Why Did "Zombie" Firms Recover in Japan?

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Abstract

The Japanese economy experienced prolonged recessions during the 1990s. Previous studies suggest that evergreen lending to troubled firms known as "zombie firms" distorted market discipline in terms of stabilizing the Japanese economy and caused significant delays in the economy's recovery. However, the eventual bankruptcy of zombies was rare. In fact, a majority of the "zombie" firms substantially recovered during the first half of the 2000s. The purpose of this paper is to investigate why zombie firms recovered in Japan. We first extend the method of Caballero, Hoshi, and Kashyap (2008) and identify zombies from among the listed firms. Subsequently, we investigate the nature of corporate restructuring that was effective in reviving zombie firms. Our multinomial logistic regressions suggest that reducing the employee strength of zombie firms and selling its fixed assets were beneficial in facilitating their recovery. However, corporate restructuring without accounting transparency or by discouraging incentives for managers was ineffective. In addition, corporate restructuring lacked effectiveness in the absence of favorable macroeconomic environment as well as substantial external financial support.

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1. Introduction

   The Japanese economy experienced prolonged recessions during the 1990s.   The negative shocks dramatically impaired collateral values as a result of which a number of Japanese banks were unable to adjust to the shocks.   However, some of the banks continued to provide credit to troubled borrowers known as zombie firms.   Previous studies including Peek and Rosengren (2005) and Caballero, Hoshi, and Kashyap (2008) suggested that evergreen lending to zombie firms distorted market discipline in terms of stabilizing the Japanese economy and caused significant delays in the economy's recovery.[1]   Under "soft budget constraints," the troubled Japanese banks were incentivized for supplying credit to weak firms, a number of which were already insolvent (see, for example, Berglöf and Roland [1995] and Dewatripont and Maskin [1995]).   Under these circumstances, an appropriate prescription would have been to dissolve these insolvent firms.

   It is plausible that banks continued to provide loans to socially inefficient zombie firms and that several inefficient firms continued to remain afloat owing to the evergreen lending.   However, the eventual bankruptcy of the zombie firms was rare. In fact, a majority of the zombie firms recovered substantially during the first half of the

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[1] In addition, see Sekine, Kobayashi, and Saita (2003), Hanazaki and Horiuchi (2003), and Ahearne and Shinada (2004).

2000s. As Figure 1 indicates, the Japanese economy had recovered from the prolonged recessions during the first half of the 2000s and recorded sustained growth until summer in 2008.[2] If the troubled firms were of no social value, their eventual bankruptcy would have been inevitable.

The purpose of this paper is to investigate why zombie firms recovered in Japan. In the paper, we first extended the method of Caballero, Hoshi, and Kashyap (2008) and identified zombies from among the listed firms. Subsequently, we investigated the nature of corporate restructuring that was effective in reviving the zombie firms and moving them into the "non-zombie" category. Our multinomial logistic regressions suggest that reducing the employee strength in zombie firms and selling its fixed assets facilitated their recovery. One of the main driving forces for the recovery of the zombie firms was the tremendous structural changes during and after the financial crisis. However, corporate restructuring without accounting transparency or by discouraging incentive for managers was ineffective. In addition, we find that corporate restructuring was less effective in the absence of a favorable macroeconomic environment as well as external financial supports. The results imply that we require

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[2] Following autumn in 2008, the Japanese economy collapsed into unprecedented recession owing to the global financial crisis. However, this is beyond the scope of this paper.

additional preconditions for corporate restructuring in order to revive troubled firms after the crisis.

In previous studies, Fukuda and Koibuchi (2006) indicated that under the Japanese banking crisis, "shock therapy" was effective in improving performance of large firms. In contrast, Fukuda and Koibuchi (2007) suggested that the "shock therapy" was less effective in improving performance of small and medium firms that were vulnerable to negative external shocks. Our results are consistent with theirs in terms of the emphasis on substantial and swift corporate restructuring for the recovery of troubled firms. However, since "shock therapy" is accompanied by considerable special losses, favorable macroeconomic environment, as well as substantial financial support is indispensable for making corporate restructuring effective.

The paper is organized in the following manner. Section 2 identifies zombies from among the listed firms. Section 3 explains our multinomial models for exploring the nature of corporate restructuring that was effective in reviving zombie firms. Section 4 presents the descriptive statistics of explanatory variables. Section 5 reports the baseline estimation results. Section 6 indicates estimation results for two sub-sample periods, and Section 7 reports the effects of corporate restructuring on the profits of healthy firms. Section 8 summarizes our main results and discusses their implications.

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2. How to identify zombie firms?

2.1. Methodology

In order to investigate why zombie firms recovered, it is critical to first identify those firms that can be categorized as zombies.   Caballero, Hoshi, and Kashyap (2008), hereafter CHK, defined zombies as those firms whose interest payments were lower than the hypothetical risk free interest payments.[3]   The basic idea is that troubled firms must have received substantial interest relief; therefore, their interest payments must have been lower than those of healthy firms.   The attractive feature of CHK's criterion is that it identifies zombies based on a simple criterion.   However, it is also a noisy measure of zombies, where both type one and two errors are noteworthy.

