 HERE

Notes ***, **, and * denote significance of 1 percent, 5 percent, and 10 percent levels respectively.

Therefore, the leverage by the bond positively contributed to efficiency in using asset only for the cases of the most profitable firms whose return on equity was greater than 30 percent (specification 7–6 in Table 7). By contrast, the leverage by the bond is suspected to be distorted in the range of the return on equity less than 20 percent. The leverage by the outstanding bond negatively affected the return on sales in the ranges of the return on equity between 0 and 20 percent (specifications 9–3 and 9–4 in Table 9).

However, the impact of the outstanding bond was positive to the return on equity in the ranges of the return on equity less than 10 percent (specifications 7–2 and 7–3 in Table 7). The results indicate possible distortions of the leverage to mechanically increase and/or smooth the return on equity among low and mediocre performing firms. Regarding the impact of borrowing, no significant effect on the returns on equity, asset, and sales in the ranges of the return on equity greater than 20 percent, and the results are mixed for the ranges of the return on equity less than 20 percent.

4.2 Ownership structure and financial leverage

From **Lemma 1**, we predict that in an inefficient market a smaller concentration of ownership implies a greater distortion of the financial leverage to mechanically increase the return on equity at the expense of optimal capital structure. To specify a possible distortion, we first regress the changes in the financial leverage by the bond flotation ($\Delta\left[\mathrm{BND}_{i,t}/(\mathrm{STK}_{i,t}+\mathrm{BBF}_{i,t})\right]$) on the changes in the ownership structure, considering a possible association between the changes

in the ownership structure and those in the return on asset ($\Delta\mathrm{ROA}_{i,t}$), with controlling for changes in business volume by the growth in sales ($\Delta\mathrm{SAL}_{i,t}$), changes in the market interest rate in Tokyo ($\Delta\mathrm{TKR}_t$), as follows.

$$
\begin{aligned}
\Delta\left[\frac{\mathrm{BND}_{i,t}}{\mathrm{STK}_{i,t}+\mathrm{BBF}_{i,t}}\right] &= \beta_0+\beta_1\Delta\mathrm{SCEO}_{i,t} \\
&\quad +\beta_2\Delta\mathrm{SAL}_{i,t}+\beta_3\Delta\mathrm{TKR}_t+\beta_4\Delta\mathrm{GNP}_t+\mu_i+\epsilon_{i,t}, \\
\Delta\left[\frac{\mathrm{BND}_{i,t}}{\mathrm{STK}_{i,t}+\mathrm{BBF}_{i,t}}\right] &= \beta_0+\beta_1\mathrm{SCEO}_{i,t}+\beta_2\Delta\mathrm{SCEO}_{i,t}\times\Delta\mathrm{ROA}_{i,t}+\beta_3\Delta\mathrm{ROA}_{i,t} \\
&\quad +\beta_4\Delta\mathrm{SAL}_{i,t}+\beta_5\Delta\mathrm{TKR}_t+\beta_6\Delta\mathrm{GNP}_t+\mu_i+\epsilon_{i,t},
\end{aligned}
\tag{23}
$$

and

$$
\begin{aligned}
&\Delta\left[\frac{\mathrm{BND}_{i,t}}{\mathrm{STK}_{i,t}+\mathrm{BBF}_{i,t}}\right] \\
&=\beta_0+\beta_1\Delta\mathrm{CNSL}_{i,t}+\beta_2\Delta\mathrm{SAL}_{i,t}+\beta_3\Delta\mathrm{TKR}_t+\beta_4\Delta\mathrm{GNP}_t+\mu_i+\epsilon_{i,t}, \\
&\Delta\left[\frac{\mathrm{BND}_{i,t}}{\mathrm{STK}_{i,t}+\mathrm{BBF}_{i,t}}\right] \\
&=\beta_0+\beta_1\Delta\mathrm{CNSL}_{i,t}+\beta_2\Delta\mathrm{CNSL}_{i,t}\times\Delta\mathrm{ROA}_{i,t} \\
&\quad +\beta_3\mathrm{ROA}_{i,t}+\beta_4\Delta\mathrm{SAL}_{i,t}+\beta_5\Delta\mathrm{TKR}_t+\beta_6\Delta\mathrm{GNP}_t+\mu_i+\epsilon_{i,t}.
\end{aligned}
\tag{24}
$$

