Information Effect of Delisting and Change in Share Ownership: Evidence from the Japanese Market

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Abstract

This paper analyzes the wealth effect of involuntary delisting and opportunistic behavior of large shareholders using the sample of involuntarily delisted firms in the Japanese stock market between 2002 and 2012. The wealth effect of involuntary delisting announcement is about -70%, indicating that delisting is a highly disruptive event in Japan. Displaying opportunistic behavior during this process, large shareholders reduce their shareholdings prior to delisting whereas individual investors increase their shareholdings and become the de facto victims of the opportunistic behavior of large shareholders. In the cross-sectional analysis, we find that the more the large shareholders reduce their shareholding and the more the individual investors increase their shareholding, the larger is the decrease in the stock price prior to delisting. We also find that when the information asymmetry between large shareholders and the market is greater, the reduction in the shareholding of the large shareholders as well as the increase in the shareholding of individual shareholders is larger This result suggests that greater information asymmetry between the insiders and the market leads to more severe opportunistic behavior of the large shareholders. Using the logit regression model for the sample of delisted firms and their matching firms, we find that the reduction in the shareholding of the large shareholders and the increase in the shareholding of retail individual investors are significant predictors of involuntary delisting.

Keywords: involuntary delisting, information asymmetry, opportunistic behavior of large shareholders, retail individual investors, investor protection.

JEL Classification: G14

I. Introduction

Involuntary delisting of the stock from the exchange is arguably the worst outcome for shareholders. Involuntary delisting is usually brought on by default, suspension of banking transactions, complete write-down of equity, refusal of audit opinion among others. This paper investigates the wealth effect of involuntary delisting and the possibility of opportunistic behavior of large shareholders in the Japanese market.

Unlike the U.S. market where delisted stocks continue to be traded in the over-the-counter market, liquidity all but disappears as a result of delisting in most other markets including Japan.[1] Thus, involuntary delisting may lead to a massive shock to the share value in the Japanese market whereas the illiquidity effect of delisting is cushioned in the U.S. market. Furthermore, considering much stronger information effect of delisting in the Japanese market, insiders are more motivated to take advantage of their privileged information. In particular, in jurisdictions where the separation between ownership and management is weak the opportunistic behavior of large shareholders is more probable. Since the large shareholders of Japanese firms are known to be active in the firm management more than their counterparts in the other advanced markets, there is more concern that large shareholders of to-be-delisted firms have a strong incentive to use their private information at the expense of outside investors in the Japanese market.

There have been a few empirical studies on delisting in the U.S. market, which document that the delisting decision has a significant negative effect on the stock price. However, depending on the sample and measurement methodology, conflicting results have

[1] In the U.S., stocks which are delisted from regulated exchanges are typically traded in over-the-counter markets such as OTC Bulletin Board or Pink Sheets.

been reported. Sanger and Peterson (1990) study the involuntary delisting from NYSE or ASE, and report a fall of about 8.5% in the stock price of delisted firms on the delisting announcement day. Shumway (1997) documents an average delisting return of -30% for the firms that are delisted for bankruptcy and other negative reasons. Angel et al. (2004) study the involuntary delisting from NASDAQ, and report that investors experience a loss of about 22% in 60 days prior to delisting.

In order to account for the cause of the fall in stock prices due to delisting, Sanger and Peterson (1990) and Macey, O'Hara, and Pompilo (2008) among others propose the liquidity hypothesis. Noting that the bid-ask spread triples and the volatility doubles in the OTC market after involuntary delisting, they contend that the reduction in liquidity as well as the increase in liquidity risk is the primary reason for the negative effect of delisting on the stock price. Therefore, in line with the liquidity hypothesis, much more negative effect of delisting is expected in the market where trading of delisted stocks essentially does not occur.

While the empirical studies for the U.S. market focus on the information effect of delisting, less attention has been paid to the wealth dissipation associated with delisting. To our knowledge there is only one study dealing with the information effect and information asymmetry of delisting by Park et al. (2013). For the sample of delisting in the Korean market they report a massive loss of 70-80%, confirming the grave nature of involuntary delisting. Furthermore, they compare the trading patterns of individual investors with those of institutional and foreign investors and examine the change in the share ownership of large shareholders. They conclude that individual investors are at an informational disadvantage in emerging markets where the participation rate of individual investors is high and the market transparency is low.

A number of prior studies present empirical evidences that insiders have far superior information regarding the firms that they manage, and trade by taking advantage of their informational advantage.[2] In particular, in the market where the separation of ownership and

[2] Lakonishok and Lee (2001) provides a comprehensive study on insider trading. Insider trading has been investigated in a number of contexts: Seyhun (1990) and Eyssell and Arshadi (1993) use mergers and

management is weak large shareholders are more likely to engage in direct management or exerting control over the operations of the firm. Thus, insider trading manifests itself through changes in the share ownership of large shareholders (La Porta et al., 1999). Large shareholders have an incentive to transfer the resources of the firm directly or indirectly to themselves in pursuit of private benefits, undermining the interest of small individual investors (Fama and Jensen, 1983; Stulz, 1988; Johnson et al, 2000). Therefore, it appears that, as the firm falls into financial distress and spirals down to the point of involuntary delisting, large shareholders have an incentive to reduce their share ownership in order to avoid incurring the foreseeable losses. Therefore, the analysis of changes in the shareholdings of large shareholders prior to involuntary delisting would shed additional light on the opportunistic behavior of large shareholders.[3]

On the other hand, a number of studies document that the investment performance of individual investors is worse than that of institutional investors due to informational disadvantage as well as irrational investment decisions (Bae, Min, and Jung, 2011; Barber and Odean, 2008; Barber et al., 2009; Grinblatt and Keloharju, 2001; Hvidkjaer, 2008; Odean, 1998, 1999). Also, there are many studies which provide evidence of information asymmetry among heterogeneous groups of investors along with the consequent differences in their trading behaviors around the disclosures of firm information. Many of these studies show that institutional investors earn profits by informed trading prior to the event; for example, earnings announcement (Ashiq, Sandy, and Oliver, 2008; Battalio and Mendenhall, 2005; Campbell, Ramadorai, and Schwartz, 2009).[4] From a similar perspective this paper

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acquisitions; Niehaus and Roth (1999) use the change of the CEO; Gombola et al.(1999) and Niehaus and Roth (1999) use the secondary equity offering; Elliott et al. (1984) use earnings announcement; John and Lang(1991) use the dividend announcement. Most of these studies report evidences that support informed trading by insiders.

[3] Ideally one would investigate the trading activities by investor type prior to involuntary delisting. However, in the absence of trading data by investor type in the Japanese market we examine the change in the ownership structure in this paper.

