

Chapter 2

Evolution and Recovery of Zombie Firms: Japan's Experience

Abstract The concept of zombie firms originally argued by Hoshi (2006) and Caballero et al. (2008) (CHK hereafter) was defined as comprising such firms that cannot survive without financial support from lenders. However, the eventual bankruptcy of zombie firms was rare in reality. In this chapter, I reexamine why most alleged zombie firms finally recovered in Japan during the lost two decades following the framework of Fukuda and Nakamura (2011) and Nakamura and Fukuda (2013). The main result of the regression analyses suggests that the more transparent accounting rules and stricter bank supervision policies introduced at the beginning of the 2000 s markedly accelerated the recovery of alleged zombie firms by downsizing in terms of employees and/or fixed assets. It was too late to carry out constructive reforms since they had exhausted the positive legacies of the past. Although cost cutting was an effective way for a troubled firm to recover, it was considered to have a substantial deflationary impact on the macroeconomy.

Keywords Lost two decades of the Japanese economy • Recovery of zombie firms • Evergreen lending • Procrastination • Restructuring

2.1 Background on the Controversy over Evergreen Lending and Secular Stagnation

Japan's secular stagnation started when the asset price bubbles collapsed in the early 1990s. In an environment of unprecedentedly easy monetary policy and asset price bubbles, Japanese banks expanded credit at an exceptionally fast pace, mainly for real estate-related projects, with lax lending standards relying on collateral

The analyses presented in this chapter are developed on the basis of the joint works with Professor Shin-ichi Fukuda on the recovery of zombie firms and the lost two decades of the Japanese economy. I am deeply grateful to Professor Fukuda for permission to use the data and include some of the research outcomes. All remaining errors are my own. Any opinions, findings, or conclusions expressed in this chapter are those of the author and do not reflect the views of the Development Bank of Japan.

values, which were dramatically impaired after the bubble burst. Around 1995, the macroeconomy experienced a lull thanks to a large-scale fiscal stimulus and the expansion of foreign demand. However, land prices kept declining, thereby undermining bank health because of the accumulation of non-performing loans followed by the bankruptcy of relatively small non-bank firms. With the onset of the economic downturn triggered by the rise in the consumption tax rate in April 1997, the difficulties of large-lot borrowers and major financial institutions came to the fore. Most troubled firms at that time first concealed the true extent of their financial problems through accounting manipulation, which was legitimate under traditional rules, and put off dealing with negative legacies, waiting for an upturn of the economy. However, in the meantime, assets and business opportunities declined further and troubled firms suddenly collapsed due to either cash shortages or asset deficiency.

As balance sheets deteriorated in the late 1990s, banks cornered by the regulation of the minimum capital adequacy ratio of the Basel Accord started to rely on crisis measures such as the indiscriminant denial of new loans, premature withdrawal of existing loans from normal borrowers, and evergreen lending to troubled borrowers. Peek and Rosengren (2005), a seminal empirical study of evergreen lending, examined the misallocation of credit in Japan associated with the perverse incentives of banks to provide additional credit to troubled firms. However, the additional supply of credit to troubled firms itself was not necessarily inefficient, because it is not only rational for lenders but also socially desirable to let a seemingly insolvent firm survive if its continuation value net of financial support costs exceeds its liquidation value.¹ In other words, the desirability of financial support should be judged based on a forward-looking basis, while insolvency or asset deficiency means no more than the consequence of past failures of managerial decisions and/or negative external shocks. Therefore, whether an additional supply of credit is desirable cannot be judged a priori without empirical analyses. Peek and Rosengren (2005) found that firms are more likely to receive additional bank credit if they are in a poor financial condition and that additional credit is more conspicuous among banks that have reported capital ratios close to the required minimum, which can be regarded as evidence of the prevalence of inefficient evergreen lending.

The term “zombie” is considered to have first appeared in a newspaper article in the late 1990s within the context of the negative externality of troubled firms surviving thanks to evergreen lending. The article stated that peer companies worried that several major constructors, which achieved turnaround from bankruptcy, could commit to cut-throat price competition by taking advantage of their cost competitiveness after substantial debt forgiveness. The controversy over zombie firms together with their excess capacity quickly became widely accepted as

¹The view that Japanese banks have an “insurance function”, which refers to banks’ commitment to bail out borrowers at critical moments, thereby facilitating the accumulation of firm-specific human capital and shaping a unique strong point of Japanese firms, was widely shared among economists at least until the 1980s.

common problems among other industries such as heavy manufacturing and retail. Motivated by these situations, CHK made the first academic attempt to shed light on zombie firms and clarify their negative externality empirically, while Peek and Rosengren (2005) focused on banks' lending behavior. To this end, CHK proposed an original method to identify zombie firms based on public information only. Based on their zombie firm dataset running from 1981 to 2002, they performed various empirical tests to show evidence of misallocation due to the existence of zombie firms.

According to CHK, financial support from banks helped troubled firms delay painful restructuring, and this increased the ratio of zombie firms to listed firms throughout the 1990s. It follows that the pace of job reallocation were slowed down more substantially in sectors with more zombies, suggesting that there is more than a simple credit crunch story at work with regard to the exceptional delay in the recovery of the macroeconomy in Japan. However, in the late 1990s and early 2000s, the Japanese banking sector reformed, including the introduction of new accounting rules with higher transparency and new bank supervision policies with stricter standards. As a result, the banking crisis was almost stabilized in the early 2000s, and non-performing loans dramatically declined with the help of the global economic expansion. Moreover, the majority of zombie firms recovered substantially during the first half of the 2000s. Nevertheless, the Japanese economy could not achieve a full-fledged recovery and the profitability of Japanese firms remained low.

In this chapter, I clarify the dynamics of zombie firms in Japan, from their evolution to their recovery/collapse, including the period after 2002 that is outside the scope of CHK. Then I reexamine why most zombie firms finally recovered, extending the regression analyses of Fukuda and Nakamura (2011) and Nakamura and Fukuda (2013) in order to discuss why their recovery did not revitalize the Japanese economy.

2.2 Identification of Zombie Firms

2.2.1 *Conceptual Framework and Methodology*

In line with CHK's definition, the term "zombie" in the context of this study merely refers to the managing status of a firm. In other words, the same firm can take either zombie status or non-zombie (healthy) status depending on its performance and its receipt of financial support from lenders. Specifically, CHK defined zombie firms as those whose interest payments are lower than the hypothetical risk-free interest payments.² The basic idea is that troubled firms must have received substantial

²CHK's criterion defined the hypothetical risk-free interest payment " $R^*_{i,t}$ " in the following manner:

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 only using published data. However, there are apparent shortcomings in their criterion both from a conceptual and from a practical point of view. Conceptually, although zombie firms are related to evergreen lending, CHK's criterion did not consider this aspect. During the banking crisis in Japan, troubled banks increased evergreen lending to troubled borrowers in order to conceal the actual value of their non-performing loans. Thus, evergreen lending permitted unhealthy firms to pay their interest at the rates prevailing in the market without any concession on the surface. Practically, CHK's criterion may have overestimated the number of zombie firms; further, a more serious problem is that the estimated number of zombies continued to increase even after the non-performing loan problem moved toward a resolution.