The results are in Table 10. We first find that the concentration of ownership to the president ($\mathrm{SCEO}_{i,t}$) in general tended to lower the financial leverage by the bond flotation (specification 10–1). However, we second find that it raised the leverage by the bond flotation when it could be accompanied by an increase in the return on asset ($\mathrm{ROA}_{i,t}$) as shown by the significantly positive coefficient of the interaction term ($\Delta\mathrm{SCEO}_{i,t}\times\Delta\mathrm{ROA}_{i,t}$) in specification 10–2. The ownership consolidation ($\mathrm{CNSL}_{i,t}$) did not have a significant impact on an increase in the leverage by the bond flotation (specifications 10–3 and 10–4). The concentration of ownership at the president was likely to rein in the financial leverage, but exceptions were

when it was associated with improvement in the efficiency of asset usage, which is consistent with our hypothesis H2 on the reduction in the leverage distortion by the concentration of ownership.

INSERT Table 10 HERE

Notes ***, **, and * denote significance of 1 percent, 5 percent, and 10 percent levels respectively.

By running the same regressions for the changes in the leverage by an increase in borrowing, we find no significant impact of the ownership structure as shown in Table 11. A distortion of the leverage due to a diffused ownership structure through borrowing was unlikely. The results are consistent with those for modern non-US advanced economies by Lin et al. (2013).

INSERT Table 11 HERE

Notes ***, **, and * denote significance of 1 percent, 5 percent, and 10 percent levels respectively.

4.3 Bond flotation as the channel of distortion

Sharing the motivation with Lin et al. (2011a, 2012, 2013), our overall results are partly consistent with theirs but partly not. Using the data from modern non-US advanced economies including Japan, they concluded that a greater concentration of ownership tends to lead towards a greater distortion through the bond flotation but that it is hard to deceive banks when

borrowing. In our case of Japan more than one century ago, the latter half is supported. The ownership structure was irrelevant to the distortion of the financial leverage through borrowing. However, regarding the leverage through the bond flotation, a greater concentration of ownership in general reined in the bond flotation, and led to a greater leverage through the bond flotation if it was accompanied by an increase in the return on asset, the longer-term predictor of performance. Thus, our results indicate that dominant owners were circumspect in raising leverage but pulled a lever if it was associated with a greater expected return on asset.

A greater concentration of ownership at the president led to an increase in the return on asset in general (Table 5). A greater concentration of ownership at the president, in general, lowered the financial leverage through the bond flotation but raised it if it was accompanied by an increase in the return on asset (Table 10). The concentration of ownership at the president never affected the return on equity (Table 5). A greater leverage through the bond flotation increased the return on asset only for the range of the return on equity greater than 30 percent (Table 8). Furthermore, a greater leverage through the bond flotation raised the return on equity only in the ranges of the return on equity less than 10 percent (Table 7). Given the results, we conclude that low or mediocre performing firms whose ownership structure was more diffused were more prone to the distortion of the financial leverage through over-reliance on the bond flotation. In summary, a possible channel is that low or mediocre performing firms in the ranges of return on equity less than 10 percent deceived the market to raise the leverage only to mechanically smooth and/or increase the short-term return on equity. The results and our inference are consistent with our hypotheses H2 on a reduction in the leverage distortion by a greater concentration of ownership.

These different results between our results and those of Lin et al. (2011a, 2012, 2013) leave us with a possibility of nonlinear relations between the ownership structure and leverage distortion. The key variable that distorts the leverage in Lin et al. (2011a, 2012, 2013) is the gap between the control and cash-flow rights of controlling managers, which they call "control-ownership wedge.' The measure is increasing in the difference between the stock

holding ratio of the president and the total equity and hence is increasing in the concentration of ownership among modern listed firms whose share are widely held. Meanwhile, the maximum stock holding ratio in our sample was 70 percent (Table 2), which formed a dominant majority and hence a smaller gap between the control and cash-flow rights of the controlling managers. In our sample of Japanese firms more than one century ago, a greater concentration of ownership at the president appears to result in a smaller gap.