First, the CHK criterion may identify rather healthy firms as zombies.   CHK used

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[3] The CHK's criterion defined the hypothetical risk free interest payment "$R^*_{i,t}$" in the following manner:

$$R^*_{i,t} = rs_{t-1} \cdot BS_{i,t-1} + \left(\frac{1}{5} \sum_{j=1}^{5} rl_{t-j} \right) \cdot BL_{i,t-1} + rcb_{5\text{years},t} \cdot Bonds_{i,t-1},$$

where $BS_{i,t}$, $BL_{i,t}$ and $Bonds_{i,t}$ are short-term (less than one year) bank loans, long-term (over one year) bank loans, and total bonds outstanding (including convertible and warrant-attached bonds) of firm i at the end of year t, respectively. The interest rates rs_t and rl_t are the average short-term and long-term prime rate for year t, respectively and $rcb_{5\text{years},t}$ is the minimum observed rate on any convertible corporate bond issued over the previous five years prior to t.

prime lending rates as risk free rates in order to identify zombies. However, we observed a number of healthy firms whose interest rates were lower than the prime lending rates. This was particularly true in the 2000s when the Japanese economy had steadily recovered under the quantitative easing monetary policy.

Second, it may not identify unhealthy firms as zombies. Banks permitted interest relief to a number of their troubled borrowers. Whenever borrowers were in serious financial trouble, the banks would grant debt relief in order to keep them afloat. In particular, during the banking crisis in Japan, troubled banks increased evergreen lending to their troubled borrowers in order to conceal the actual value of their non-performing loans. This evergreen lending permitted rather unhealthy firms to pay their interest at rates prevailing in the market without any concession.

In order to avoid the type one and two errors, we introduced additional criteria for defining zombies. First is the "profitability criterion," where those firms whose earnings before interest and taxes (EBIT) exceeded the hypothetical risk free interest payments were excluded from being categorized as zombies.[4] Pre-tax profits after deducting non-operating income should never be negative for healthy firms. Therefore,

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[4] Since interest payments are smaller than the hypothetical risk free interest payments under CHK's criterion, only those firms that had positive pre-tax profits were excluded from being categorized as "zombies" under the profitability criterion.

excluding such profitable firms from being categorized as zombies reduced the likelihood of CHK's criterion identifying healthy firms as zombies.

The other criterion is the "evergreen lending criterion," where those firms that were unprofitable and highly leveraged and had increased their external borrowings were categorized as zombies. Those firms whose EBIT was less than the hypothetical risk free interest payments in period t, total external debt was over half of their total assets[5] in period t-1, and borrowings increased in period t were categorized as zombies in the period t. The firms with negative pre-tax profits and large external debt are rather unlikely to take a fresh loan. Therefore, by categorizing such firms as zombies, it is less likely that CHK's criterion would misidentify unhealthy firms as non-zombies.

2.2. Basic characteristics of zombie firms

Similar to the sample universe provided by CHK, the firms that are listed in the Tokyo Stock Exchange (TSE), excluding those on TSE Mothers (market of the high-growth and emerging stocks), constitute the sample for this study. The sample period ranges from 1995 to 2004. We collected the firm-level financial data from *The Corporate Financial Databank*, compiled by the Development Bank of Japan. We

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[5] Throughout this paper, the total asset value refers to its book value except for land, which is considered at market value.

identified zombies on the basis of the modified CHK's criterion in various industries including manufacturing, construction, real estate, retail, wholesale (excluding nine general trading companies), and service industries.

Figure 2 depicts the manner in which the share of zombie firms increased from 1995 to 2004 among the sampled firms. It indicates the zombie ratio calculated on the basis of our modified criterion as well as the original CHK's criterion.[6] For comparison, it also indicates the non-performing loan ratios for banks' during the same period. From 1995 to 2001, the two categories of zombie ratios exhibited similar features, although the zombie ratio calculated on the basis of our modified criterion was always smaller than that calculated on the basis of the CHK's criterion. Regardless of the criterion, the zombie ratio increased substantially in the late 1990s under the economic conditions of prolonged recessions and banking crisis.

However, from 2002 to 2004, the two categories of zombie ratios exhibited rather different features. The zombie ratio calculated on the basis of our modified criterion declined substantially after 2002. This corresponds to the decline in the non-performing loan ratios during the same period. However, the zombie ratio

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[6] The calculated "zombie" ratio based on the CHK's criterion may not replicate the original series since we used a different data source and our calculation was based on the fiscal year.

continued to increase when calculated on the basis of the CHK's criterion.   It is likely

that the original CHK's criterion overestimated the number of zombies in the first half

of the 2000s because it identified healthy firms as zombies under the quantitative easing

monetary policy.

3.   Multinomial logistic regression

The main purpose of this paper is to investigate why the number of zombies declined

after the prolonged recessions in Japan.   In order to answer this question, we estimated

a multinomial logistic model for exploring which corporate restructuring was effective

in reviving zombies and moving them into the non-zombie category.   The sampled

firms in period t are the firms that were classified as zombies in period t-1 on the basis

of our criterion.   The data is unbalanced panel data from 1995 to 2004.   While

estimating the multinomial logistic model on the basis of the panel data, we use the

current status of the sampled firms as the dependent variable.   The firms in period t

were coded as one if they continued to be categorized as zombie firms, and as two if

they moved to the non-zombie category.   In case the firms were delisted during the

period t, they were coded as three in period t.   Since exploring the determinants of

delisting firms is beyond the scope of this paper, the following analysis focuses on the

differences between the firms that were coded as one and two. [7]

Our explanatory variables comprise three categories of financial variables and several auxiliary variables. The first category of financial variables comprise of those variables that may measure the degree of restructuring of zombie firms such as "the change in employee strength", "change in value of fixed assets", and "no bonus payment dummy for executives." "The change in employee strength" and "change in value of fixed assets" are computed on the basis of the logged time difference in the variables. The "no bonus payment dummy" assumed the value of one when firms failed to pay bonus to their executives despite reporting a positive profit and zero otherwise. Dismissing employees, selling fixed assets, and curtailing bonus payments to executives were the typical restructuring schemes that were adopted by troubled Japanese firms. Depending on the effectiveness of the schemes, we expect significantly negative signs for the first two variables and significantly positive sign for the third variable.