Figure 2.1 shows the share of zombie firms among sampled firms (ratio of zombie firms hereafter), mimicking CHK's method for the most part.³ One could argue that CHK's criterion captures the basic feature that the ratio of zombie firms increases throughout the lost decade. However, this ratio exceeds 30 % in 2001, which must be an overestimation given that the non-performing loan ratio never exceeds 10 % even at its peak. Moreover, the zombie firm ratio increases further after 2001 and hovers at nearly 40 % in contrast to the substantial decline in the non-performing loan ratio. Indeed, it is easy to find a number of cases where reputable firms are misidentified as zombies based on CHK's criterion after the peak of the non-performing loan problem. This problem is considered to be attributable to the intentional avoidance of information on profitability. By doing so, CHK intended to examine whether firms suspected of receiving substantial interest relief are unprofitable. However, as banks increasingly committed to "under-prime lending" to attract reputable firms in the context of weak borrowing demand, any such criterion without information on profitability became ineffective.

Therefore, following Fukuda and Nakamura (2011) and Nakamura and Fukuda (2013), two additional criteria for defining zombies are introduced herein to modify

(Footnote 2 continued)

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

where $BS_{i,t}$, $BL_{i,t}$, and $Bonds_{i,t}$ are the short-term (less than 1 year) bank loans, long-term (over 1 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 rates for year t , respectively, while $rcb_{5\text{years},t}$ is the minimum observed rate on any convertible corporate bond issued over the previous 5 years prior to t .

³One thing different from CHK is that all the data in this book are aggregated on a fiscal year basis, which is more suitable for analyzing Japanese firms since the great majority of them choose March as the settlement month for accounting purposes. By contrast, CHK aggregated their data on a calendar year basis. However, such difference is trivial for the discussion below.

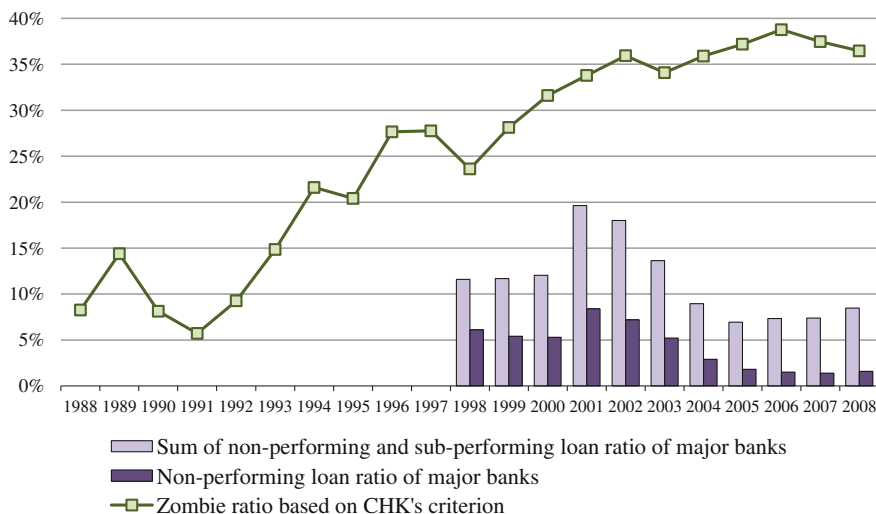


Fig. 2.1 Zombie ratio based on CHK's criterion. *Notes* 1. Zombie ratio based on CHK's criterion refers to the result of the reproductive calculation applying the criterion of Caballero et al. (2008) to the dataset of this book. 2. "Sub-performing" refers to loans classified as "need attention" but not classified as "special attention" by the self-assessment of assets by banks

CHK's criterion. One is the "profitability criterion." Under this criterion, firms whose earnings before interest and taxes (EBIT) exceed the hypothetical risk-free interest payments are excluded from zombies.⁴ Low leveraged firms whose total external debt is less than one-fifth of their total assets from zombies are also excluded. Healthy firms are unlikely to have negative pre-tax profits after deducting non-operating income, while unhealthy firms are unlikely to be low leveraged. Therefore, excluding these firms from zombies also reduces the likelihood that the modified criteria misidentify healthy firms as zombies.

The second criterion is the "evergreen lending criterion." Under this criterion, unprofitable and highly leveraged firms with increasing external borrowings are included in zombies. Specifically, the evergreen lending criterion categorizes as zombies firms whose EBIT is less than the hypothetical risk-free interest payments, whose total external debt exceeds one-fifth of their total assets, and whose borrowings have increased from the previous year. Firms with negative pre-tax profits and large external debt are rather unlikely to take out a fresh loan. Therefore, by categorizing such firms as zombies, the modified criteria are less likely to misidentify unhealthy firms as non-zombies.

⁴Since 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 zombie firms.

2.2.2 Features of the Modified Criteria and Exclusion of “One Shot Zombie Firms”

Similar to CHK, firms that are listed or used to be listed on the Tokyo Stock Exchange (TSE) excluding TSE Mothers (market for emerging companies) and whose primary business belongs to the manufacturing, construction, real estate, retail, wholesale (excluding nine general trading companies), and service industries constitute the sample universe for this study. The sample period ranges from 1995 to 2008. The firm-level non-consolidated financial data are collected from the Corporate Financial Databank, compiled by the Development Bank of Japan. Zombie firms are identified every year based on the aforementioned modified version of CHK's criterion. In short, the dataset used in this chapter is the same as that of Nakamura and Fukuda (2013).

Figure 2.2 depicts how the ratio of zombie firms changed based on these modified criteria from 1995 to 2008. From 1995 to 2001, the modified zombie ratio exhibits similar features to that of CHK, although it is always far smaller. Regardless of the criteria, the zombie ratio increases substantially in the late 1990s under the prolonged recession and banking crisis. On the contrary, after 2002, it declines dramatically from 2002 to 2004 and remains low until 2007 corresponding to the decline in the non-performing and sub-performing loan ratios during the same period, while that of CHK keeps increasing and hovers at nearly 40 % as shown in

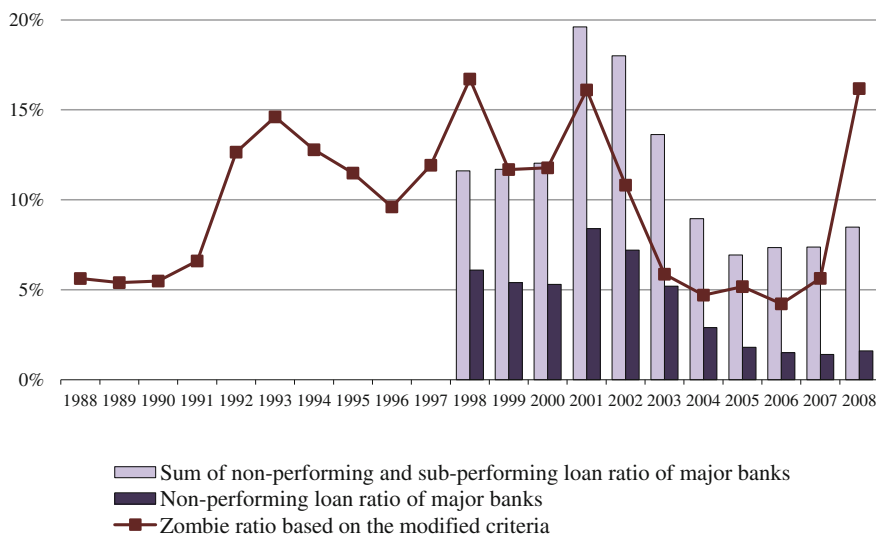


Fig. 2.2 Zombie ratio based on the modified criteria. *Notes* 1. “Modified criteria” refers to the method adopted in this book to identify zombie firms, which introduced the “profitability criterion” and “evergreen lending criterion” as additional criteria to CHK’s criterion. 2. “Sub-performing” refers to loans classified as “need attention” but not classified as “special attention” by the self-assessment of assets by banks