The inefficient Japanese market from 1878 to 1910 was prone to a self-fulfilling distortion of the financial leverage, particularly for poorly performing firms. A greater concentration of ownership at the president reined in the bond flotation but raised the bond flotation in the case where it contributed to an increase in the return on asset. Thus, in the inefficient market, a greater concentration of ownership helped close to the optimal capital structure, as predicted by our hypothesis H2 on the relevance of a greater concentration of ownership to a less distorted leverage.

5 Conclusion

Irrelevance of the ownership structure in modern US firms is explained by a possible discipline from the market (Demsetz and Lehn (1985); Himmelberg et al. (1999) and Demsetz and Villalonga (2001)). Meanwhile, our finding shows that the stock prices in Tokyo market from 1878 to 1910 strongly responded to the return on equity in the current term, but never responded to the return on asset (Tables 3). Furthermore, the skewness adjusted variation coefficient of the return on equity was smaller than that of the return on asset by 34 percent. The result indicates that firms mechanically smoothed or raised the return on equity and or skewed it to the right by the leverage distortion. The Japanese market in its early stage was inefficient in the sense of our hypothesis H1 on a self-fulfilling overemphasis on the return on equity to end up in exacerbating the distortion.

The distortion was unambiguous among low and mediocre performing firms. The leverage

by blond flotation contributed to the return on asset only in the case of excellent firms, but it did not raise the return on asset of low and mediocre performing firms (Table 8) while it raised the return on equity of low and mediocre performing firms (Table 7). The distortion of borrowing was apparently weak.

A remedy to complement the imperfect market was the concentrated and/or consolidated ownership structure within the board. An increase in the concentration of ownership at the president in general reined in the bond flotation except for the case of being accompanied by the growth in the return on asset (Table 10). Our hypothesis on a reduction in the leverage distortion by a greater concentration of ownership is supported.

After all, the ownership concentration and/or consolidation within the board improved the return on asset and the return on sales (Table 5). Our hypothesis on the positive impact of the ownership concentration on the return on asset is supported. Meanwhile, we are in this study not explicitly focused on why the founder who pursued the return on asset instead of the return on equity. A straightforward conjecture is that in a less developed market, private benefit for the founder is greater (Dyck and Zingales (2004)) and hence the founder sought to greater control (Zingales (1995)). The individually optimal response might contribute to the long-term growth of the firm, as founders sought the long-term growth in the private benefit and hence emphasized the return on asset instead of the return on equity.

The concentration and consolidation of ownership curbed the leverage distortion, and the ownership concentration, in particular, was the driver to pursue the long-term growth in the shareholders' value. The discipline of the concentrated ownership needed to offset adverse effects of an inefficient market.

We did not capitalize on any Japan-specific features to obtain the results. The significance of discipline by ownership had better be considered when understanding no-US markets and planning reforms of them in particular.

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Table 1 Distribution of ownership, 1897.

Shares owned	Individuals				Institutions				Total			
	Number of shareholders	share	Number of shares	share	Number of shareholders	share	Number of shares	share	Number of shareholders	share	Number of shares	share
1-99	467	24.4%	22,043	1.5%	2	4.5%	189	0.0%	469	24.0%	22,232	1.0%
100-499	962	50.3%	209,432	14.5%	10	22.7%	2,571	0.3%	972	49.7%	212,003	9.5%
500-999	207	10.8%	140,402	9.7%	7	15.9%	3,917	0.5%	214	10.9%	144,319	6.5%
1,000-1,999	151	7.9%	201,586	14.0%	6	13.6%	9,808	1.3%	157	8.0%	211,394	9.5%
2,000-2,999	50	2.6%	120,260	8.3%	4	9.1%	8,182	1.0%	54	2.8%	128,442	5.8%
3,000-3,999	22	1.2%	73,142	5.1%	2	4.5%	7,286	0.9%	24	1.2%	80,428	3.6%
4,000-4,999	9	0.5%	40,137	2.8%	1	2.3%	4,000	0.5%	10	0.5%	44,137	2.0%
5,000-5,999	13	0.7%	68,844	4.8%	1	2.3%	5,250	0.7%	14	0.7%	74,094	3.3%
6,000-6,999	4	0.2%	25,318	1.8%	0	0.0%	0	0.0%	4	0.2%	25,318	1.1%
7,000-7,999	3	0.2%	22,524	1.6%	2	4.5%	14,221	1.8%	5	0.3%	36,745	1.7%
8,000-8,999	2	0.1%	16,766	1.2%	3	6.8%	25,694	3.3%	5	0.3%	42,460	1.9%
9,000-9,999	2	0.1%	18,625	1.3%	1	2.3%	9,575	1.2%	3	0.2%	28,200	1.3%
10,000-	20	1.0%	482,785	33.5%	5	11.4%	691,558	88.4%	25	1.3%	1,174,343	52.8%
Total	1,912	100.0%	1,441,864	100.0%	44	100.0%	782,251	100.0%	1,956	100.0%	2,224,115	100.0%