[4] The abnormal returns from unexpected earnings announcements are between -2% and 2%. Considering a much stronger information effect of involuntary delisting, we expect that there exists a much stronger motivation for acquiring and analyzing information on delisting.

investigates the informational disadvantages of individual investors prior to involuntary delisting, one of the most value-destructive events.

For the sample of delisted firms in Japan between 2002 and 2012, we find the following results: (1) The wealth effect of involuntary delisting is about -70%, indicating that involuntary delisting is a highly disruptive event in Japan unlike the U.S. where there is still some liquidity even after the delisting; (2) The one-year buy-and-hold abnormal return (BHAR) prior to the delisting announcement is about -60%, indicating that stocks that show a significant fall in value become delisted. In addition, the one-year BHAR including the effect of delisting announcement is as high as -90%, indicating that investors holding the shares during that period lose essentially all of their investment; (3) Large shareholders reduce their shareholdings prior to involuntary delisting, displaying opportunistic behavior in order to avoid massive losses from impending involuntary delisting. On the other hand, individual investors increase their shareholdings and become the victims of the opportunistic behaviors of large shareholders; (4) The greater the reduction in the shareholding of the large shareholders and the greater the increase in the shareholding of the individual shareholders, the larger is the one-year decrease in the stock price prior to delisting; (5) The greater the information asymmetry between the insiders and the market, the larger is the reduction in the shareholding of the large shareholders and the increase in the shareholding of individual shareholders. This result suggests that the greater information asymmetry between the insiders and the market leads to the more severe opportunistic behavior of the large shareholders; (6) In the logit regression for the sample of delisted firms and their matching firms, we observe that the reduction in the shareholding of the large shareholders and the increase in the shareholding of retail individual investors are significant predictors of involuntary delisting.

The rest of the paper is organized as follows. In section II we describe the relevant regulations and institutional environments on delisting in Japan. Section III describes the sample composition and characteristics of the sample firms. In section IV we examine the information effect of delisting as well as opportunistic behavior of large shareholders. In addition, the results of cross-sectional regression are presented in section IV. Finally, section V presents the summary of the findings and their implications.

II. Delisting Process in Japan

For investor protection and orderly operation of the market, both Tokyo Stock Exchange and other stock exchanges instituted the delisting regulation.[5,6] The specific reasons for involuntary delisting as stated in the delisting regulation include false statement, unfair representations, suspension of bank transactions, bankruptcy, rehabilitation proceedings, reorganization proceedings or liquidation, suspension of business activities, inappropriate merger, impairment of soundness of transactions with a controlling shareholder, delay in submission of securities reports, false statement in securities reports, violation of the listing agreement, failure to delegate shareholder services to an agent, restriction on transfer of shares, failure to comply with the handling by the designated book-entry transfer

[5] The discussion in this section is based on the listing rules of Tokyo stock exchange, JASDAQ and other stock exchanges, as found in the homepages of those stock exchanges.

[6] Other stock exchanges include JASDAQ, MOTHERS, Osaka Stock Exchange, Sapporo Stock Exchange, Nagoya Stock Exchange, etc. Although each stock exchange has slightly different criteria for delisting, the main reasons stated in the regulation for involuntary delisting and the delisting process are the same.

organization, unreasonable restrictions on shareholders' rights, involvement of anti-social groups, and others.

The delisting process of Tokyo Stock Exchange and other exchanges is presented in Figure 1. When the stock exchange discovers that a listed firm may possibly fall under the delisting criteria, the stock exchange will designate this firm as a security under supervision (examination) for reasons of false statement in securities reports, unfair representations and violation of the delisting agreement, or as a security under supervision (confirmation) for other reasons, and make this designation known to the public. During this time, the stock exchange will conduct an examination to clarify whether a trigger event is present in this firm. If a trigger event is identified, delisting decision will be made on this firm. While for the firm which designated as a security under supervision (examination), if some problems exist but the firm is still salvageable under the delisting criteria, it will be designated as a security on alert and requested to improve its internal system during the granted remedial period. In general, the firm designated as a security on alert has an obligation to report its improvement every year and the time limit of remedial period is 3 years. If the improvement cannot be approved, then the firm will be delisted directly.

[Figure 1 about here]

If the delisting decision is made against a firm, the stock exchange will designate the firm as a security to be delisted and a notice is made to the public. In principle, one month trading period that starts from the next trading day of the delisting announcement and ends on the day before the firm is actually delisted so that the existing shareholders can trade their shares. Although the individual investors can cash their shares in the Phoenix market after the

firm is delisted, such trade rarely occurs in practice.[7] Consequently, there is virtually no opportunity for shareholders who hold the delisted stock to cash their shares.

III. Sample and Descriptive Statistics

1. Sample construction

The sample period covers from January 2002 to December 2012. The data of delisted firms are obtained from the database called "eol", a comprehensive corporate information database mainly for Japanese companies, which is provided by the company PRONEXUS, a database vender. Stock return data are from the financial database provided by Financial Data Solution, a database vender. Accounting data of delisting firms are obtained from "eol" while accounting data of matching firms are from the database called “Financial QUEST”.

The sample is constructed as follows. The total number of delisted firms from Tokyo Stock Exchange (TSE) is 665 while that from JASDAQ and MOTHERS as well as regional stock exchanges such as Osaka, Nagoya, Sapporo and Fukuoka is 494. Of these firms we remove voluntary delisting due to mergers and acquisitions as well as conversion into subsidiaries. We also remove the cases with uncertain causes of delisting. As a result, the sample of involuntarily delisted firms is 144. After we remove six financial services firms, the final sample consists of 136 non-financial firms which are involuntarily delisted.

[7] Phoenix market is founded by Japan Securities Dealers Association in 2008. Before that, there was no public market for investors to cash their shares.

Table 1 shows the sample composition. Panel A shows the sample composition by exchanges and years of delisting. TSE has the most cases with 69 delisting followed by JASDAQ with 35; Osaka Stock Exchange (OSE) with 16; MOTHERS with 12; Sapporo with 6; and Nagoya with 6. In terms of yearly distribution the involuntary delisting is concentrated in years 2008 and 2009 due to the global financial crisis, and 2002 as a result of the collapse of the dot-com bubble.

[Table 1 about here]

Panel B shows the distribution of delisting by industry. The manufacturing sector has the largest number of delisting with 43 firms. The real estate sector and the construction sector form a next order with 27 firms and 22 firms, respectively, reflecting the prolonged depression in real estate market in Japan. The service sector, the communication sector and the retail distribution sector follow thereafter. While there are 8 firms in the financial services sector we remove these firms from the sample since financial services firms show different financial and operating characteristics from the other sectors.