The second category of financial variables is "special losses" and "special profits," [8] which are normalized by the total sales. The Japanese accounting system regards

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[7] See, for example, Fukuda, Kasuya, and Akashi (2009) for the determinants of bankruptcy of Japanese firms.

[8] Since we employed debt relief as another explanatory variable, gross income from debt relief was subtracted from special profits.

non-operational losses as special losses and non-operational income as special profits whenever a firm realized its unrealized capital losses and gains, respectively. Owing to prolonged recessions, troubled firms had concealed the true extent of their financial problems in order to reduce the reported value of losses on their books or inflate their reported capital. Therefore, the market participants were suspicious of the reported valuation of the firms. Under the circumstances, an increase in special losses was not necessarily distressing news for stakeholders because it merely revealed the firm's previously concealed losses to the public. In contrast, an increase in special profits was not necessarily pleasant news because the temporary increase in liquidity may permit the firm to continue concealing their real issues. To the extent that these signaling effects were important, significantly positive and negative signs were expected for special losses and profits, respectively.

The third category of variables is the financial variables that are related to a firm's external debt and equity. The variables used in this category were "debt-asset ratio," "accumulated debt relief," and "capital reduction dummy." The debt-asset ratio is the total value of outstanding external debt normalized by the value of total assets. Firms with larger external debt are more difficult to restructure. Therefore, we may expect a significantly negative sign for the debt-asset ratio. In contrast, both debt relief and capital reduction are financial supports provided by existing stakeholders. The

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"accumulated debt relief" is the sum of forgiven debt ratios for the previous three

consecutive years.   The forgiven debt ratio for each period is the value of forgiven debt

divided by the total value of outstanding debt during the previous year.   The "capital

reduction dummy" assumes the value of one if a firm undergoes capital reduction

during the period t and zero otherwise.   To the extent that the external financial

supports facilitate the restructuring process, we may expect a significantly positive sign

for both debt relief and capital reduction.   In order to permit non-linear effects, we

include a quadratic term of "accumulated debt relief" as an additional explanatory

variable.

   In addition to the abovementioned three categories of financial variables, we include

the following four auxiliary variables: "The length of being a zombie," "the change

(logged time difference) in total sales," "dummy of exporting manufacturing," and

"year dummies."   "The length of being a zombie" denotes the number of years that a

firm continued to be a zombie.   The recovery of firms that have experienced extended

periods of financial trouble is rather challenging.   Therefore, we may expect a

significantly negative sign for "the length of being a zombie."   The other three

auxiliary variables have been included in order to account for Japan's external

macroeconomic environment.   The "dummy of export manufacturing" assumes the

value of one if the firm belongs to any one of the nine manufacturing industries (textiles,

chemicals, iron and steel, nonferrous metals, machinery, electric equipment, automobiles and auto parts, other transportation equipment, precision instruments) and zero otherwise. Following prolonged recessions, the Japanese economy had recovered from the crisis in the first half of the 2000s. The improved macroeconomic environment was one of the main driving forces for the economy's recovery. In particular, Japanese exports experienced considerable growth, which supported the recovery of the Japanese economy from the demand side. The remaining three auxiliary variables may capture these effects in the regression.

4. Elimination of outliers and descriptive statistics

In the following analysis, those observations whose employee strength, total value of fixed assets, or the total sales volume increased by over 900% in a year, or whose special losses or profits divided by total sales exceeded 10, or whose total sales declined by over 90% in a year were eliminated as outliers. In addition, we excluded those observations that had merged with any other listed firms or those who experienced surveillance by the Tokyo Stock Exchange owing to a merger with an unlisted company from our sample. Excluding the outliers permits us to avoid discontinuity in time series as a result of mergers and acquisitions and any other kind of fundamental change in operation like becoming a holding company.

Table 1 presents the average, standard deviation, maximum, and minimum of each financial variable for all zombie firms after eliminating the outliers. In order to facilitate comparison, it also reports the corresponding statistics for all non-zombie firms included in our sample universe. The table indicates that corporate restructuring was more conspicuous for the zombie firms as compared to non-zombie firms. For example, on an average, there was a greater reduction in the employee strength for the zombie firms as compared to non-zombie firms. On an average, the change in the value of fixed assets was positive for both the zombie and non-zombie firms; however, it was approximately zero for the zombie firms. The median was negative only for the zombie firms. In addition, the zombie firms faced more serious financial problems and less favorable external environment as compared to non-zombie firms. The special losses and profits as well as debt-asset ratio were larger for the zombie firms as compared to non-zombie firms on both average and median. The change in the total sales was positive for the non-zombie firms but negative for zombie firms on both average and median.

Table 2 compares the basic statistics of two categories of zombie firms including those firms that continued to be categorized as zombies and those that recovered. The comparison directly corresponds to the logistic regression results in the subsequent section. The table indicates that both categories of zombie firms carried out some

corporate restructuring. However, the degree of corporate restructuring was more

conspicuous for those firms that had recovered as compared to those that continued to

be categorized as zombies. For example, the decrease in the employee strength and

value of fixed assets was more conspicuous for those firms that had recovered. Special

losses normalized by total sales were significantly higher for the firms that had

recovered. In contrast, special profits normalized by total sales were higher for those

firms that continued to be categorized as zombies, even though the difference is

statistically insignificant. The different degrees and directions of restructuring may

have affected the status of the troubled firms in the subsequent periods.