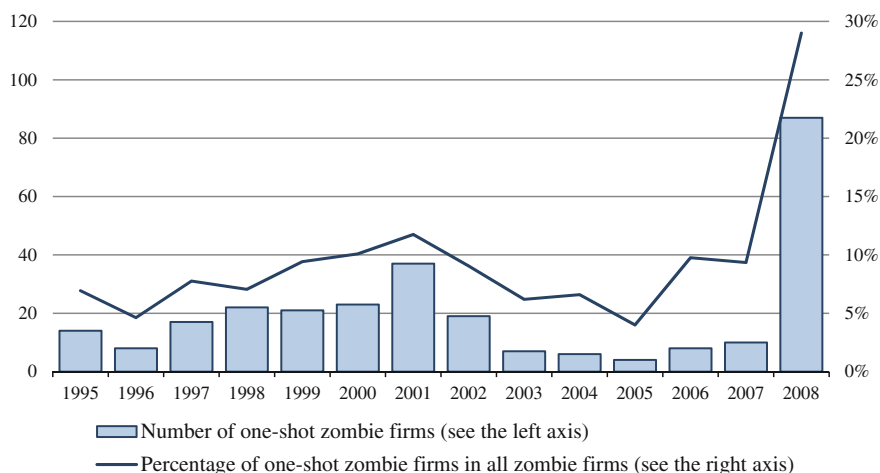


Fig. 2.3 Number of one-shot zombie firms and their percentage in all zombie firms based on the modified criteria. *Notes* 1. One-shot zombie firms are those categorized as zombie firms just once from 1995 to 2008. 2. “Modified criteria” refers to the method adopted in this book to identify zombie firms, which introduced the “profitability criterion” and “evergreen lending criterion” as additional criteria to CHK’s criterion

Fig. 2.1. Hence, it is evident that the modified criteria have a significant advantage over CHK’s criterion when capturing the reality of zombie firm issues, particularly in the 2000s.

However, there remains one more point to be considered with respect to the modified version. As shown in Fig. 2.2, the modified zombie ratio experiences a distinct surge in 2008, while the non-performing and sub-performing loan ratios remain low in 2008. This trend is apparently due to the temporary but huge negative demand shocks of the global financial crisis. Consequently, nearly one-third of zombie firms in 2008 based on the modified criteria are those identified as zombies for the first time in 14 years since 1995. Likewise, in the following, an “one-shot zombie” is defined as a firm identified as a zombie only once from 1995 to 2008. Figure 2.3 shows the number of one shot zombie firms by year, highlighting that it is highly likely that one shot zombie firms in 2008 are misidentified as zombies because of the uniqueness of the global financial crisis. Furthermore, one shot zombie firms are observed every year before 2008 and reach nearly 200 firms in total. Again, these one shot zombie firms are likely to have been misidentified as zombies owing to some temporary and unforeseen events given they survived as healthy firms in the other 13 years including the severe depression of 2008.

Therefore, it is considered to be appropriate to exclude one shot zombie firms from the following analysis. Figure 2.4 shows the zombie ratio after the elimination of one shot zombie firms, illustrating that it still has a surge in 2008. However, given that the surge in non-performing ratios in 2008 may have been suppressed by policy actions such as the SME Financing Facilitation Act against the large negative

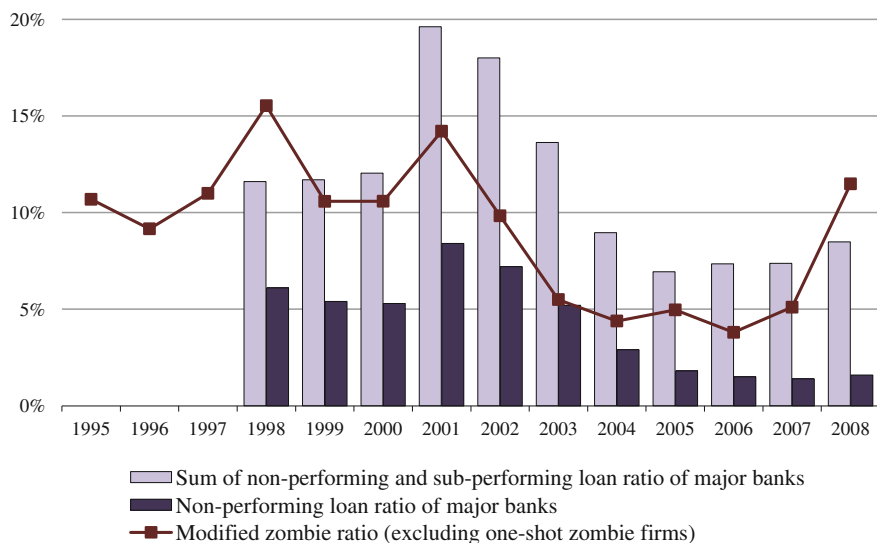


Fig. 2.4 Modified zombie ratio (excluding one-shot zombie firms). *Notes* 1. The “modified zombie ratio” refers to the zombie ratio calculated based on the method adopted in this book. 2. “Sub-performing” refers to loans classified as “need attention” but not classified as “special attention” by the self-assessment of assets by banks

shock due to the bankruptcy of Lehman Brothers, a modest increase in the zombie ratio is not necessarily unrealistic. In the following sections, this robust version of the modified zombie criteria is adopted in the analyses.

2.3 Evolution and Recovery of Zombie Firms by Three Categories of Financial Support

One of the unique features of the aforementioned approach to identifying zombie firms is that the introduction of the evergreen lending criterion enables us to conduct in-depth analyses of zombie firms by three categories of financial support, namely “interest rate relief only,” “evergreen lending only,” and “both.” However, this aspect was not explored by Fukuda and Nakamura (2011) and Nakamura and Fukuda (2013). Hence, before proceeding to the regression analyses of the driving forces of the recovery, we examine the evolution and recovery of zombie firms by these three categories.