2. Basic characteristics of sample firms

The basic characteristics of 136 sample firms are shown in Table 2, where we divide sample firms into TSE firms and non-TSE firms.[8] We observe that the average firm size of delisted TSE firms is larger than that of non-TSE firms. We also observe that as the delisting approaches the market capitalization shrinks dramatically due to the precipitous decline in the stock price. ROA, which is a measure of a firm's profitability, is negative for T-3 through T-1, indicating that the profitability of the firm has already greatly deteriorated prior to

[8] Hereafter, by defining the delisting fiscal year as T, we indicate the year-end of one year prior to delisting by T-1, two years prior to delisting by T-2 and three years prior to delisting by T-3.

involuntary delisting, and its magnitude expands as the delisting approaches. Note, however, that the means tend to be larger than the medians, suggesting the presence of extreme observations.

[Table 2 about here]

Debt ratio, which is measured as total debt divided by total assets, also increases as the delisting approaches. The number of firms with negative equity, where debt exceeds assets, is 13 at T-1 for the TSE subgroup; and 25 for the JASDAQ and others subgroup. Also, interest coverage ratio, which is measured as interest expenses relative to operating income, worsens progressively so that at T-1 either the sample mean or the median coverage ratio turns negative.

IV. Empirical Results

1. Information effect of involuntary delisting

First, we examine the information effect of involuntary delisting disclosure in the Japanese market and show the results in Table 3. Even after the delisting decision is announced trading continues in the Japanese market until the actual delisting occurs. Typically the average time between delisting disclosure and the actual delisting day is about one month. However, the exact trading days until actual delisting vary across firms. Table 3 shows the daily abnormal return (AR) during eight trading days surrounding the announcement of involuntary delisting.

[Table 3 about here]

The abnormal return between the announcement day (t=0) and the following day (t=+1) is negative and significant. The average two-day BHAR(0, +1) is -79.10% for the TSE subgroup and -63.31% for the JASDAQ and others subgroup, indicating that the involuntary delisting causes a massive loss for the investors holding the shares in Japan. The median BHAR(0, +1) is -90.22%, -67.49% for the TSE subgroup and the JASDAQ and others subgroup, respectively.[9] This loss is much larger than that reported for the U.S. sample. We attribute this result to the difference in post-delisting liquidity between the U.S. and the Japanese market. Unlike the U.S. market, where delisted stocks continue to be traded in the over-the-counter market, trading comes to a virtual stop in the Japanese market. The magnitude of the decrease in the stock price is comparable to that of the Korean market, where the liquidity of delisted stocks is also virtually non-existent. Park et al. (2013) report a price drop of 70-80% due to involuntary delisting in the Korean market.

Stock price continues to fall after the delisting announcement. The average (the median) BHAR(+2, +8) is -21.33% (-7.64%) for the TSE subgroup; -28.62% (-29.12%) for the JASDAQ and others subgroup. Furthermore, the average (the median) BHAR(-8, -1), which shows the stock price movement immediately preceding the delisting announcement, is -7.09% (-2.95%) for the TSE subgroup; -11.12% (-8.54%) for the JASDAQ and others subgroup.

Next, we investigate the long-term trend of stock prices prior to delisting. Table 4 shows buy-and-hold abnormal returns (BHARs) for three months, six months, one year, and two years. Panel A of Table 4 shows the BHAR prior to the delisting announcement. The

[9] Here, we use BHAR rather than CAR since BHAR captures the actual investment performance better than CAR when the returns are large negative numbers. For example, if the stock price falls from 100 to 50, then to 20 the following day, the CAR is -110%, which is potentially misleading since it suggests that the loss exceeds the initial investment. In contrast, BHAR is -80%, which reflects more accurately the actual loss relative to the initial investment.

average (the median) BHAR(-500, -1) is -51.31% (-65.15%) for the TSE subgroup and -75.01% (-83.80%) for the JASDAQ and others subgroup, suggesting that there has be a sustained fall in stock price long before the delisting announcement. We find also that the average (the median) BHAR(-60, -1) is -19.84% (-23.26%) for the TSE subgroup and -42.34% (-46.45%) for the JASDAQ and others subgroup, indicating that the fall in stock price accelerates as the delisting announcement approaches. Panel B of Table 4 shows the BHAR including the announcement effect of involuntary delisting. The average (the median) BHAR(-250, +2) is -92.50% (-97.43%) for the TSE and -89.86% (-94.84%) for the JASDAQ and others subgroup, suggesting that investors holding the shares of the delisted firms lose almost all of the initial investment due to involuntary delisting.

[Table 4 about here]

2. Changes in share ownership prior to involuntary delisting

Next, we consider the change in ownership stakes of large shareholders as well as other investors surrounding this massively wealth dissipating event. Unfortunately, daily trading data by investor types are not available for the Japanese market. Therefore, we trace the change in the ownership composition on the basis of the ownership distribution data as of T-1, T-2 and T-3 (the year-end of each fiscal year) as found in the annual reports.

Table 5 shows the mean and the median share ownerships of the sample firms at T-1, T-2 and T-3. The mean percentage ownership of the largest shareholder decreases from 53.73% at T-3 to 51.95% at T-2, then to 50.30% at T-1 successively. If we further divide large shareholders into individuals, institutions including banks, other firms and foreigners, the reduction in the share ownership of individual large shareholders as well as institutional large

shareholders is evident while it is not for large shareholders that are other firms and foreigners.[10]

[Table 5 about here]

As the ownership stake of large shareholders decreases leading up to delisting, the ownership stakes of the outside shareholders naturally decrease. However, when we divide the outside shareholders into individuals, institutions, other firms and foreigners, we find that only individual investors exhibit a definitive increase in ownership whereas the rest of the outside shareholders including institutional investors show a decreasing trend in ownership. Note that ownership stakes of institutional investors and foreign investors in the sample firms tend to be low contrary to the stylized fact about Japanese stock market, where institutions and foreign investors play a dominant role. This is likely to be due to the fact that most of the delisted firms are small firms neglected by institutions and foreign investors.

Table 6 shows the changes in the share ownership during three years prior to involuntary delisting, and report whether these changes are statistically significant. The mean ownership stake of large shareholders decreases by 3.42% in two years between T-3 and T-1 and this decrease is significant at 1% level. The median percentage change in ownership of large shareholders is 2.16%, which is also significant at 1% level. We find that this sizable change in ownership of large shareholders is due to the change in ownership of large individual shareholders as well as institutions including banks. The mean changes in share ownership of large individual shareholders between T-3 and T-1 are -2.64%, which is significant at 1% level. The mean changes in share ownership of institutions between T-3 and

[10] In view of the widely practiced cross-share ownership across related firms in Japan, the share ownership of other firms included in the large shareholders appears to be those of related firms. Furthermore, reflecting the fact that banks play the central role in a typical *Keiretsu* of Japan, we often find instances where banks are large shareholders.

T-1 are -2.43%, which are significant at 1% level. However, the median changes in share ownership are smaller than the mean values, implying that the distribution of share ownership changes is skewed by some extreme values.