Table 2 Descriptive statistics of firms listed at the Tokyo Stock Exchange, from the first half of 1878 to the second half half of 1910.

Number of individual firms (cross sections) 95 variables		Number of total observations	Unit	Mean	Median	Maximum	Minimum	Standard deviation	Skewness	Kurtosis
Amount of sales in the current term	SAL	1,101	Yen	1,673,988	524,863	19,305,644	600	2,818,222.923	2.791	11.617
Total assets as of the current term	TAS	1,119	Yen	15,717,824	3,651,671	301,457,885	52,168	35,907,995.178	5.014	31.721
Paid-in stock as of the current term	STK	1,077	Yen	6,111,014	1,600,000	102,000,000	25,000	12,036,180.793	4.681	32.877
Borrowing as of the current term	BOR	1,119	Yen	375,992	0	13,146,042	0	1,083,525.975	4.911	36.511
Outstanding bond as of the current term	BND	1,119	Yen	1,471,965	0	93,568,012	0	8,000,257.208	7.924	70.028
Profit in the current term	PRF	1,081	Yen	388,115	97,992	18,084,554	-1,318,361	837,159.095	9.887	188.851
Total dividends in the current term	DVD	979	Yen	283,615	75,000	3,648,813	0	480,640.730	2.721	12.120
Balance brought forward as of the end of the current term	BBF	1,113	Yen	88,170	10,195	2,316,513	-1,065,271	241,258.728	3.750	26.400
Average share price in the current term	STP	323	Yen	89.1015	68.3000	425.5000	6.2400	76.721	1.818	6.290
Return on equity: =PRF/(STP+BBF)	ROE	1,040	percent	8.1012%	6.2254%	104.6430%	-104.7981%	0.108	1.598	33.371
Return on asset: =PRF/TAS	ROA	1,080	percent	3.3989%	2.9467%	34.6725%	-33.8713%	0.038	0.875	23.463
Stock holding ratio of the president as of the current term: =[Shares owned by President]/[Total Share]	SCEO	610	percent	5.1408%	2.7633%	70.0000%	0.0000%	0.071	4.248	30.622
Stock holding ratio of the director whose stock holding ratio is the smallest in the board as of the current term: [Share owned by the board member]/[Total Share]	SMIN	610	percent	1.1309%	0.7000%	10.0000%	0.0000%	0.015	3.360	17.700
Measure of ownership consolidation in the board: =SCEO×SMIN	CNSL	610	per ten thousand	8.7819‰	2.0000‰	130.0000‰	0.0000‰	0.002	3.630	16.941

Table 3 Determinants of the stock prices (STP), from the first half of 1879 to the second half of 1910.

Dependent variable	$\Delta\log(STP_{i,t})$		$\Delta\log(STP_{i,t})$		$\Delta\log(STP_{i,t})$		$\Delta\log(STP_{i,t})$	
	3−1		3−2		3−3		3−4	
estimation method	panel least squares		panel least squares		panel least squares		panel least squares	
Cross section fixed effect	fixed		fixed		fixed		fixed	
Independent variables		*t* statistic		*t* statistic		*t* statistic		*t* statistic
Constant	-0.0042	-0.20	0.0048	0.24	0.0018	0.09	0.0022	0.11
$\Delta ROE_{i,t}$	2.2891	3.24 ***	1.2669	2.53 **				
$\Delta ROA_{i,t}$	-2.4499	-1.31			-1.2504	-0.62		
$\Delta ROS_{i,t}$							-0.0233	-0.36
$\Delta(TOD_{i,t}/TAS_{i,t})$			4.5266	2.21 **	8.8569	3.09 ***	7.6265	4.36 ***
ΔGNP_t	0.0000	0.16	0.0000	0.11	0.0000	0.31	0.0000	0.31
adjusted R^2		0.04		0.11		0.08		0.08
Log likelihood		-2.40		14.96		12.17		12.34
F statistic		1.35		2.08 ***		1.70 **		1.74 **
Number of individual firms (cross sections)		24		21		22		22
Number of total observations		217		201		202		201