We can observe whether a firm that has zombie status in period t moves to non-zombie status in period $t + 1$ (called “recovery”) or remains a zombie firm, as long as it is listed. However, a firm that has zombie status in period t is delisted in period $t + 1$. In this case, the third category “delisted” is introduced since one can never know whether the firm is a zombie or non-zombie without financial data. The

“delisted” category includes various situations, both negative and positive, such as liquidation, court-guided rehabilitation, and buyout. From 1995 to 2008, there are around 2300 zombie samples, 47.6 % of which recover in the next period, 50.4 % retain zombie status, and 2.0 % are delisted. In other words, on average, zombie firms recovered in a little over 2 years, probably a far shorter period than generally thought. Indeed, as shown in Table 2.1, the average duration of zombie firms reached its peak in 1996 at 2.87 years and persistently declined thereafter.

For the measure of financial support to zombie firms, shown in Fig. 2.5, the category “evergreen lending only” accounts for nearly half of the total through 1995–2008, while “interest rate relief only” accounts for 31 % and “both” for 20 %.

Table 2.1 Average duration of zombie firms by industry (in years)

	All industry	Manufacturing (a)	Non-manufacturing (b)	Difference (b – a)
1995	2.47	2.38	2.69	0.31
1996	2.87	2.73	3.15	0.42
1997	2.61	2.47	2.87	0.40
1998	2.16	1.89	2.86	0.97
1999	2.33	2.21	2.69	0.48
2000	2.13	2.01	2.37	0.35
2001	1.87	1.75	2.26	0.50
2002	2.02	1.93	2.27	0.34
2003	1.92	1.98	1.83	–0.15
2004	1.93	1.98	1.88	–0.10
2005	1.79	1.70	1.94	0.24
2006	1.81	1.80	1.84	0.04
2007	1.71	1.80	1.57	–0.23
2008	1.54	1.52	1.63	0.11

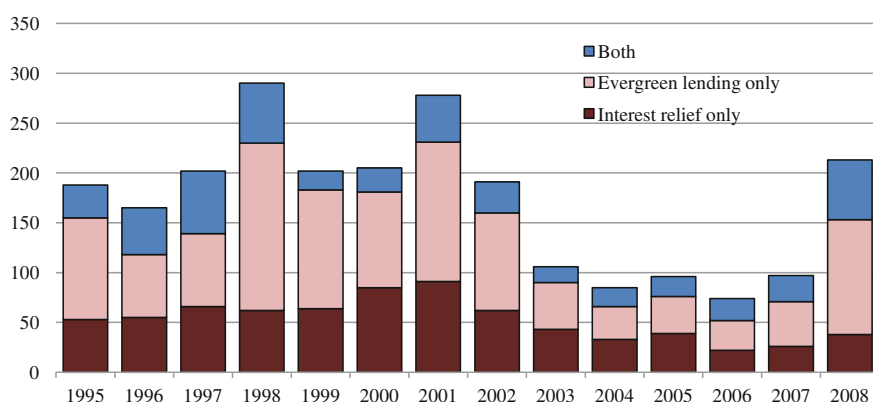


Fig. 2.5 Number of zombie firms (excluding one-shot zombie firms) by measure of financial support

Table 2.2 Relationship between the measure of financial support to zombie firms and the duration of zombie firms

1995–2008			
Duration (years)	Measure of financial support (share in per cent)		
	Interest relief only	Evergreen lending only	Both
1	0.237	0.587	0.176
2	0.264	0.492	0.244
3	0.421	0.354	0.225
4	0.454	0.315	0.231
5	0.577	0.205	0.218
6	0.560	0.160	0.280
7	0.500	0.133	0.367
8	0.761	0.090	0.149
9	0.309	0.487	0.204

1995–2001			
Duration (years)	Measure of financial support (share in per cent)		
	Interest relief only	Evergreen lending only	Both
1	0.231	0.618	0.152
2	0.238	0.524	0.238
3	0.416	0.386	0.199
4	0.466	0.301	0.233
5	0.540	0.190	0.270
6	0.535	0.163	0.302
7	0.609	0.130	0.261
8	0.698	0.113	0.189
9	0.311	0.497	0.192

2002–2008			
Duration (years)	Measure of financial support (share in per cent)		
	Interest relief only	Evergreen lending only	Both
1	0.248	0.540	0.212
2	0.301	0.445	0.254
3	0.432	0.284	0.284
4	0.407	0.370	0.222
5	0.733	0.267	0.000
6	0.714	0.143	0.143
7	0.143	0.143	0.714
8	1.000	0.000	0.000
9	0.305	0.470	0.225

This finding shows the importance of introducing the evergreen lending criterion to analyze the zombie firm issue. Surprisingly, these figures are almost the same in the first half or pre-reform period (1995–2001) and in the second half or post-reform period (2002–2008), although some fluctuations are observed on a year-to-year

basis. From this finding, it is evident that the fundamental transformation of accounting rules and bank supervision policies around 2001 made little difference in the choice of financial support measures, suggesting some time-consistent judgment criteria were widely shared among banks.

To look closely at this aspect, it is useful to perform a cross tabulation of the choice of financial support measure and the duration of zombie firms (the number of years in a row a firm has retained its zombie status). As shown in Table 2.2, from 1995 to 2008, there is a robust tendency toward shifting from evergreen lending to interest rate relief as duration increases. For zombie firms whose duration equals one, the category “evergreen lending only” accounts for 59 %, while “interest rate relief only” accounts for 24 %. However, for zombie firms whose duration is more than eight, evergreen lending only accounts for just 9 %, while interest rate relief only accounts for 76 %. These figures can be interpreted that while evergreen lending is regarded by banks as a relatively flexible measure to cover the cash shortages of troubled firms, it is no more than a temporary solution. Of course, this does not deny that some evergreen lending was supplied with the intention of concealing non-performing loans or postponing painful losses. Nevertheless, not only did the temporary nature of evergreen lending surely exist before the Koizumi–Takenaka reform, but also the probability of recovering in the next year was higher for firms categorized as evergreen lending only than for those categorized as interest rate relief only, particularly before the major reform.

2.4 Empirical Framework to Analyze How Zombie Firms Recovered

2.4.1 *Multinomial Logistic Model*

The rest of this chapter explores how most alleged zombie firms finally recovered in Japan, focusing on the difference between before and after the major reform in 2001 as well as that between manufacturing and non-manufacturing. To this end, this section estimates a multinomial logistic model to clarify which factor was effective in reviving zombies and moving them to non-zombie status, focusing on both the quantitative and the qualitative aspects of operational restructuring. The sampled firms in each period t are those classified as zombies in the previous period $t - 1$ excluding one shot zombie firms, as discussed in Sect. 2.2.2. The dataset comprises an unbalanced panel from 1995 to 2008. However, it is handled as pooled cross-section data in the following analyses because of its sparse structure due to the infrequency of zombie incidences. Zombie firms in the previous period are coded as one in the current period if they continued to be categorized as zombie firms, two if they moved to non-zombie status, and three if they were delisted during the current period. Since exploring the determinants of delisting is outside

the scope of this book, the following analysis focuses on the differences between the firms coded as one and two.⁵

2.4.2 List of Explanatory Variables

The explanatory variables adopted in the following regression analyses can be classified into seven categories. All these explanatory variables are lagged by 1 year to avoid simultaneous biases. The first category of explanatory variables corresponds to the quantitative aspects of the operational restructuring of zombie firms and includes *Change in the number of employees*, *Change in fixed assets*,⁶ and *No bonus payment dummy* (to executives). The *Change in the number of employees* and the *Change in fixed assets* are computed as the logged time difference in the number of employees and that in fixed assets, respectively. The *No bonus payment dummy* takes one if a firm failed to pay a bonus to its 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 adopted by troubled Japanese firms. To the extent that these schemes were effective for the recovery of zombie firms, significantly negative signs for the first two variables and a significantly positive sign for the third variable are expected.