[Table 6 about here]

While the ownership stake of large shareholders decreases, the mean and the median ownership stakes of outside investors rise by 3.42% and 2.16%, respectively. The increases in ownership stakes are significant at 1% level. We find that the increase in shareholder ownership of outside shareholders is due principally to the increase in share ownership of individual shareholders; the mean and the median increase in share ownership of individual shareholders between T-3 and T-1 are 5.87% and 3.78%, respectively, which are significant at 1% level. In contrast, the share ownerships of institution as well as other firms decrease by 1.19% and 0.89%, respectively, which are significant at 1% level.

In short, as involuntary delisting approaches only outside individual investors increase their stakes in the delisted firms while the large shareholders as well as other outside investors roll back their ownership stakes, suggesting that retail individual investors bear the brunt of loss. We infer that, faced with the prospect of involuntary delisting that triggers a massive share price decline, large shareholders reduce their ownership stakes in the firm whereas retail individual investors increase their ownership stakes and become the de facto victims of the opportunistic behaviors of large shareholders.

3. Relation between abnormal returns and changes in share ownership

In previous sections we report that involuntary delisting leads to a massive stock price decline and that large shareholders decrease their ownership stakes whereas only retail

individual investors increase their ownership stakes. However, since this inference is based on the mean and the median of abnormal returns and changes in ownership stakes, a direct relationship between the changes in ownership stakes and the abnormal returns cannot be asserted unambiguously. Therefore, in this section we use the cross-sectional regression of the sample firms in an attempt to show the relationship between abnormal returns due to delisting and changes in ownership stakes.

We test a cross-sectional regression model, where the dependent variable is BHAR(-250, -1), the one-year holding period return prior to delisting or BHAR(0, +1), a measure of the disclosure effect of involuntary delisting. The independent variables are changes in the share ownership of large shareholders (ΔLG_SHDR), changes in the share ownership of outside individual shareholders (ΔOT_INDI), changes in the share ownership of outside institutional shareholders (ΔOT_INST) and other control variables. We control for the effect of firm size using the natural logarithm of capitalization at the end of T-3 (SIZE) and the effect of financial leverage using the debt ratio at the end of T-3 (LEV). We also control for the effect of the deterioration in profitability on the holding period return using the change in ROA from the end of T-3 to the end of T-1 (ΔROA) and the effect of turnover on the holding period return using the trading volume turnover during the period from T-3 to T-1 (Turnover). The model estimation results are shown in Table 7.

[Table 7 about here]

First, we examine the model of the holding period for one year prior to delisting (BHAR(-250, -1)). The effect of ΔLG_SHDR is positive and significant whereas the effect of ΔOT_INDI is negative and significant, suggesting that those firms in which large shareholders reduce their ownership stakes and retail individual investors increase their

ownership stakes show a larger fall in stock price. However, the coefficient of ΔOT_INST is not statistically significant, suggesting that changes in the ownership stakes of outside institutional investors do not affect the holding period return prior to delisting.

Though not shown in the table, we also find that the effect of the change in the share ownership of other outside investors such as foreigners and other firms on the holding period return is not statistically significant. Therefore, we conclude that, of changes in share ownership, the reduction in the ownership stakes of the large shareholders and the increase in the ownership stakes of retail individual investors are the only economically meaningful factors. Among the control variables only the effect of SIZE is negative and significant, albeit weakly, suggesting that larger firms experience a larger stock price decline prior to involuntary delisting.

Next, we turn to the model of two-day abnormal return of the delisting announcement, BHAR(0, +1). We find that none of the coefficients of ΔLG_SHDR, ΔOT_INDI and ΔOT_INST is significant, suggesting that the delisting announcement effect is not influenced by the changes in the ownership stakes of the large shareholders, outside individual investors or outside institutional investors. Among control variables we find that the coefficient of SIZE is negative and statistically significant, indicating that the information effect of delisting announcement is larger on larger firms. The coefficient of ΔROA is positive and weakly significant, indicating that firms that suffer a large deterioration in profitability experience a larger fall in stock price following the delisting announcement.

4. Determinants of change in share ownership prior to involuntary delisting

Up to this point we have found that prior to the involuntary delisting large shareholders reduce their ownership stakes whereas retail individual investors increase their ownership stakes. I addition, outside institutional investors reduce their ownership stakes albeit in a smaller measure. In this section we examine what factors determine the changes in the ownership stakes of these shareholders.

We propose to investigate the effect of the unique Japanese corporate governance structure on the changes in the ownership stakes prior to delisting. Cross-share ownership across related firms is widely practiced in Japan (Kaplan, 1994; Kaplan and Minton, 1994; Kang and Shivdasani, 1995; Kang and Shivdasani, 1997). In particular, banks own a sizable equity stake of related firms being at the center of the governance structure of the related firms (Hoshi et al., 1990; Weinstein and Yafeh, 1998; Morck et al., 2000; Imai, 2007). For the purpose of examining the influence of the unique Japanese corporate governance on the changes in the ownership stakes prior to delisting, we create the following corporate governance variables. Bank_dummy takes the value of 1 if banks own more than 5% of the shares and zero, otherwise. Other_firms_dummy takes the value of 1 if related firms own more than 50% of the shares and zero, otherwise. In order to see if secondary equity offering (SEO) affects the changes in ownership composition, we create SEO_dummy, which takes the value of 1 if there was an SEO between T-3 to T-1 and zero, otherwise.

In addition, in order to examine the effect of information asymmetry between the managers and outside investors on the changes in ownership composition we include an information asymmetry variable in the model. Dierkens(1991) examines the relevance of information asymmetry between the managers of the firm and the market for the equity issue process. Following Dierkens(1991), this paper utilizes the market-adjusted residual standard

deviation of daily abnormal returns during the period from T-3 to T-1 (σ_ε) as a proxy for information asymmetry between the large shareholders and outside investors.[11] As control variables SIZE and ΔROA are added in the model.

As shown in Table 8, neither Bank_dummy nor Other_firms_dummy has statistically significant influence on the changes in the ownership stakes of large shareholders or outside investors. This result suggests that the sizable ownership stakes of bank or related firms are not a determinant of the changes in the ownership stakes of large shareholders and outside investors prior to delisting. The effect of the secondary equity offering, SEO_dummy, is not significant, either.

[Table 8 about here]

However, the proxy for information asymmetry between the large shareholders and outside investors, $\sigma_{\varepsilon,}$ has a statistically significant negative effect on the change in the share ownership of large shareholders (ΔLG_SHDR), and a statistically significant positive effect on the change in the share ownership of retail individual investors (ΔOT_INDI). This result implies that the larger the information asymmetry between large shareholders and the outside investors prior to delisting, the larger is the reduction in the share ownership of large shareholders and the larger is the increase in the share ownership of retail individual investors. This result is consistent with the interpretation that the larger the information asymmetry between large shareholders and outside investors, the more severe is the opportunistic behavior on the part of large shareholders at the expense of retail individual investors.