5. Baseline estimation results

Table 3 indicates the results of our multinomial logistic regression. The data set

covers the entire period from 1995 to 2004, except if the data is unavailable. The

sampled firms are the zombie firms that were identified on the basis of our criterion

after eliminating outliers, mentioned in section 2. By benchmarking against those

firms that were coded as one, the sign of each coefficient suggests the effectiveness of

each factor in reviving the zombie firms and moving them to the non-zombie category

In order to avoid simultaneous biases, we accounted for a one-year lag for all

explanatory variables. Table 3 reports two types of specifications, i.e., one without

time dummies and one with time dummies but without variables related to external debt and equity. We compute the value of the coefficients as well as marginal effects (indicated as "dp/dx" in Table 3) in order to confirm whether or not the latter is essentially the same as the former.

With respect to the degree of corporate restructuring, both the coefficient of "the change in employee strength" and "change in value of fixed assets" assumed a significantly negative sign. Reducing the number of employees and selling underutilized fixed assets were beneficial in reviving zombie firms. However, the coefficient of "no bonus payment dummy" assumed a negative sign. This implies that providing an incentive to managers rather than penalizing them may be preferable for facilitating the recovery of troubled firms.

"Special losses" and "special profits" also played an important role in the recovery of troubled firms. The coefficient of "special losses" and "special profits" assumed a significantly positive and negative sign, respectively. Until the early 2000s, there was a lack of transparency in the Japanese accounting system owing to the historical cost principle. Traditional Japanese firms held substantial unrealized gains in the form of prime assets. Utilizing these gains could increase their final profits arbitrarily. Once the troubled firms increased special profits, it was likely that they had sold off their prime assets in order to conceal poor business status and postpone the laborious process

of restructuring. As a result, the recovery of the firms with higher special profits was further delayed. In contrast, when the troubled firms substantially increased their special losses, it was likely that they had revealed their previously concealed losses to the public. Therefore, transparency in a firm's business condition may encourage it to accept the laborious process of restructuring more readily, thereby accelerating its recovery.

The coefficient of "debt-asset ratio" was significantly negative. Firms with surplus debt tended to delay their process of recovery. This suggests that firms with excess debt required external financial support for their recovery. In our estimation results, debt relief and capital reduction were useful for reviving the zombie firms. However, the impact of debt relief was not linear since the coefficient of the linear and quadratic terms assumed a significantly negative and positive sign, respectively. The non-linearity implied that substantial financial support was necessary for achieving sustained recovery.

The coefficient of the "length of being a zombie" assumed a significantly negative sign. For external financial support to be effective, prompt restructuring of troubled firms is preferable. With respect to the macroeconomic environment, an increase in total sales accelerated the recovery of troubled firms. The time dummies for the 2000s were significantly positive. All of these suggest the importance of improvement in the

macroeconomic environment for the recovery of troubled firms.

6. Estimation for sub-periods

In the previous section, we investigated the nature of corporate restructuring that was effective for the recovery of the zombie firms from 1995 to 2004.   The sample period includes both the recession and recovery period of the Japanese economy.   In order to investigate the robustness of our baseline estimation results, this section estimates our multinomial logistic model by dividing the sample into the following two sub-periods: 1995 - 2001 and 2001 - 2004.   We divide the sample period prior to and post 2001 because both the share of zombies and non-performing loan ratios reached their peak in 2001.   The first (1995 - 2001) and second sub-period (2001 - 2004) roughly correspond to the period of the prolonged recessions and economic recovery, respectively.

We estimated the multinomial logistic model by employing the unbalanced panel data for the two sub-sample periods.   In order to avoid simultaneous biases, we assumed a one-year lag for all explanatory variables.   Tables 4(1) and 4(2) summarize the estimation results for the first and second sub-periods, respectively.   By benchmarking against the firms that were coded as one, the sign of each coefficient suggested the effectiveness of each factor in facilitating the recovery of zombie firms.

All coefficients assumed the same signs as those in the previous section for both the periods.   This implies that our basic results hold for both the sub-periods.

However, the estimated coefficients were less significant for the first sub-period (1995 - 2001), i.e., during recession in the Japanese economy.   The "Debt-asset ratio," "accumulated debt relief," and "length of being a zombie" continued to remain significant.   However, none of the proxy variables for corporate restructuring were significant.   Corporate restructuring without an improved macroeconomic environment may have been less effective for the recovery of troubled firms.

In contrast, a majority of the estimated coefficients were significant during the second sub-period (2001 - 2004) when the Japanese economy was recovering.   In particular, "the change in employee strength," "change in the value of fixed assets," "special losses," and "special profits" had larger marginal effects than those in the previous tables.   Reducing the employees' strength and selling underutilized fixed assets were generally beneficial in reviving zombie firms.   However, they usually accompanied large amounts of special losses for the firms.   In order to enhance the effectiveness of corporate restructuring, a favorable macroeconomic environment may be indispensable for the recovery of troubled firms.

7. The impact on profit

In the previous sections, we showed that reducing the employee strength and selling fixed assets were beneficial for reviving zombie firms. However, it is still unclear whether the effectiveness of corporate restructuring is exclusive for reviving zombie firms. The zombie firms recovered when their profits substantially improved. It would be interesting to investigate whether or not a similar corporate restructuring improved the profits of non-zombie firms. Therefore, this section investigates the impact of corporate restructuring on the profits of healthy firms.