The second category of explanatory variables corresponds to the qualitative side of the operational restructuring of zombie firms and includes *Special losses* and *Special profits*, which are normalized by total sales.⁷ Until the early 2000s, the accounting system in Japan was based on the historical cost principle, which regarded non-operational losses as special losses and non-operational income as special profits whenever a firm realized unrealized capital losses and gains, respectively. Owing to such accounting rules, troubled firms were incentivized to conceal the true extent of their financial problems by reducing the reported value of losses on their books and/or inflating their reported capital. Consequently, although both special losses and special profits are accompanied by restructuring in a quantitative sense, namely some disposal of assets, they have the opposite implications in a qualitative sense—at least in the less transparent circumstances until the early 2000s. Specifically, an increase in special losses was not necessarily bad news because it may have indicated that the firm chose to liquidate negative legacies of the past and commit to a major operational reform in the true sense. By contrast, an increase in special profits was not necessarily good news because it may have indicated that the firm chose to sell its prime assets for temporary liquidity relief in order to continue concealing its real problems. To the extent that these qualitative

⁵See, for example, Fukuda et al. (2009) for the determinants of the bankruptcy of Japanese firms.

⁶In this chapter, fixed assets refer to book value excluding land.

⁷Throughout the following analyses, income from debt relief is subtracted from the published value of special profits because debt relief is adopted as another explanatory variable.

aspects were important for the recovery of zombie firms, significantly positive and negative signs are expected for *Special losses* and *Special profits*, respectively.

The third category of explanatory variables corresponds to financial restructuring and includes the *Debt relief dummy*, *Debt relief ratio*, and *Capital reduction dummy*. These variables represent the external financial support provided by stakeholders. The *Debt relief dummy* takes one if a firm received debt relief from creditors during period t and zero otherwise. The *Debt relief ratio* is the ratio of debt forgiveness during period t to total outstanding external debt at the beginning of period t . The *Capital reduction dummy* takes one if a firm makes capital reductions during period t and zero otherwise. To the extent that external financial support facilitated the painful restructuring process, significantly positive signs are expected for these three variables.⁸

The fourth category of explanatory variables is introduced to control the distance to recovery, and it includes the *Debt-asset ratio* and *Length of being a zombie*. The *Debt-asset ratio* is total outstanding external debt normalized by the total book value of assets. Zombie firms with larger external debt are considered to be more difficult to recover. Therefore, a significantly negative sign is expected for the *Debt-asset ratio*. The *Length of being a zombie* denotes the number of years that a firm continued to be a zombie. The recovery of zombie firms that have experienced extended periods of financial trouble is rather challenging. At the same time, providing that debt burden is controlled for by the other variables, the *Length of being a zombie* can also be interpreted as the effects of procrastination on the recovery. In either case, a significantly negative sign is expected.

The fifth category of explanatory variables is introduced to control for corporate governance issues in terms of shareholder composition, and it includes *Financial institutions' ownership* (in per cent), *Non-financial institutions' ownership* (in per cent), and *Foreign ownership* (in per cent). Until the 1990s, in a broad sense, the shareholder composition of Japanese firms had two distinct features, namely bank ownership and cross shareholdings, which influenced corporate decision making markedly. Bank ownership has declined dramatically since the regulation was introduced in 1998, which set an upper limit of 5 % for each bank's share in terms of voting rights. On the contrary, foreign investors rapidly increased their share throughout the 1990s and 2000s along with the number of activists. The prevalence of bank ownership and cross shareholdings used to be seen as a major advantage of the Japanese corporate system before the lost decades, as these features insulated Japanese firms from short-termism in the market. However, as the Japanese economy slowed in the 1990s, bank ownership and cross shareholdings became criticized for inefficiently protecting lazy managers from market discipline. Hence, in the case of zombie firms, bank ownership and cross shareholdings are considered

⁸On the contrary, firms that receive debt relief and make capital reductions are expected to face more severe financial conditions than others. To the extent that such negative selection effects are dominant, a significantly negative sign can be expected for these variables.

to be harmful for the recovery (i.e., as they facilitate procrastination), while foreign ownership is considered to be beneficial for the recovery (i.e., as it promotes restructuring). According to these widely accepted views, significantly negative signs are expected for both *Financial institutions' ownership* as a proxy for bank ownership and *Non-financial institutions' ownership* as a proxy for cross share-holdings,⁹ while a significantly positive sign is expected for *Foreign ownership*.

The sixth category of explanatory variables corresponds to the external business environment of Japanese firms, and it includes *Change in total sales*, the *Dummy of export manufacturing*, and year dummies. *Change in total sales* is computed as the logged time difference in total sales. The *Dummy of export manufacturing* takes one if a firm belongs to the nine manufacturing industries with relatively high export dependence (textiles, chemicals, iron and steel, nonferrous metals, machinery, electric equipment, automobiles and auto parts, other transportation equipment, precision instruments) and zero otherwise. The Japanese economy experienced a temporal recovery from prolonged stagnation in the early and mid-2000s. In particular, exports to emerging economies including China grew considerably, which supported Japanese manufacturing production from the demand side. Therefore, the improved external environment in the 2000s could be a driving force for the recovery of zombie firms. Given that the *Dummy of export manufacturing* captures the external business environment at an industry level and that the year dummies capture other macroeconomic shocks, *Change in total sales* may correspond to idiosyncratic shocks including the outcome of internal restructuring efforts to expand sales. To the extent that the aforementioned demand-side effects were important, significantly positive signs are expected for these variables.

Lastly, three auxiliary control variables, *Employee Size*, *Asset size*, and *Firm age*, are included as the seventh category. The former two variables correspond to firm size in terms of the number of employees and total assets and these are computed as natural logarithmic values. The effect of firm size on the recovery of zombie firms can be twofold. On the one side, larger firms may have more slack to restructure productive resources and thus many options to improve performance. However, on the other, larger firms may have difficulties making a bold and quick decision because of complicated vested interests not only inside the organization but also with stakeholders including banks. *Firm age* counts the number of years since foundation in natural logarithmic values. Older firms may have similar characteristics to larger firms with regard to restructuring. Hence, although either sign is expected for these variables, their effects on the possibility of recovery should be controlled for.

⁹The category of *Financial institutions' ownership* includes the shares held by institutional investors such as insurance companies, pension funds, and mutual funds. In the 2000s, institutional shareholders accounted for a larger proportion than banks because of the regulation. However, the time series and cross-sectional differences in *Financial institutions' ownership* as a whole were still driven by the shares held by banks. Moreover, institutional investors in Japan were stable and silent shareholders until the 2000s. Hence, this category can be used effectively as a proxy for bank ownership.