Besides, SIZE has a negative effect on ΔLG_SHDR and has a positive effect on

[11] Dierkens (1991) utilizes σ_ε as a proxy for information asymmetry between the managers and outside investors. Since in Japan the separation between ownership and management is weak and the large shareholders are active in the firm management, this paper utilizes σ_ε as a proxy for information asymmetry between large shareholders and outside investors

ΔOT_INDI, indicating that for larger firms the reduction in the share ownership of large shareholders as well as the increase in the share ownership of retail individual investors is larger. On the other hand, the effects of most of the explanatory variables on the change in the share ownership of outside institutional investors (ΔOT_INST) are not statistically significant. It is interesting to observe that regardless of whether explanatory variables are statistically significant or not, the coefficients of these variables are of similar magnitude with opposite signs between the change in the share ownership of large shareholders (ΔLG_SHDR) and the retail individual investors (ΔOT_INDI). This result suggests that the wealth expropriation by large shareholders is inflicted specifically on retail individual investors.

5. Relation between change in share ownership and involuntary delisting

Finally, we examine whether the change in the share ownership of large shareholders and retail individual investors have any relationship with involuntary delisting. For this we find firms that match the sample firms with similar firm characteristics but without being delisted. Using the sample consisting of the delisted firms and their matched firms, we estimate a logit regression model of delisting, where we investigate the predictive power of the change in share ownership of large shareholders and outside investors as well as other explanatory variables on involuntary delisting,

The matched firms are those in the same industry as the sample firms with similar size and profitability to the sample firms, but without being delisted. First we rank-order all listed firms in Japan on the basis of ROA into ten groups; then we rank-order firms in each of the ROA-sorted groups into five groups on the basis of market capitalization at T-3. In this manner we create 50 groups. Then, we find the firms in the same group as the delisted firm

belonging to the same industry. The industry is matched on the first two or three digits of the SIC codes, which are shown in Table 1. When the same firm is a match for more than one delisted firm, then we use the firm only once. Out of 136 delisted firms in the sample we are not able to find a matching firm for one delisted firm. As for the other delisted firms we are able to find between one and six matching firms. Finally, the total number of the matched firms used in the logit regression model is 438.

The dependent variable of the logit model takes the value of 1 if the firm is delisted and zero, otherwise. As explanatory variables (predictors) we use the change in share ownership of large shareholders (ΔLG_SHDR), the change in share ownership of retail individual investors (ΔOT_INDI), the change in share ownership of outside institutional investors (ΔOT_INST), which are used separately in Models 1, 2 and 3.[12] As additional explanatory variables we use return volatility (VarR) and trading volume turnover (Turnover) during the period from T-3 to T-1, the natural logarithm of market capitalization (SIZE), return on asset (ROA) and debt ratio (LEV) at T-3, and change in ROA from T-3 to T-1 (ΔROA). The regression estimation results are shown in Table 9.

[Table 9 about here]

First, we find that ΔLG_SHDR has a significantly negative coefficient, indicating that a reduction in share ownership of large shareholders can be a predictor of involuntary delisting; ΔOT_INDI has a significantly positive coefficient, indicating that an increase in share ownership of retail individual investors adds to the probability of involuntary delisting. This result suggests that of firms that belong to the same industry with comparable profitability and size the large shareholders decreases their ownership in the firms that are

[12] We use ΔLG_SHDR, ΔOT_INDI, and ΔOT_INST in separate regression models to avoid multicolinearity between them.

expected to be delisted. In the meantime the shares disposed by large shareholders are added to the share ownership of retail individual investors.[13] On the other hand, the change in share ownership of outside institutional investors (ΔOT_INST) is not a significant predictor of involuntary delisting.

As for the other explanatory variables the coefficients of VarR and Turnover are positive and significant, suggesting that firms with larger volatility and turnover are more likely to be delisted. In addition, the coefficients of ΔROA and LEV are negative and positive, respectively, implying that as the profitability of firms deteriorates and financial leverage increases the firms become more likely to be delisted. On the other hand, SIZE and ROA, which are criteria used to find matching firms, are not statistically significant, confirming that the matching process has been carried out properly.

V. Summary and Conclusions

This paper analyzes the wealth effect of involuntary delisting in the Japanese stock market. More importantly, we investigate whether large shareholders take advantage of inside information on delisting likelihood at the expense of outside investors by examining the changes in share ownership structure of the delisted firms. Using the sample of delisted firms in Japan between 2002 and 2012, we find the following results.

[13] The reason for retail individual investors to purchase the shares sold by large shareholders is that retail investors tend to purchase shares that have been falling in price for some time. This contrarian approach by retail investors has been discussed extensively in the literature (Nofsinger and Sias, 1999; Griffin et al., 2003; Kaniel et al., 2008).

First, the information effect of involuntary delisting decision is about -70%, suggesting that delisting is a highly disruptive event in Japan. The fall in valuation due to delisting is far more pronounced in Japan than in the U.S. This difference in the market response between the two jurisdictions is likely to be due to the fact that there is very little post-delisting liquidity of delisted stocks in Japan whereas there is still some liquidity even after the delisting in the U.S. This view is consistent with the liquidity hypothesis proposed by Macey, O'Hara, and Pompilo (2008) and Sanger and Peterson (1990), who contend that the reduction in liquidity as well as the increase in liquidity risk is the primary reason for the negative effect of delisting on the stock price.

Second, the delisted firms show a price decline long before the delisting decision is announced. The one-year holding period prior to delisting is about -60%, indicating that stocks that show a significant fall in value become delisted. Furthermore, the one-year holding period that includes the effect of delisting disclosure is as high as -90%, indicating that investors holding the shares lose essentially all of their investment.

Third, large shareholders reduce their shareholdings prior to involuntary delisting, suggesting that faced with the prospect of involuntary delisting that triggers a massive share price decline, large shareholders display opportunistic behavior by reducing their ownership stakes in the firm. By contrast, retail individual investors increase their shareholdings prior to involuntary delisting, suggesting that retail individual investors become the victims of the opportunistic behaviors of large shareholders.

Fourth, in the cross-sectional regression analyses of the abnormal returns of delisted firms we find that the greater the reduction in the shareholding of the large shareholders and the greater the increase in the shareholding of the individual shareholders, the larger is the

one-year decrease in the stock price prior to delisting. This result suggests that those firms in which large shareholders reduce their ownership stakes and retail individual investors increase their ownership stakes show a larger fall in stock price. In addition, from the model of the change in share ownership of different investor types we find that the greater the information asymmetry between the insiders and the market the larger is the reduction in the shareholding of the large shareholders and the increase in the shareholding of individual shareholders. This result suggests that the greater information asymmetry between the insiders and the market leads to the more severe opportunistic behavior of the large shareholders.