Table 4 Stock prices' prediction power against profitability (ROE, ROA), from the second half of 1882 to the second half of 1910.

Dependent variables	$ROE_{i,t}$			$ROA_{i,t}$		
	4−1			4−2		
Estimation method	Panel least squares			Panel least squares		
Cross section fixed effect	fixed			fixed		
Independent variables		*t* statistic			*t* statistic	
Constant	0.0780	12.42	***	0.0346	18.46	***
$\Delta\log(TSP_{i,t-1})$	0.0439	2.21	**	0.0061	1.03	
$\Delta\log(TSP_{i,t-2})$	0.0322	1.76	*	0.0041	0.75	
$\Delta\log(TSP_{i,t-3})$	0.0162	0.86		0.0006	0.10	
ΔGNP_t	-0.0001	-1.21		0.0000	-1.61	
adjusted R^2		0.38			0.33	
log likelihood		202.56			358.61	
F statistic		6.69	***		5.60	***
Number of individual firms (cross sections)		11			11	
Number of total observations		129			129	

Table 5 The return on equity (ROE), return on asset (ROA), and return on sales (ROS) and the stock ownership structure, from the second half of 1878 to the second half of 1910.

Dependent variables	$ROE_{i,t}$		$ROE_{i,t}$		$ROA_{i,t}$		$ROA_{i,t}$		$ROS_{i,t}$		$ROS_{i,t}$	
	5–1		5–2		5–3		5–4		5–5		5–6	
estimation method	Panel least squares		Panel least squares		Panel least squares		Panel least squares		Panel least squares		Panel least squares	
Cross section fixed effect	fixed		fixed		fixed		fixed		fixed		fixed	
Independent variables		*t* statistic		*t* statistic		*t* statistic		*t* statistic		*t* statistic		*t* statistic
Constant	0.0678	8.37 ***	0.0688	11.44 ***	0.0292	10.44 ***	0.0317	14.96 ***	-0.3955	-3.90 ***	0.0351	0.47
$SCEO_{i,t}$	0.0945	0.83			0.0943	2.45 **			11.9172	7.90 ***		
$CNSL_{i,t}$			7.0553	2.29 **			2.8618	2.76 ***			223.2661	5.32 ***
$SAL_{i,t}$	0.0000	8.41 ***	0.0000	8.56 ***	0.0000	6.77 ***	0.0000	6.76 ***				
ΔGNP_t	-0.0001	-3.52 ***	-0.0001	-3.55 ***	0.0000	-2.97 ***	0.0000	-3.09 ***	-0.0003	-0.64	-0.0004	-0.96
adjusted R^2		0.47		0.48		0.42		0.42		0.18		0.12
Log likelihood		599.53		591.10		1,225.36		1,226.28		-909.40		-927.25
F statistic		8.21 ***		8.36 ***		6.86 ***		6.90 ***		2.76 ***		2.17
Number of individual firms (cross sections)		67		67		70		70		70		70
Number of total observations		560		560		582		582		582		582

Table 6 Impacts of the Commercial Code on the asset and operation efficiency, from the second half of 1878 to the second half of 1910.