2.5 Descriptive Statistics

In the following analyses, any outliers are eliminated from the sample. Specifically, those observations whose number of employees, total fixed assets, or total sales increased by over 900 % in a year, or whose total sales declined by over 90 % in a year, or whose special loss or special profit normalized by total sales exceeded one were eliminated as outliers.¹⁰ In addition, observations that had merged with any other listed firms in the past 3 years and observations that experienced surveillance by the TSE because of mergers with unlisted firms in the past 3 years were excluded from the sample. Excluding these samples allows us to avoid discontinuity in the time series as a result of mergers and acquisitions and any other types of fundamental changes in operations (e.g., becoming a holding company).

Table 2.3 presents the descriptive statistics of the explanatory variables for zombie and non-zombie firms after eliminating the outliers. On average, zombie firms are smaller in terms of both employees and assets, older, and more likely to belong to export manufacturing industries than non-zombie firms. For shareholder composition, the proportion held by non-financial institutions is larger for zombie firms, while that held by financial institutions and foreign investors is larger for non-zombie firms, on average. This table also indicates that operational restructuring is more conspicuous for zombie firms compared with non-zombie firms. Specifically, on average, there is a greater reduction in the number of employees for zombie firms compared with non-zombie firms. On average, the *Change in fixed assets* variable is negative for zombie firms but positive for non-zombie firms. At least partly because of operational restructuring, the *Change in total sales* variable is negative for zombie firms but positive for non-zombie firms. In addition, zombie firms faced more serious financial problems during the study period and were more likely to realize their unrealized capital losses and gains compared with non-zombie firms. Specifically, the *Debt-asset ratio* as well as *Special losses* and *Special profits* are larger for zombie firms compared with non-zombie firms, on average. All the aforementioned differences between zombie and non-zombie firms are statistically significant at the one per cent level.

2.6 Estimation Results for the Entire Sample Period

Table 2.4 presents the results of the multinomial logistic regression analyses for the entire sample period (1995–2008) with respect to firms that continued to be listed as non-zombie firms in the current year, coded as two, benchmarking against firms that continued to be listed as zombie firms in the current year, coded as one. Since the sampled firms are those identified as zombies in the previous year excluding one shot zombie firms as well as outliers, the sign of each coefficient suggests the

¹⁰Each criterion was applied to the 1-year lagged values.

Table 2.3 Descriptive statistics of the explanatory variables of zombie firms, 1995–2008

	Change in the number of employees	Change in fixed assets	No bonus payment dummy	Special losses (normalized by total sales)	Special profits (normalized by total sales)	Debt relief dummy	Debt relief ratio	Capital reduction dummy	Debt-asset ratio
<i>Zombie firms (2247 observations)</i>									
Mean	-0.078	-0.027	0.192	0.072	0.022	0.014	0.004	0.010	0.443
Median	-0.046	-0.026	0.000	0.031	0.004	0.000	0.000	0.000	0.425
Standard deviation	0.248	0.202	0.394	0.121	0.062	0.117	0.039	0.101	0.189
<i>Non-zombie firms (22249 observations)</i>									
Mean	-0.018	0.033	0.271	0.023	0.011	0.002	0.000	0.003	0.197
Median	-0.012	0.013	0.000	0.008	0.001	0.000	0.000	0.000	0.167
Standard deviation	0.193	0.174	0.445	0.055	0.038	0.039	0.012	0.058	0.173
	Financial institutions' ownership (in per cent)	Non-financial institutions' ownership (in per cent)	Foreign ownership (in per cent)	Change in total sales	Dummy of export manufacturing	Employee size (in natural log)	Asset size (in natural log)	Firm age (in natural log)	
<i>Zombie firms (2247 observations)</i>									
Mean	25.837	31.526	4.225	-0.057	0.458	6.585	17.847	4.032	
Median	24.720	28.150	1.100	-0.042	0.000	6.554	17.769	4.060	
Standard deviation	13.800	18.268	8.299	0.160	0.498	1.180	1.342	0.341	
<i>Non-zombie firms (22249 observations)</i>									
Mean	27.199	28.389	8.388	0.019	0.408	6.759	17.924	3.913	
Median	25.480	24.520	4.680	0.019	0.000	6.714	17.772	3.989	
Standard deviation	14.498	18.339	10.187	0.142	0.491	1.192	1.278	0.426	

Notes

1. All explanatory variables are lagged by 1 year to avoid simultaneous biases
2. Outliers are excluded from both categories
3. One shot zombie firms are included in non-zombie observations
4. Income from debt relief is subtracted from special profits
5. Null hypotheses of t-test for independent means are rejected at the 0.01 level for all items in column headings

Table 2.4 Estimation results for the entire sample period: 1995–2008

	Coefficient	<i>p</i> -value	<i>dp/dx</i>
Change in the number of employees	−0.558	0.011**	−0.139
Change in fixed assets	−0.746	0.014**	−0.186
No bonus payment dummy	0.168	0.183	0.042
Special losses (normalized by total sales)	1.920	0.001**	0.479
Special profits (normalized by total sales)	−1.892	0.021**	−0.472
Debt relief dummy	−3.338	0.001**	−0.488
Debt relief ratio	8.862	0.015**	2.214
Capital reduction dummy	0.173	0.757	0.043
Debt-asset ratio	0.084	0.793	0.021
Length of being zombie	−0.144	0.000**	−0.036
Financial institutions' ownership (in per cent)	0.001	0.852	0.000
Non-financial institutions' ownership (in per cent)	−0.005	0.127	−0.001
Foreign ownership (in per cent)	−0.002	0.770	0.000
Change in total sales	1.242	0.002**	0.310
Dummy of export manufacturing	0.000	1.000	0.000
Employee size (in natural log)	0.082	0.263	0.021
Asset size (in natural log)	−0.124	0.062	−0.031
Firm age (in natural log)	0.347	0.015	0.086
Year dummy1995	−0.020	0.933	−0.004
Year dummy1996	0.329	0.139	0.082
Year dummy1998	0.146	0.517	0.036
Year dummy1999	1.006	0.000**	0.236
Year dummy2000	0.693	0.002**	0.167
Year dummy2001	0.426	0.069*	0.104
Year dummy2002	0.893	0.000**	0.211
Year dummy2003	1.312	0.000**	0.291
Year dummy2004	1.120	0.000**	0.252
Year dummy2005	1.088	0.000**	0.246
Year dummy2006	1.183	0.000**	0.265
Year dummy2007	0.758	0.021**	0.179
Year dummy2008	−0.622	0.059*	−0.155
Constant	0.042	0.968	
Number of observations	2247		
Wald chi-squared	10342.69		
Prob > chi-sq.	0.000		
Log pseudolikelihood	−1614.65		
Pseudo R-squared	0.093		

Notes

1. The left-out (benchmark) category for the dependent variables is “continues to be listed as a zombie” (coded as one). The estimation results of the dependent variable category “delisted” (coded as three) are not shown since they are outside the scope of the analyses

2. * and ** denote significance at the 0.10 and 0.05 levels, respectively. P-values were calculated based on heteroskedasticity robust standard errors (Huber-White estimator)

3. The year dummy 1997 was eliminated instead of 1995 or 1996 since we have no observations for the category “delisted” (coded as three) in 1995 and 1996

4. Marginal effects (*dp/dx*) denote the marginal impact of a given independent variable at its sample mean on the transition probability. However, in the case of the dummy variables, “marginal” represents a discrete change from zero to one

effectiveness of each factor in reviving zombie firms to non-zombie status. All the explanatory variables are lagged by 1 year to avoid simultaneous biases. It is confirmed that the estimated marginal effects of each variable, indicated as " dp/dx " in Table 2.4, have the same sign as the corresponding estimates of the coefficients.