We investigated the effects of corporate restructuring on the profits during period t for the firms that were categorized as non-zombie in period t-1. We use the firms' ROA (return on asset) as an assessment of the profits. We calculated the ROA by using earnings before interest and taxes (EBIT) normalized by total asset value. Except the elimination of the "length of being a zombie," the OLS regressions were run using the same set of explanatory variables as used in the previous sections. In order to avoid simultaneous biases, we assumed a one-year lag for all explanatory variables.

Table 5 reports the estimation results for the entire sample period and two sub-periods. A majority of the explanatory variables were statistically significant. Except for the coefficient of the quadratic term of accumulated debt relief, the signs of all other coefficients were stable. However, contrary to the results of multinomial logistic regressions, the coefficients of "the change in employee strength" and "change in the

value of fixed assets" assumed significantly positive signs.   Downsizing was not useful in improving the profits of healthy firms.

In general, troubled firms have excess capacity with respect to labor input and capital stock.   Therefore, restructuring the excess capacity is indispensable for improving the efficiency of such firms.   However, healthy firms do not possess excess capacity. Instead, to the extent that their future earnings are promising, they need to increase labor input and capital stock in order to enhance their profits.   Corporate restructuring is an important prescription only for reviving troubled firms.

8. Concluding remarks

In this paper, we investigated why zombie firms recovered in Japan in the first half of the 2000s.   Extending the method from previous studies, we first identified those firms that could be categorized as zombies from among the listed firms.   This permitted us to obtain a group of zombie firms, in which the number of firms corresponded with the non-performing loan ratios in the first half of the 2000s.   By employing the extended series, we performed multinomial logistic regressions in order to investigate the nature of corporate restructuring that was effective in reviving zombie firms.

We found that restructuring including reducing the employee strength and selling unutilized fixed assets was effective for the revival of troubled firms.   In addition,

increasing special losses aided the recovery of zombie firms as it may have improved

their accounting transparency. However, increasing special profits through the sale of

prime assets was detrimental to the recovery of zombie firms because it may postpone

the laborious process of restructuring. Curtailing bonus payments to executives was

not effective as it may discourage and demotivate them.

External supports including debt relief and capital reduction were the other

important factors for the recovery of zombie firms. However, we found that

substantial external supports and not small amounts of debt relief were necessary for

reviving zombie firms. In addition, the favorable macroeconomic environment in the

2000s was played an important role in enhancing the effectiveness of corporate

restructuring. The sub-sample estimation result implies that the impact of corporate

restructuring was insignificant in the absence of a favorable macroeconomic

environment.

Finally, we found that although downsizing capacity was effective in reviving the

zombie firms, it did not contribute to improving the profits of the non-zombie firms.

This suggests that desirable prescriptions for the revival of zombie firms, which our

empirical findings elucidated, are different from those that are required for the growth

of healthy firms.

Acknowledgement

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Figure 1.