Dependent variables	$ROE_{i,t}$		$ROE_{i,t}$		$ROA_{i,t}$		$ROA_{i,t}$		$ROS_{i,t}$		$ROS_{i,t}$	
	6–1		6–2		6–3		6–4		6–5		6–6	
estimation method	Panel least squares		Panel least squares		Panel least squares		Panel least squares		Panel least squares		Panel least squares	
Cross section fixed effect	fixed		fixed		fixed		fixed		fixed		fixed	
Independent variables		*t* statistic		*t* statistic		*t* statistic		*t* statistic		*t* statistic		*t* statistic
Constant	0.0829	5.53 ***	0.0817	7.15 ***	0.0313	6.23 ***	0.0345	8.77 ***	-0.1119	-0.59	-0.1238	-0.78
$SCEO_{i,t}$	0.0555	0.24			0.1086	1.47			1.0395	0.37		
d1899×$SCEO_{i,t}$	0.0397	0.17			-0.0186	-0.25			13.0829	4.59 ***		
$CNSL_{i,t}$			8.2257	1.39			3.1851	1.65 *			192.4261	2.48 **
d1899×$CNSL_{i,t}$			-1.2086	-0.20			-0.3774	-0.19			37.1312	0.46
d1899	-0.0220	-1.31	-0.0198	-1.39	-0.0034	-0.58	-0.0045	-0.89	-0.3508	-1.58	0.2326	1.17
$SAL_{i,t}$	0.0000	8.57 ***	0.0000	8.74 ***	0.0000	6.83 ***	0.0000	6.85 ***				
ΔGNP_t	-0.0001	-3.51 ***	-0.0001	-3.54 ***	0.0000	-2.96 ***	0.0000	-3.09 ***	-0.0003	-0.62	-0.0004	-0.98
adjusted R^2		0.47		0.48		0.42		0.42		0.21		0.13
Log likelihood		601.08		592.83		1,225.98		1,227.04		-895.13		-925.62
F statistic		8.03 ***		8.19 ***		6.67 ***]		6.72 ***		3.16		2.15
Number of individual firms (cross sections)		67		66		70		70		70		70
Number of total observations		560		552		582		582		582		582

Table 7 The return on equity (ROE) and the financial leverage, from the second half of 1878 to the second half of 1910.

Dependent variables	$ROE_{i,t}$		$ROE_{i,t}$		$ROE_{i,t}$		$ROE_{i,t}$		$ROE_{i,t}$		$ROE_{i,t}$	
	7–1		7–2		7–3		7–4		7–5		7–6	
estimation method	Panel least squares		Panel least squares		Panel least squares		Panel least squares		Panel least squares		Panel least squares	
Cross section fixed effect	fixed		fixed		fixed		fixed		fixed		fixed	
Independent variables		*t* statistic		*t* statistic		*t* statistic		*t* statistic		*t* statistic		*t* statistic
Constant	0.0639	14.69 ***	-0.1969	-1.92	0.0469	39.50 ***	0.1448	30.77 ***	0.2266	18.02 **	0.2806	2.69 **
$BOR_{i,t}/(STK_{i,t}+BBF_{i,t})$	0.0097	1.24	-0.0137	-0.04	0.0013	0.74	-0.0106	-0.49	-0.0168	-0.17	-0.0169	-0.06
$BND_{i,t}/(STK_{i,t}+BBF_{i,t})$	0.0012	0.31	2.7259	2.21 **	0.0041	4.10 ***	-0.0023	-0.69	0.0870	1.74 *	1.1332	1.39
$SAL_{i,t}$	0.0000	7.31 ***	0.0000	-2.32 **	0.0000	6.10 ***	0.0000	-2.83 ***	0.0000	0.55	0.0000	2.14
ΔGNP_t	-0.0001	-3.70 ***	0.0003	1.36 *	0.0000	-1.75 *	0.0000	0.54	0.0000	1.24	0.0000	0.08 **
adjusted R^2		0.63		0.54		0.49		0.22		0.24		0.33
Log likelihood		1,184.50		57.67		1,991.91		364.04		132.96		21.81
F statistic		10.18 ***		3.18 ***		9.59 ***		2.05 **		1.91 **		2.24 *
number of individual firms (cross sections)		89		24		82		37		15		9
Restriction of observation by ROE	no restriction		ROE≤0%		0%<ROE≤10%		10%<ROE≤20%		20%<ROE≤30%		30%<ROE	
Number of total observations		1,031		52		746		148		54		31

Table 8 The return on asset (ROA) and the financial leverage, from the second half of 1878 to the second half of 1910.