For the quantitative aspects of operational restructuring, both the coefficient of *Change in the number of employees* and that of *Change in fixed assets* take a significantly negative sign. This finding implies that reducing the number of employees and selling underutilized fixed assets were beneficial to reviving zombie firms. By contrast, the coefficient of the *No bonus payment dummy* takes a positive sign, but not significantly. This fact may suggest that penalizing managers was not necessarily an effective way in which to promote the recovery of troubled firms.

The qualitative aspects of operational restructuring also played an important role in the recovery of troubled firms. The coefficients of *Special losses* and *Special profits* take a significantly positive and negative sign, respectively. Until the early 2000s, there was a lack of transparency in the accounting system in Japan. Owing to the historical cost principle, traditional Japanese firms could hold substantial unrealized gains in the form of prime assets and utilize these gains to increase their final profits arbitrarily. When a troubled firm substantially increased special profits in such circumstances, it was highly likely that it sold off its prime assets to conceal poor business status and postpone the laborious process of restructuring. As a result, the recovery of troubled firms with higher special profits is considered to have been further delayed. By contrast, when a troubled firm substantially increased special losses, it was highly likely that it revealed its previously concealed losses to the public. An increase in the transparency of a firm's business condition is considered to have encouraged its stakeholders including employees and creditors to accept the laborious process of restructuring more readily, thereby accelerating the recovery.

For financial restructuring, the coefficient of the *Debt relief dummy* takes a significantly negative sign. This finding reflects the negative selection effects among zombie firms, suggesting that a firm with a highly deteriorated balance sheet tended to receive debt relief. At the same time, the coefficient of the *Debt relief ratio* takes a significantly positive sign as expected. This fact suggests that substantial amounts of debt relief were inevitable for reviving zombie firms in severe financial conditions. By contrast, the coefficient of the *Capital reduction dummy* takes a positive sign, but not significantly. Capital reductions explicitly recognize accumulated losses as reductions in shareholder wealth and can thus be effective means to induce additional support from lenders. However, their effect on the recovery may be indirect and less conspicuous than the direct effect of debt forgiveness.

With respect to the distance to recovery, the coefficient of the *Debt-asset ratio* takes a positive sign contrary to expectations, although not significantly. On the one hand, the heavier the debt burden, the higher is the hurdle for the recovery. On the other, a heavier debt burden can enforce stronger discipline to zombie firms and make them commit to a painful restructuring process. Moreover, a substantial inter-industry discrepancy in the effect of the debt burden is likely to exist. By contrast, the coefficient of *Length of being a zombie* takes a significantly negative

sign as expected. In other words, the longer the firm remains a zombie, the more difficult is its recovery. This finding suggests that procrastination harmed the recovery of zombie firms.

Regarding shareholder composition, none of *Financial institutions' ownership*, *Non-financial institutions' ownership*, and *Foreign ownership* had a significant impact on the recovery. However, bearing in mind that Japan experienced substantial reform of its corporate governance rules, accounting rules and bank supervision policies in the middle part of the entire sample period, further analyses of sub-periods are required to draw a conclusion about this issue.

For the external environment, the coefficients of the year dummies take significantly positive signs from 1999 to 2007 and the marginal effects are larger from 2003 to 2006, suggesting that the considerable growth in Japanese exports thanks to the favorable development of overseas economies at that time supported the recovery of zombie firms from the demand side. By contrast, the coefficient of the *Dummy of export manufacturing* is insignificantly different from zero, suggesting that the favorable effects of an increase in external demand disseminated rapidly to other industries via supply chains and multiplier effects. On the contrary, the coefficient of *Change in total sales* takes a significantly positive sign, suggesting that an increase in total sales at the individual firm level also accelerated the recovery of zombie firms.

Lastly, none of the three auxiliary variables controlling for firm size and firm age had a significant impact on the recovery.

2.7 Estimation for the Sub-periods

2.7.1 Importance of the Sub-period Analyses

In the previous section, we investigated how restructuring and other factors influenced the recovery of zombie firms from 1995 to 2008. The sample period, however, included both the escalating and the resolution phases of zombie firms as well as non-performing loans. Moreover, it is likely that the sweeping reforms of accounting rules and bank supervision policies in the late 1990s and the early 2000s would have different impacts on the mechanisms behind the recovery of zombie firms. From such a point of view, this section estimates the multinomial logistic model based on the following two sub-periods. The first sub-period (1995–2001) is the escalating phase of zombie firms as well as non-performing loans and is roughly interpreted as the pre-reform period. The second sub-period (2001–2008) is the resolution phase of zombie firms as well as non-performing loans and is roughly interpreted as the post-reform period. Table 2.5 summarizes the estimation results. In a broad sense, for both sub-periods, the main implications remain unchanged from those for the entire sample period shown in Table 2.4. Nevertheless, several important differences from the result of the entire sample period are found for both sub-periods.

Table 2.5 Estimation results for the two sub-periods

	First sub-period (1995–2001)			Second sub-period (2002–2008)		
	Coefficient	<i>p</i> -value	<i>dp/dx</i>	Coefficient	<i>p</i> -value	<i>dp/dx</i>
Change in the number of employees	−0.528	0.254	−0.131	−0.527	0.071*	−0.122
Change in fixed assets	−0.393	0.316	−0.097	−1.754	0.001**	−0.399
No bonus payment dummy	0.370	0.015**	0.092	−0.320	0.162	−0.074
Special losses (normalized by total sales)	2.098	0.004**	0.520	1.394	0.128	0.327
Special profits (normalized by total sales)	−1.770	0.075*	−0.438	−0.809	0.664	−0.193
Debt relief dummy	−3.996	0.006**	−0.448	−6.459	0.000**	−0.652
Debt relief ratio	9.100	0.032**	2.253	33.605	0.002**	7.699
Capital reduction dummy	−1.211	0.390	−0.255	0.755	0.516	0.157
Debt-asset ratio	0.339	0.292	0.084	−0.558	0.370	−0.136
Length of being zombie	−0.166	0.000**	−0.041	−0.098	0.050*	−0.023
Financial institutions' ownership (in per cent)	−0.008	0.232	−0.002	0.017	0.051*	0.004
Non-financial institutions' ownership (in per cent)	−0.011	0.014**	−0.003	0.004	0.471	0.001
Foreign ownership (in per cent)	−0.002	0.807	−0.001	0.005	0.637	0.001
Change in total sales	1.887	0.000**	0.467	0.766	0.211	0.180
Dummy of export manufacturing	0.041	0.739	0.010	−0.059	0.717	−0.015
Employee size (in natural log)	0.149	0.122	0.037	0.037	0.758	0.008
Asset size (in natural log)	−0.070	0.392	−0.017	−0.278	0.030**	−0.064
Firm age (in natural log)	0.389	0.060*	0.096	0.268	0.187	0.062
Year dummy1995	0.008	0.971	0.002			
Year dummy1996	0.381	0.088*	0.095			
Year dummy1998	0.204	0.369	0.051			
Year dummy1999	1.119	0.000**	0.271			
Year dummy2000	0.731	0.002**	0.180			
Year dummy2001	0.447	0.064*	0.111			
Year dummy2003				0.400	0.072*	0.089
Year dummy2004				0.237	0.368	0.052
Year dummy2005				0.258	0.395	0.058
Year dummy2006				0.327	0.250	0.084
Year dummy2007				0.033	0.918	0.007
Year dummy2008				−1.409	0.000**	−0.340
Constant	−1.274	0.366		3.803	0.034**	
Number of observations	1400			847		
Wald chi-squared	4036.31			3251.92		
Prob > chi-sq.	0.000			0.000		
Log pseudolikelihood	−966.40			−615.07		
Pseudo R-squared	0.079			0.117		