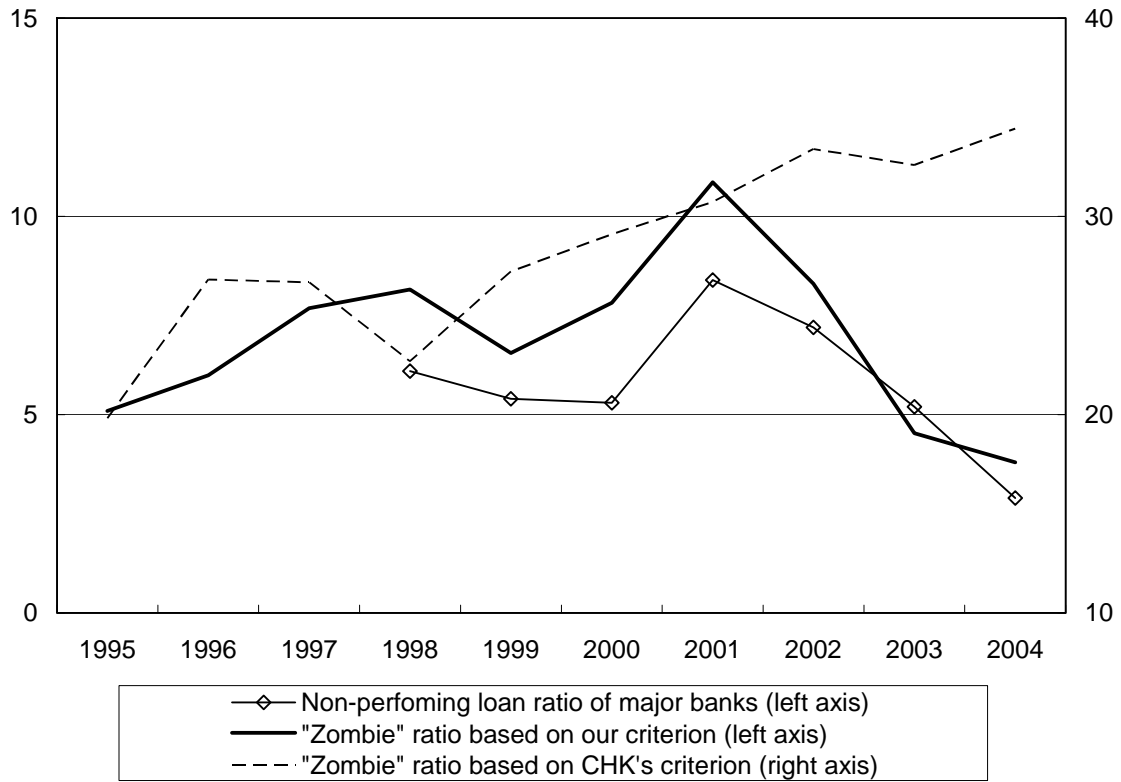Industrial production index in Japan: Monthly and seasonally adjusted.
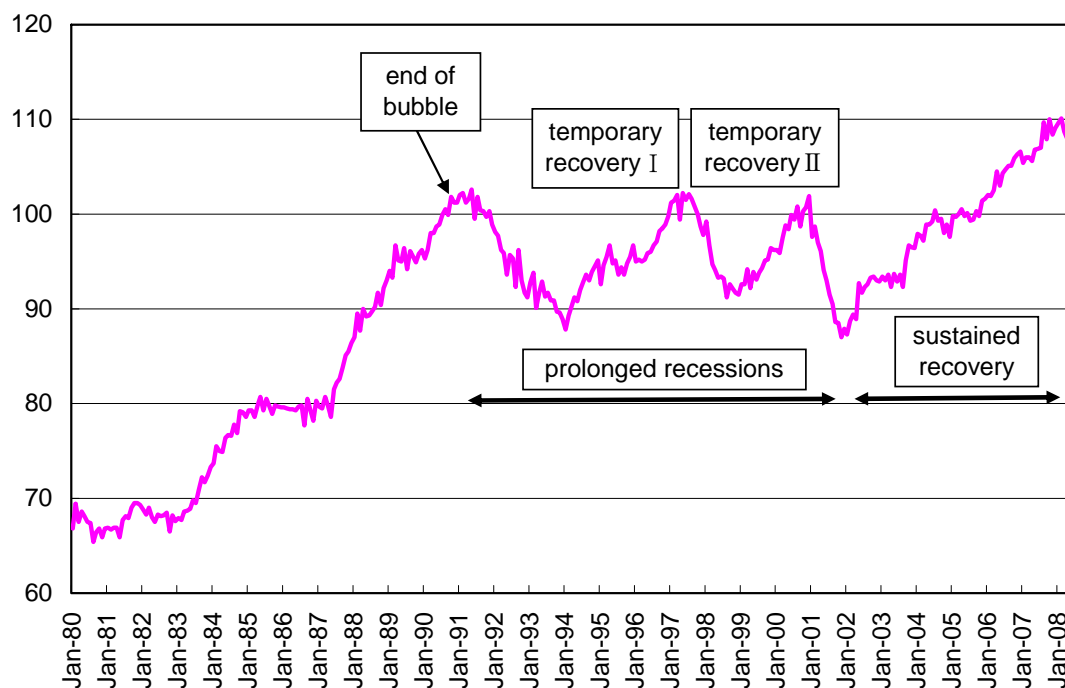
Data source: Ministry of Economy, Trade, and Industry

Note: 2005 = 100.

Figure 2.

Zombie ratios and Non-performing loan ratio (%).

Notes: 1. Zombie ratio denotes the number of zombie firms from among the sample firms.

2. The data for non-performing loan ratios has been published by the Financial Services Agency.

3. Zombie ratio on the basis of CHK's criterion is not necessarily a perfect replication of the original

paper since we have used a different data source and our calculations are based on the fiscal year.

Table 1

Descriptive statistics of key variables on the basis of the current status of the firms

	Change in employees strength (logged time difference)	Change in value of fixed assets (logged time difference)	Special losses (normalized by total sales)	Special profits (normalized by total sales)	Debt-asset ratio	Change in total sales (logged time difference)
"Zombies"						
Number of observations	1257	1257	1257	1257	1257	1257
Mean	-0.057	0.001	0.059	0.023	0.340	-0.043
Median	-0.040	-0.013	0.015	0.002	0.320	-0.030
Standard deviation	0.145	0.209	0.181	0.092	0.202	0.159
Minimum value	-2.738	-2.145	0.000	0.000	0.001	-1.152
Maximum value	0.960	2.123	3.103	1.801	1.398	0.775
"Non-zombies"						
Number of observations	16348	16348	16348	16348	16348	16348
Mean	-0.023	0.031	0.029	0.011	0.200	0.007
Median	-0.019	0.010	0.009	0.001	0.177	0.009
Standard deviation	0.130	0.176	0.106	0.043	0.163	0.137
Minimum value	-4.830	-3.548	0.000	0.000	0.000	-1.925
Maximum value	2.296	2.101	5.943	2.069	1.422	1.616
Difference of two-means test (one-sided)	0.000	0.000	0.000	0.000	0.000	0.000

Notes: 1. The statuses of the firms have been described for the period 1995 to 2004. In order to avoid simultaneous biases, we assume a one-year lag for all explanatory variables.

2. After eliminating outliers, all the listed firms in our sample universe have been included, provided they were listed over the last three years.