Dependent variables	$ROA_{i,t}$		$ROA_{i,t}$		$ROA_{i,t}$		$ROA_{i,t}$		$ROA_{i,t}$		$ROA_{i,t}$	
	8–1		8–2		8–3		8–4		8–5		8–6	
estimation method	Panel least squares		Panel least squares		Panel least squares		Panel least squares		Panel least squares		Panel least squares	
Cross section fixed effect	fixed		fixed		fixed		fixed		fixed		fixed	
Independent variables		*t* statistic		*t* statistic		*t* statistic		*t* statistic		*t* statistic		*t* statistic
Constant	0.0334	19.94	-0.0707	-1.37	0.0241	24.63 ***	0.0754	28.94 ***	0.1146	12.88 ***	0.1013	4.22
$BOR_{i,t}/(STK_{i,t}+BBF_{i,t})$	-0.0018	-0.61	-0.0279	-0.16	-0.0022	-1.48	-0.0292	-2.44 **	-0.0134	-0.20	-0.0127	-0.18
$BND_{i,t}/(STK_{i,t}+BBF_{i,t})$	-0.0007	-0.45	1.0002	1.62	-0.0006	-0.72	-0.0008	-0.44	-0.0413	-1.17	0.5041	2.68 **
$SAL_{i,t}$	0.0000	1.79 *	0.0000	-1.65	0.0000	2.61 ***	0.0000	-8.35 ***	0.0000	-3.11 ***	0.0000	-0.29
ΔGNP_t	0.0000	-2.61 ***	0.0001	1.26	0.0000	-0.69	0.0000	-1.04	0.0000	1.29	0.0001	0.75
adjusted R^2		0.32		-0.08		0.32		0.76		0.78		0.73
Log liklehood		2,169.01		93.48		2,135.60		451.61		151.63		67.34
F statistic		6.36 ***		0.86		5.15 ***		12.77 ***		11.70 ***		7.86 ***
number of individual firms (cross sections)		89		24		82		37		15		9
Restriction of observation by ROE	no restriction		ROE≤0%		0%<ROE≤10%		10%<ROE≤20%		20%<ROE≤30%		30%<ROE	
Number of total observations		1,031		52		746		148		54		31

Table 9 The return on sales (ROS) and the financial leverage, from the second half of 1878 to the second half of 1910.

Dependent variables	$ROS_{i,t}$		$ROS_{i,t}$		$ROS_{i,t}$		$ROS_{i,t}$		$ROS_{i,t}$		$ROS_{i,t}$	
	9–1		9–2		9–3		9–4		9–5		9–6	
estimation method	Panel least squares		Panel least squares		Panel least squares		Panel least squares		Panel least squares		Panel least squares	
Cross section fixed effect	fixed		fixed		fixed		fixed		fixed		fixed	
Independent variables		*t* statistic		*t* statistic		*t* statistic		*t* statistic		*t* statistic		*t* statistic
Constant	0.2522	6.21 ***	-1.2166	-0.31	0.3050	35.39 ***	0.3528	29.63 ***	0.4509	15.35	0.6997	2.82 **
$BOR_{i,t}/(STK_{i,t}+BBF_{i,t})$	0.1123	1.16	0.8750	0.06	0.0675	3.80 ***	-0.3112	-4.43 ***	-0.9404	-2.16	-0.2063	-0.13
$BND_{i,t}/(STK_{i,t}+BBF_{i,t})$	-0.0164	-0.34	0.6668	0.03	-0.0177	-1.83 *	-0.0289	-2.69 ***	-0.0347	-0.15	2.2648	0.75
ΔGNP_t	-0.0003	-1.00	-0.0041	-0.43	0.0000	-0.03	-0.0001	-1.78 *	0.0003	2.08	-0.0006	-0.26
adjusted R^2		0.10		-0.44		0.59		0.84		0.65		0.39
Log likelihood		-1,401.04		-137.61		283.71		187.88		50.67		-33.89
F statistic		2.28 ***		0.40		13.76 ***		20.35 ***		6.75 ***		2.78 **
number of individual firms (cross sections)		89		24		82		37		33		9
Restriction of observation by ROE		no restriction		ROE≤0%		0%<ROE≤10%		10%<ROE≤20%		20%<ROE≤30%		30%<ROE
Number of total observations		1,031		52		746		148		54		31

Table 10 Determinants of the changes in outstanding bond (BND), from the first half of 1887 to the second half of 1910.