Finally, using the sample consisting of the delisted firms and their matched firms, we estimate a logit model of delisting probability. We find that the reduction in the shareholding of the large shareholders and the increase in the shareholding of individual shareholders are significant predictors of involuntary delisting. This result suggests that the large shareholders decrease their ownership in the firms that are expected to be delisted, and the shares disposed by large shareholders are added to the share ownership of retail individual investors.

In conclusion, involuntary delisting precipitates a collapse of prices in the delisted stocks in Japan. This dramatic market response appears to be due primarily to the market condition in Japan where the trading of delisted stocks is virtually non-existent. Large shareholders appear to take advantage of private information on the prospect of delisting, causing wealth transfer from large shareholders to individual investors. Individual investors absorb most of losses from delisting. This is remarkable because the Japanese market being a preeminent market in an advanced economy is perceived to be far more transparent and orderly than the emerging markets. Therefore, our study suggests that delisting does not offer adequate retail investor protection even in advanced markets if the separation of ownership

and management is not rigorous and the information asymmetry between large shareholders and retail individual investors is high.

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Table 1 Involuntary delisted firms in the Japanese stock market

This table shows the division and yearly distribution of involuntary delisted firms (Panel A) and their industry distribution (Panel B) in the Japanese market for the period from January 2002 to December 2012.

Panel A: Division and Yearly Distribution

Division	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
Tokyo Stock Exchange	19	6	4	2	0	2	12	14	3	3	4	69
JASDAQ	2	0	0	1	1	2	11	6	6	2	4	35
MOTHERS	0	0	0	2	0	1	1	4	1	2	1	12
Osaka Stock Exchange	0	1	1	1	1	2	3	6	0	1	0	16
Sapporo Stock Exchange	1	0	0	0	0	0	0	1	0	1	3	6
Nagoya Stock Exchange	0	0	0	0	0	0	1	2	0	1	2	6
Total	22	7	5	6	2	7	28	33	10	10	14	144

Panel B: Industry Distribution

Large Classification	Numbers
Fishery, Agriculture & Forestry	1
Mining	0
Construction	22
Manufacturing	43
(Fiber)	(9)
(Machinery)	(11)
(Electric Appliance)	(11)
(Others)	(12)
Electric Power & Gas	0
Transport & Telecommunication	15
(Transportation & Wharehouse)	(1)
(Communication)	(14)
Commerce	12
Finance & Insurance	8
Real Estate	27
Service	16
Total	144

Table 2 Basic characteristics of sample firms

This table shows the basic characteristics of the sample firms, which are involuntarily delisted from either the Tokyo Stock Exchange or the JASDAQ and others (including Mothers, Osaka Stock Exchange, Nagoya Stock Exchange and Sapporo Stock Exchange) for the period from January 2002 to December 2012. Means and medians of the basic characteristics are shown for each year from three years prior to the delisting (T-3) to the year before delisting (T-1). Market capitalization, ROA, debt ratio, and interest coverage ratio are measured at year-end.

Division		Tokyo Stock Exchange			JASDAQ and Others		
Basic characteristics		T-3	T-2	T-1	T-3	T-2	T-1
Market capitalization (billion yen)	Mean	41.28	40.13	20.74	8.89	6.50	2.90
	Median	11.54	8.83	4.77	3.73	2.57	1.21
ROA (%)	Mean	-3.81	-8.83	-27.36	-24.71	-34.58	-77.66
	Median	0.30	-1.13	-6.66	-1.34	-13.68	-24.59
Debt ratio (%)	Mean	74.38	77.82	99.80	73.06	79.54	121.40
	Median	78.75	78.91	86.78	72.45	77.59	90.46
Interest coverage ratio	Mean	1.43	1.64	-0.39	0.36	0.66	0.34
	Median	0.13	0.12	-0.03	0.01	0.00	-0.02

Table 3 Abnormal returns surrounding involuntary delisting disclosure

This table shows the daily abnormal returns (AR) during eight trading days surrounding the announcement of involuntary delisting. BHAR(t_1, t_2) is the buy-and-hold abnormal return between day t_1 and day t_2. *, ** and *** correspond to the level of significance at 10%, 5% and 1% , respectively.

Return Measure	Market division							
	Tokyo Stock Exchange				JASDAQ & Others			
	Mean	(t-value)	Median	(z-value)	Mean	(t-value)	Median	(z-value)
AR(-8)	0.80	(0.60)	0.15	(-0.68)	-1.60	(-0.91)	-0.57	(-1.51)
AR(-7)	0.68	(0.50)	-0.52	(-0.06)	0.38	(0.36)	-0.21	(-0.42)
AR(-6)	-1.59	(-1.51)	-0.90**	(-2.11)	-1.05	(-0.62)	-1.58***	(-2.80)
AR(-5)	-2.72*	(-1.69)	-1.56***	(-2.62)	-1.11	(-1.10)	-0.80*	(-1.82)
AR(-4)	-0.85	(-0.78)	-1.00	(-1.46)	-0.80	(-0.40)	-1.33***	(-2.59)
AR(-3)	-1.52	(-1.12)	-0.19	(-0.62)	-3.27**	(-2.30)	-0.99*	(-1.96)
AR(-2)	-1.50	(-1.32)	-1.96**	(-2.09)	-1.87**	(-1.99)	-1.21**	(-2.19)
AR(-1)	-2.36	(-1.65)	-0.23	(-1.06)	-0.60	(-0.35)	-0.54	(-1.17)
AR(0)	-52.48***	(-13.15)	-48.21***	(-6.89)	-34.72***	(-11.01)	-23.62***	(-7.33)
AR(+1)	-45.68***	(-8.45)	-52.65***	(-5.57)	-41.23***	(-10.61)	-34.11***	(-7.03)
AR(+2)	-6.12	(-1.09)	-0.93*	(-1.69)	-8.60**	(-2.12)	-8.17***	(-3.24)
AR(+3)	-5.37**	(-2.37)	-1.46***	(-3.38)	-5.74**	(-2.14)	-8.56***	(-3.08)
AR(+4)	-1.46	(-0.57)	-0.23	(-1.44)	-5.83	(-1.59)	-7.50***	(-3.94)
AR(+5)	-2.28	(-0.74)	-0.62**	(-2.12)	2.00	(0.51)	-3.91**	(-2.22)
AR(+6)	-0.69	(-0.24)	-0.60	(-1.14)	-4.01	(-1.61)	-3.53**	(-2.35)
AR(+7)	-4.47**	(-2.13)	-0.52**	(-2.35)	-6.47***	(-3.50)	-7.34***	(-4.58)
AR(+8)	-0.09	(-0.03)	-0.57	(-1.52)	-1.36	(-0.65)	-0.65	(-1.30)
BHAR(-8, -1)	-7.09*	(-1.92)	-2.95**	(-2.17)	-11.12***	(-3.72)	-8.54***	(-4.15)
BHAR(0, +1)	-79.10***	(-24.77)	-90.22***	(-6.92)	-63.31***	(-19.28)	-67.49***	(-7.33)
BHAR(+2, +8)	-21.33***	(-3.58)	-7.64***	(-3.74)	-28.62***	(-5.11)	-29.12***	(-5.89)

Table 4 Buy-and-hold abnormal returns prior to involuntary delisting

This table shows the buy-and-hold abnormal returns (BHARs) prior to involuntary delisting. Panel A shows the BHAR until the day before the delisting decision (t=-1) while Panel B shows the BHAR until two days after the delisting decision (t=+2), which includes the announcement effect of involuntary delisting. *, ** and *** correspond to the level of significance at 10%, 5% and 1% , respectively.