Table 2

Descriptive statistics of key variables classified on the basis of the change in the status

	Change in employees strength (logged time difference)	Change in value of fixed assets (logged time difference)	Special losses (normalized by total sales)	Special profits (normalized by total sales)	Debt-asset ratio	Change in total sales (logged time difference)
"Zombies"						
Number of observations	530	530	530	530	530	530
Mean	-0.070	-0.025	0.075	0.030	0.390	-0.068
Median	-0.052	-0.025	0.022	0.003	0.364	-0.047
Standard deviation	0.118	0.172	0.185	0.123	0.204	0.159
Minimum value	-0.790	-0.916	0.000	0.000	0.005	-1.152
Maximum value	0.405	1.041	1.988	1.801	1.300	0.494
"Non-zombies"						
Number of observations	730	730	730	730	730	730
Mean	-0.083	-0.050	0.090	0.024	0.327	-0.061
Median	-0.051	-0.037	0.036	0.003	0.312	-0.037
Standard deviation	0.166	0.258	0.190	0.077	0.203	0.170
Minimum value	-1.769	-3.548	0.000	0.000	0.000	-1.317
Maximum value	0.405	2.101	2.494	0.983	1.422	0.618
Difference of two-means test (one-sided)	0.057	0.039	0.076	0.131	0.000	0.249

Notes: 1. The statuses of the firms have been described for the period 1995 to 2004.   In order to avoid simultaneous biases, we assumed a one-year lag for all explanatory variables.

2. After eliminating outliers, only the sample firms that were categorized as zombies in the previous year, which coincides with the samples of logit estimation, have been included and described. The delisted firms were eliminated.

Table 3

Baseline estimation results (Sample period: 1995 - 2004)

Dependent variable: "continues to be listed as a non-zombie"

	Model 1				Model 2			
	Coefficient	z-Statistic		dp/dx	Coefficient	z-Statistic		dp/dx
Change in employee strength	-0.746	-1.76	*	-0.182	-0.764	-1.74	*	-0.185
Change in value of fixed assets	-0.763	-2.43	**	-0.186	-0.577	-1.73	*	-0.140
No bonus payment dummy	-0.215	-1.59		-0.053	-0.272	-1.97	**	-0.066
Special losses	1.736	4.04	**	0.422	0.811	1.76	*	0.197
Special profits	-1.527	-2.41	**	-0.371	-0.703	-1.13		-0.170
Debt-asset ratio	-1.486	-4.78	**	-0.361	-1.278	-4.04	**	-0.310
Accumulated debt relief	-7.847	-2.60	**	-1.909				
Accumulated debt relief squared	7.476	1.72	*	1.818				
Capital reduction dummy	1.387	1.89	*	0.268				
The length of being a zombie	-0.153	-3.35	**	-0.037	-0.153	-3.47	**	-0.037
Change in total sales	0.686	1.83	*	0.167	1.099	2.78	**	0.267
Dummy of exporting manufacturing	0.206	1.72	*	0.050	0.264	2.19	**	0.064
Year dummy1995					0.249	0.90		0.061
Year dummy1996					-0.115	-0.39		-0.027
Year dummy1998					0.349	1.31		0.082
Year dummy1999					0.880	3.19	**	0.194
Year dummy2000					0.592	2.08	**	0.135
Year dummy2001					0.432	1.61		0.101
Year dummy2002					0.715	2.76	**	0.162
Year dummy2003					1.162	4.10	**	0.245
Year dummy2004					0.692	2.22	**	0.155
Constant	0.987	6.41	**		0.420	1.67	*	
Number of observations	1306				1306			
Wald chi-squared	8088.2				38451.1			
Prob＞chi-sq.	0.000				0.000			
Log pseudolikelihood	-1001.3				-982.3			
Pseudo R-squared	0.052				0.070			

Notes: 1. The estimation results of dependent variable category "continues to be listed as a zombie" (coded as one) was not shown to save the space.

2. * and ** denote significance at .10 and .05 levels, respectively.   The z-Statistics were calculated based on heteroskedasticity robust standard errors (Huber-White estimator).

3. The year dummy 1997 was eliminated because we did not have a sample for the category "delisted" (code three) in 1995 and 1996.

4. dp/dx denotes the marginal impact of a given independent variable at its sample mean on the transition probability.   However, in case of dummy variables, "marginal" represents a discrete change from zero to one.

Table 4

Estimation Results for two sub-periods

(1) Sample period: 1995 - 2001

Dependent variable: "continues to be listed as a 'non-zombie'"

	Model 1				Model 2			
	Coefficient	z-Statistic		dp/dx	Coefficient	z-Statistic		dp/dx
Change in employee strength	-0.077	-0.13		-0.019	-0.019	-0.03		-0.005
Change in value of fixed assets	-0.447	-1.35		-0.111	-0.391	-1.09		-0.097
No bonus payment dummy	-0.203	-1.23		-0.051	-0.227	-1.36		-0.057
Special losses	1.029	2.06	**	0.256	0.139	0.29		0.034
Special profits	-0.717	-0.94		-0.179	-0.008	-0.01		-0.002
Debt-asset ratio	-1.425	-3.61	**	-0.355	-1.368	-3.42	**	-0.340
Accumulated debt relief	-10.128	-1.79	*	-2.522				
Accumulated debt relief squared	11.956	1.47		2.977				
Capital reduction dummy	0.647	0.88		0.153				
The length of being a zombie	-0.181	-3.28	**	-0.045	-0.187	-3.44	**	-0.047
Change in total sales	0.138	0.28		0.034	0.747	1.36		0.186
Dummy of exporting manufacturing	0.176	1.21		0.044	0.224	1.53		0.056
Year dummy1995					0.210	0.76		0.052
Year dummy1996					-0.108	-0.36		-0.027
Year dummy1998					0.316	1.17		0.078
Year dummy1999					0.877	3.10	**	0.207
Year dummy2000					0.633	2.21	**	0.152
Year dummy2001					0.464	1.72	*	0.113
Constant	0.954	4.71	**		0.595	2.12	**	
Number of observations	862				862			
Wald chi-squared	4712.6				14534.7			
Prob＞chi-sq.	0.000				0.000			
Log pseudolikelihood	-635.8				-626.5			
Pseudo R-squared	0.043				0.057			

Notes: 1. The estimation results of dependent variable category "continues to be listed as a zombie"

(coded as one) was not shown to save the space.