Dependent variables	$\Delta[BND_{i,t}/(STK_{i,t}+BBF_{i,t})]$		$\Delta[BND_{i,t}/(STK_{i,t}+BBF_{i,t})]$		$\Delta[BND_{i,t}/(STK_{i,t}+BBF_{i,t})]$		$\Delta[BND_{i,t}/(STK_{i,t}+BBF_{i,t})]$	
	10–1		10–2		10–3		10–4	
estimation method	Panel least squares		Panel least squares		Panel least squares		Panel least squares	
Cross section fixed effect	fixed		fixed		fixed		fixed	
Independent variables		*t* statistic		*t* statistic		*t* statistic		*t* statistic
Constant	0.0011	0.56	0.0018	0.90	0.0013	0.63	0.0019	
$\Delta SCEO_{i,t}$	-0.1238	-1.88 *	-0.0475	-0.63				
$\Delta SCEO_{i,t} \times \Delta ROA_{i,t}$			14.2044	2.03 **				
$\Delta CNSL_{i,t}$					-0.0302	-0.01	-0.5787	-0.22
$\Delta CNSL_{i,t} \times \Delta ROA_{i,t}$							-45.9281	-0.56
$\Delta ROA_{i,t}$			-0.1619	-2.59 **			-0.1795	-2.78 ***
$\Delta SAL_{i,t}$	0.0000	-0.01	0.0000	1.23	0.0000	-0.06	0.0000	1.50
ΔTKR_t	0.0007	0.34	0.0011	0.54	0.0002	0.08	0.0002	0.10
ΔGNP_t	0.0000	0.97	0.0000	0.52	0.0000	0.95	0.0000	0.48
adjusted R^2		0.02		0.07		0.01		0.05
Log likelihood		808.57		818.37		806.58		813.64
F statistic		1.20		1.61		1.11		1.40
Number of individual firms (cross sections)		43		42		43		42
Number of total observations		397		390		397		390

Table 11 Determinants of the changes in borrowing (BOR), from the first half of 1887 to the second half of 1910.

Dependent variables	$\Delta[BOR_{i,t}/(STK_{i,t}+BBF_{i,t})]$		$\Delta[BOR_{i,t}/(STK_{i,t}+BBF_{i,t})]$		$\Delta[BOR_{i,t}/(STK_{i,t}+BBF_{i,t})]$		$\Delta[BOR_{i,t}/(STK_{i,t}+BBF_{i,t})]$	
	11–1		11–2		11–3		11–4	
estimation method	Panel least squares		Panel least squares		Panel least squares		Panel least squares	
Cross section fixed effect	fixed		fixed		fixed		fixed	
Independent variables		*t* statistic		*t* statistic		*t* statistic		*t* statistic
Constant	-0.0185	-0.54	-0.0185	-0.53	-0.0190	-0.56	-0.0190	-0.55
$\Delta SCEO_{i,t}$	-0.2910	-0.27	0.0342	0.03				
$\Delta SCEO_{i,t} \times \Delta ROA_{i,t}$			55.1128	0.44				
$\Delta CNSL_{i,t}$					-1.6403	-0.32	-10.2520	-0.22
$\Delta CNSL_{i,t} \times \Delta ROA_{i,t}$							-2.5717	0.00
$\Delta ROA_{i,t}$			-0.6215	-0.56			-0.6353	-0.56
$\Delta SAL_{i,t}$	0.0000	-0.05	0.0000	0.22	0.0000	-0.06	0.0000	0.26
ΔTKR_t	0.1136	3.17 ***	0.1147	3.15 ***	0.1129	3.17 ***	0.1130	3.13 ***
ΔGNP_t	0.0004	1.60	0.0004	1.52	0.0004	1.61	0.0004	1.51
adjusted R^2		-0.04		-0.05		-0.04		-0.05
Log likelihood		-307.90		-305.52		-307.88		-305.63
F statistic		0.64		0.63		0.64		0.62
Number of individual firms (cross sections)		43		42		43		42
Number of total observations		397		390		397		390