Panel A: BHAR until the day before the delisting decision (t=-1)

Division	BHAR(-500, -1)		BHAR(-250, -1)		BHAR(-120, -1)		BHAR(-60, -1)	
	Mean (t-value)	Median (z-value)	Mean (t-value)	Median (z-value)	Mean (t-value)	Median (z-value)	Mean (t-value)	Median (z-value)
Tokyo Stock Exchange	-51.31*** (-6.09)	-65.15*** (-6.10)	-48.73*** (-9.26)	-57.11*** (-5.89)	-32.54*** (-4.99)	-39.94*** (-5.10)	-19.84*** (-3.19)	-23.26*** (-3.82)
JASDAQ & Others	-75.01*** (-19.87)	-83.80*** (-6.95)	-65.85*** (-20.22)	-70.98*** (-7.28)	-52.22*** (-13.89)	-60.25*** (-6.93)	-42.34*** (-10.81)	-46.45*** (-6.60)

Panel B: BHAR until two days after delisting decision (t=+2)

Division	BHAR(-500, +2)		BHAR(-250, +2)		BHAR(-120, +2)		BHAR(-60, +2)	
	Mean (t-value)	Median (z-value)	Mean (t-value)	Median (z-value)	Mean (t-value)	Median (z-value)	Mean (t-value)	Median (z-value)
Tokyo Stock Exchange	-93.80*** (-7.85)	-98.01*** (-6.52)	-92.50*** (-18.25)	-97.43*** (-6.52)	-83.77*** (-11.32)	-95.79*** (-6.53)	-83.42*** (-13.30)	-95.32*** (-6.51)
JASDAQ & Others	-93.65*** (-68.49)	-96.42*** (-7.37)	-89.86*** (-50.81)	-94.84*** (-7.38)	-84.91*** (-38.29)	-92.60*** (-7.37)	-82.20*** (-36.81)	-88.92*** (-7.37)

Table 5 Share ownership during 3 years prior to involuntary delisting

This table shows the shareholder composition of involuntary delisting firms at the end of three years (T-3), two years (T-2), and one year (T-1) prior to the delisting fiscal year T.

Shareholder composition	T-3		T-2		T-1	
	Mean	Median	Mean	Median	Mean	Median
Large shareholders	53.73	54.11	51.95	53.10	50.30	50.99
Individual	18.38	9.45	17.61	9.97	15.73	9.37
Institution	8.66	6.03	7.77	5.01	6.23	4.05
(Bank)	(3.05)	(0.00)	(2.69)	(0.00)	(2.57)	(0.30)
Other firms	22.28	16.64	21.78	15.49	22.90	17.36
Foreigner	4.40	0.00	4.80	0.00	5.43	0.00
Outsider Investors	46.27	45.89	48.05	46.91	49.70	49.01
Small Individual	35.08	34.04	37.15	35.01	40.96	39.62
Institution	4.53	2.86	4.41	3.13	3.34	2.05
Other Firms	4.27	2.85	3.84	2.37	3.38	2.25
Foreigners	2.38	0.83	2.64	0.87	2.00	0.77

Table 6 Test of changes in share ownership during 3 years prior to involuntary delisting

This table shows the changes in the share ownership during three years prior to involuntary delisting. Tests of differences are based on the t-test for mean difference and the Wilcoxon signed-rank test for median difference. Numbers in round brackets are t-values and z-values. *, ** and *** correspond to the level of significance at 10%, 5% and 1%, respectively.

Shareholder composition	t-test			Wilcoxon signed-rank test		
	T-3 vs.T-1	T-2 vs.T-1	T-3 vs.T-2	T-3 vs.T-1	T-2 vs.T-1	T-3 vs.T-2
Large shareholders	-3.42***	-1.65	-1.77**	-2.16***	-0.84***	-1.14***
	(-2.62)	(-1.58)	(-2.09)	(-3.16)	(-2.77)	(-2.95)
Individual	-2.64**	-1.88*	-0.77	0.00	0.00	0.00
	(-2.32)	(-1.95)	(-1.04)	(-1.09)	(-1.28)	(-0.62)
Institution	-2.43***	-1.53***	-0.90**	-1.14***	-0.35***	-0.04***
	(-5.47)	(-4.27)	(-2.08)	(-5.21)	(-4.21)	(-2.67)
Bank	-0.48**	-0.12	-0.37***	0.00***	0.00	0.00***
	(-2.35)	(-0.87)	(-2.74)	(-2.63)	(-1.01)	(-3.31)
Other firms	0.62	1.13	-0.50	-0.01	0.00	-0.04*
	(0.41)	(0.93)	(-0.54)	(-0.73)	(-0.52)	(-1.76)
Foreigner	1.03	0.64	0.39	0.00	0.00	0.00
	(1.25)	(1.06)	(0.63)	(-0.99)	(-0.34)	(-1.32)
Outsider Investors	3.42***	1.65	1.77**	2.16***	0.84***	1.14***
	(2.62)	(1.57)	(2.08)	(-3.17)	(-2.77)	(-2.96)
Small Individual	5.87***	3.81***	2.07***	3.78***	2.71***	1.45***
	(4.52)	(3.59)	(2.60)	(-4.88)	(4.66)	(-3.24)
Institution	-1.19***	-1.07***	-0.12	-0.68***	-0.62***	-0.05
	(-4.89)	(-5.40)	(-0.65)	(-4.97)	(-5.60)	(-0.35)
Other Firms	-0.89***	-0.46*	-0.43**	-0.53***	-0.34***	-0.23***
	(-2.89)	(-1.71)	(-2.13)	(-4.34)	(-3.60)	(-2.93)
Foreigners	-0.38	-0.64***	0.26	-0.01	-0.08***	0.01
	(-1.38)	(-2.75)	(-1.18)	(-1.41)	(-3.09)	(-0.33)

Table 7 Determinants of BHAR(-250, -1) and BHAR(0, +1) prior to involuntary delisting