2. * and ** denote significance at .10 and .05 levels, respectively. The z-Statistics were calculated based on heteroskedasticity robust standard errors (Huber-White estimator).

3. The year dummy 1997 was eliminated because we did not have a sample in the category "delisted" (code three) in 1995 and 1996.

4. dp/dx denotes the marginal impact of a given independent variable at its sample mean on the transition probability. However, in case of dummy variables, "marginal" represents a discrete change from zero to one.

Table 4 (continued)

Estimation Results for two sub-periods

(2) Sample period: 2001 - 2004

Dependent variable: "continues to be listed as a non-zombie"

	Model 1				Model 2			
	Coefficient	z-Statistic		dp/dx	Coefficient	z-Statistic		dp/dx
Change in employee strength	-1.230	-1.91	*	-0.275	-1.419	-2.21	**	-0.298
Change in value of fixed assets	-1.427	-2.57	**	-0.319	-0.969	-1.82	*	-0.184
No bonus payment dummy	-0.209	-0.99		-0.047	-0.297	-1.39		-0.055
Special losses	2.025	2.43	**	0.452	1.586	1.75	**	0.372
Special profits	-3.436	-2.28	**	-0.768	-2.844	-1.83	*	-0.591
Debt-asset ratio	-1.115	-2.21	**	-0.249	-1.278	-2.64	**	-0.328
Accumulated debt relief	-8.437	-2.06	**	-1.885				
Accumulated debt relief squared	7.903	1.18		1.766				
Capital reduction dummy	1.575	1.46		0.247				
The length of being a zombie	-0.150	-2.04	**	-0.034	-0.151	-2.29	**	-0.030
Change in total sales	1.137	2.07	**	0.254	0.971	1.75	*	0.225
Dummy of exporting manufacturing	0.213	1.13		0.047	0.245	1.32		0.052
Year dummy2002					0.260	1.06		-0.015
Year dummy2003					0.714	2.61	**	0.074
Year dummy2004					0.246	0.81		-0.019
Constant	1.036	4.67	**		0.772	2.83	**	
Number of observations	590				590			
Wald chi-squared	6178.0				58.7			
Prob＞chi-sq.	0.000				0.000			
Log pseudolikelihood	-451.7				-453.3			
Pseudo R-squared	0.070				0.066			

Notes: 1. The estimation results of dependent variable category "continues to be listed as a zombie"

(coded as one) was not shown to save the space.

2. * and ** denote significance at .10 and .05 levels, respectively. The z-Statistics were calculated based on heteroskedasticity robust standard errors (Huber-White estimator).

3. dp/dx denotes the marginal impact of a given independent variable at its sample mean on the transition probability. However, in case of dummy variables, "marginal" represents a discrete change from zero to one.

Table 5

Determinants of profitability of healthy firms

Dependent variable: ROA (Return on asset)

	Sample period: 1995-2004			Sample period: 1995-2001			Sample period: 2001-2004		
	Coefficient	t-Statistics		Coefficient	t-Statistics		Coefficient	t-Statistics	
Change in employee strength	0.038	3.79	**	0.053	2.91	**	0.029	2.64	**
Change in value of fixed assets	0.019	2.97	**	0.019	2.65	**	0.018	1.87	*
No bonus payment dummy	-0.082	-2.70	**	-0.056	-3.85	**	-0.095	-2.30	**
Special losses	0.061	2.05	**	0.030	1.08		0.085	2.14	**
Special profits	-0.013	-9.73	**	-0.015	-9.53	**	-0.010	-4.61	**
Debt-asset ratio	-0.091	-17.92	**	-0.084	-16.48	**	-0.110	-12.09	**
Accumulated debt relief	-0.177	-0.82		-0.066	-0.21		-0.292	-1.14	
Accumulated debt relief squared	-0.077	-0.22		-0.184	-0.39		0.058	0.14	
Capital reduction dummy	0.011	0.62		0.005	0.31		0.032	1.03	
Change in total sales	0.105	14.85	**	0.116	12.92	**	0.099	9.60	**
Dummy of exporting manufacturing	-0.007	-6.79	**	-0.007	-6.47	**	-0.009	-4.69	**
Year dummy1995	0.008	5.04	**	0.008	5.11	**			
Year dummy1996	0.008	5.78	**	0.009	5.93	**			
Year dummy1998	-0.005	-3.00	**	-0.005	-2.85	**			
Year dummy1999	0.007	3.03	**	0.007	3.45	**			
Year dummy2000	-0.001	-0.56		-0.001	-0.33				
Year dummy2001	-0.020	-8.24	**	-0.020	-8.89	**			
Year dummy2002	0.006	2.74	**				0.026	7.94	**
Year dummy2003	0.017	6.90	**				0.036	11.30	**
Year dummy2004	0.015	7.50	**				0.035	12.18	**
Constant	0.051	33.37	**	0.049	31.95	**	0.035	10.93	**
Number of observations	16350			11380			6609		
R-squared	0.180			0.187			0.189		

Notes: 1. "ROA" is calculated as earnings before interest and taxes (EBIT) divided by the total value

of assets.

2. * and ** denote significance at .10 and .05 levels, respectively. The t-Statistics were calculated

based on heteroskedasticity robust standard errors (Huber-White estimator).

3. The year dummy 1997 was eliminated for comparison to the results of logistic estimations.