This table shows the determinants of BHAR(-250, -1) and BHAR(0, +1) prior to involuntary delisting based on the following cross-sectional regression:

BHAR(-250, -1) or BHAR(0, +1) = C+ β_1(ΔLG_SHDR or ΔOT_INDI or ΔOT_INST) + β_2SIZE + β_3ΔROA + β_4LEV + β_5Turnover + ε

where, BHAR(-250, -1) and BHAR(0, +1) are the buy-and-hold abnormal returns for the period from t=-250 to t=-1 and that from t=0 to +1, respectively; ΔLG_SHDR, ΔOT_INDI, and ΔOT_INST are changes in shareholding of large shareholders, outside individual investors and outside institutional investors during the period from T-3 to T-1, respectively; SIZE and LEV are the natural logarithm of market capitalization and the debt ratio at the end of T-3, respectively; ΔROA is the change in ROA from T-3 to T-1; and Turnover is the trading volume turnover during the period from T-3 to T-1. Numbers in round brackets are t-statistics. *, ** and *** correspond to the level of significance at 10%, 5% and 1%, respectively.

Independent Variables	Dependent Variable					
	BHAR(-250, -1)			BHAR(0, 1)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
ΔLG_SHDR	0.427**			0.174		
	(2.76)			(1.09)		
ΔOT_INDI		-0.330**			-0.092	
		(-2.11)			(-0.57)	
ΔOT_INST			-0.154			0.490
			(-0.18)			(0.56)
SIZE	-2.773*	-2.638	-3.17*	-3.72**	-3.728**	-3.984**
	(-1.76)	(-1.64)	(-1.94)	(-2.29)	(-2.27)	(-2.43)
ΔROA	0.029	0.024	0.025	0.036*	0.034	0.037*
	(1.43)	(1.19)	(1.15)	(1.72)	(1.63)	(1.71)
LEV	-0.077	-0.066	-0.071	-0.068	-0.064	-0.073
	(-1.48)	(-1.25)	(-1.26)	(-1.27)	(-1.19)	(-1.31)
Turnover	0.035	0.001	-0.08	0.372	0.347	0.335
	(0.15)	(0.00)	(-0.34)	(1.53)	(1.43)	(1.40)
C	-55.562***	-56.955***	-53.324***	-35.295**	-35.443**	-33.417**
	(-3.60)	(-3.63)	(-3.33)	(-2.27)	(-2.22)	(-2.08)
Adj R2	0.03	0.072	0.039	0.108	0.101	0.101
P-value	(0.01)	(0.09)	(0.41)	(0.01)	(0.02)	(0.02)

Table 8 Determinants of change in share ownership prior to involuntary delisting

This table shows the determinants of change in shareholding of large shareholders (ΔLG_SHDR), outside individual investors (ΔOT_INDI) and outside institutional investors (ΔOT_INST) during the period from T-3 to T-1 based on the following cross-sectional regression:

$\Delta LG\_SHDR \text{ or } \Delta OT\_INDI \text{ or } \Delta OT\_INST = C + \beta_1 Bank\_dummy + \beta_2 Other\_firms\_dummy + \beta_3 SEO\_dummy + \beta_4 \sigma_\varepsilon + \beta_5 SIZE + \beta_6 \Delta ROA + \varepsilon$

where, Bank_dummy takes the value of 1 if banks own more than 5% of the stock and zero, otherwise; Other_firms_dummy takes the value of 1 if related firms own more than 50% of the stock and zero, otherwise; SEO_dummy is takes the value of 1 if there was an SEO between T-3 to T-1 and zero, otherwise; σ_ε is the market-adjusted residual standard deviation of daily abnormal returns during the period from T-3 to T-1; SIZE is the natural logarithm of market capitalization at the end of T-3; and ΔROA is the change in ROA from T-3 to T-1. Numbers in round brackets are t-statistics. *, ** and *** correspond to the level of significance at 10%, 5% and 1%, respectively.

Independent Variables	Dependent Variable		
	ΔLG_SHDR	ΔOT_INDI	ΔOT_INST
Bank_dummy	3.265	-1.826	-1.124
	(0.98)	(-0.55)	(-1.65)
Other_firms_dummy	1.607	-1.769	-0.197
	(0.59)	(-0.66)	(-0.37)
SEO_dummy	2.756	-2.486	-0.459
	(0.96)	(-0.86)	(-0.82)
σ_ε	-1.749***	1.723***	0.075
	(-2.78)	(2.76)	(0.62)
SIZE	-2.075**	2.521***	-0.075
	(-2.25)	(2.75)	(-0.42)
ΔROA	-0.003	0.003	0.000
	(-1.21)	(1.22)	(0.67)
C	20.123**	-21.945**	-0.285
	(1.99)	(-2.18)	(-0.15)
Adj. R2	0.106	0.111	0.038
P-value	(0.02)	(0.02)	(0.54)

Table 9 Logit regression for predictability of involuntary delisting

This table shows the results of the following logit regression for the dependent variable which takes the value of 1 for the sample of delisted firms and zero for the matching sample of non-delisted firms.

Delist_dummy = C+ β_1(ΔLG_SHDR or ΔOT_INDI or ΔOT_INST) + β_2VarR + β_3Turnover + β_4SIZE + β_5ROA + β_6ΔROA + β_7LEV + ε

where, ΔLG_SHDR, ΔOT_INDI, and ΔOT_INST are changes in shareholding of large shareholders, outside individual investors and outside institutional investors during the period from T-3 to T-1, respectively; VarR and Turnover are return volatility and trading volume turnover during the period from T-3 to T-1, respectively; SIZE, ROA, LEV are the natural logarithm of market capitalization, the return on asset (ROA), and the debt ratio at the end of T-3; and ΔROA is the change in ROA from T-3 to T-1.

Independent Variables	Dependent Variable Delisted firm = 1; Non-delisted firm = 0		
	Model 1	Model 2	Model 3
ΔLG_SHDR	-0.020**		
	(0.03)		
ΔOT_INDI		0.038***	
		(0.00)	
ΔOT_INST			-0.028
			(0.58)
VarR	0.246***	0.249***	0.240***
	(0.00)	(0.00)	(0.00)
Turnover	0.058***	0.055***	0.066***
	(0.00)	(0.00)	(0.00)
SIZE	0.086	0.078	0.093
	(0.38)	(0.43)	(0.33)
ROA	-0.003	-0.005	-0.003
	(0.67)	(0.59)	(0.73)
ΔROA	-0.023***	-0.023***	-0.022***
	(0.00)	(0.00)	(0.00)
LEV	0.036***	0.036***	0.036***
	(0.00)	(0.00)	(0.00)
C	-5.752***	-5.743***	-5.775***
	(0.00)	(0.00)	(0.00)
Cox-Snell R-squared	0.250	0.256	0.244

Figure 1. Delisting process of the Japanese Stock Exchanges