Notes

1. The left-out (benchmark) category for the dependent variables is “continues to be listed as a zombie” (coded as one). The estimation results of the dependent variable category “delisted” (coded as three) are not shown since they are outside the scope of the analyses

2. * and ** denote significance at the 0.10 and 0.05 levels, respectively. P-values were calculated based on heteroskedasticity robust standard errors (Huber-White estimator)

3. The year dummy 1997 was eliminated instead of 1995 or 1996 since we have no observations for the category “delisted” (coded as three) in 1995 and 1996

4. Marginal effects (*dp/dx*) denote the marginal impact of a given independent variable at its sample mean on the transition probability. However, in the case of the dummy variables, “marginal” represents a discrete change from zero to one

2.7.2 *The First Sub-period (Escalating Phase)*

With respect to the quantitative aspects of corporate restructuring, the coefficients of *Change in the number of employees* and *Change in fixed assets* become insignificant, although they still take negative signs. By contrast, the coefficient of the *No bonus payment dummy* takes a significantly positive sign, although insignificant for the entire period. These differences from the result for the entire sample period may reflect that compared with zombie firms in the resolution phase, those in the escalating phase still had a relatively great margin of resilience thanks to the positive legacies of the past such as prime assets and technological advantages. In such a circumstance, penalizing incumbent managers by cutting bonus payments was sufficient to facilitate the recovery process. They still had the opportunity to recover through constructive reforms such as intensifying innovation, without drastically downsizing the number of employees and/or fixed assets.

In addition, two more differences from the results for the entire sample period are noted. Firstly, with respect to shareholder composition, the coefficient of *Non-financial institutions' ownership* becomes significantly negative, consistent with the widely accepted view that cross shareholdings, one of the distinct features of Japanese shareholder composition, were harmful for zombie firms as they blocked the disciplinary pressure from the market before the major reform. Secondly, the coefficient of *Firm age* becomes significantly positive, suggesting that older firms could recover easily thanks to the room for restructuring operations.

2.7.3 *The Second Sub-period (Resolution Phase)*

The results for the second sub-period contrast with those of the first sub-period in terms of both the quantitative and the qualitative aspects of operational restructuring as well as the effect of sales growth. Firstly, for the quantitative aspects, both the coefficient of *Change in the number of employees* and that of *Change in fixed assets* take a significantly negative sign, while the coefficient of the *No bonus payment dummy* takes a negative sign, although not significantly. These results suggest that zombie firms in the second sub-period had exhausted the positive legacies of the past such as prime assets and technological advantages and that they were cornered to the extent that the gradual reform lead by incumbent executives who gave up their own bonus was unhelpful. Secondly, with respect to the qualitative aspects of corporate restructuring, neither *Special losses* nor *Special profits* still had a significant impact on recovery. In the second sub-period, accounting rules were more transparent and bank supervision policies were stricter. In such a circumstance, these items no longer contained any additional information about the quality of restructuring and true extent of the financial problem. Thirdly, the coefficient of *Change in total sales* at the individual firm level becomes insignificant, although it still takes a positive sign. This finding may imply that cost cutting was more

effective than innovation for the recovery of zombie firms in the second sub-period. Although the improved macroeconomic environment had a positive impact, zombie firms in the second sub-period did not have sufficient time or resources to expand their own businesses through innovation. In such circumstances, they were trapped in cost competition without sales growth.

In addition, for shareholder composition, the coefficient of *Financial institutions' ownership* takes a significantly positive sign in the second sub-period, inconsistent with the widely accepted view that bank ownership delayed the recovery of zombie firms. Unlike the first sub-period, bank ownership declined substantially due to the regulatory reform mentioned in Sect. 2.4.2. Moreover, after the reform of corporate governance rules as well as accounting rules and bank supervision policies, banks could not help being sensitive to the impairment of their assets. In these circumstances, if banks kept holding the stocks of a troubled firm, they must have a strong incentive to discipline the troubled firm for the recovery. By contrast, there is no evidence that *Foreign ownership* promoted the recovery, even after the Koizumi–Takenaka reform.

2.8 Estimation of the Sub-periods by Industry

The issues of zombie firms and the non-performing loan problem were most serious in the construction, real estate, and wholesale/retail industries. Indeed, most well-known troubled firms that endangered banks' health associated with large-scale debt reorganization belonged to these industries. However, with respect to the number of zombie firms, manufacturing firms accounted for the majority throughout the sample period, as shown in Fig. 2.6. At the same time, we found three important

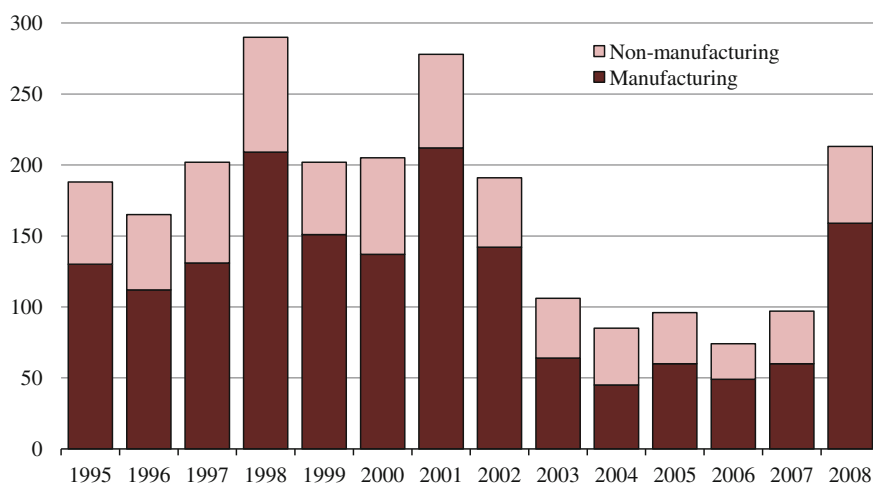


Fig. 2.6 Number of zombie firms (excluding one-shot zombie firms) by industry

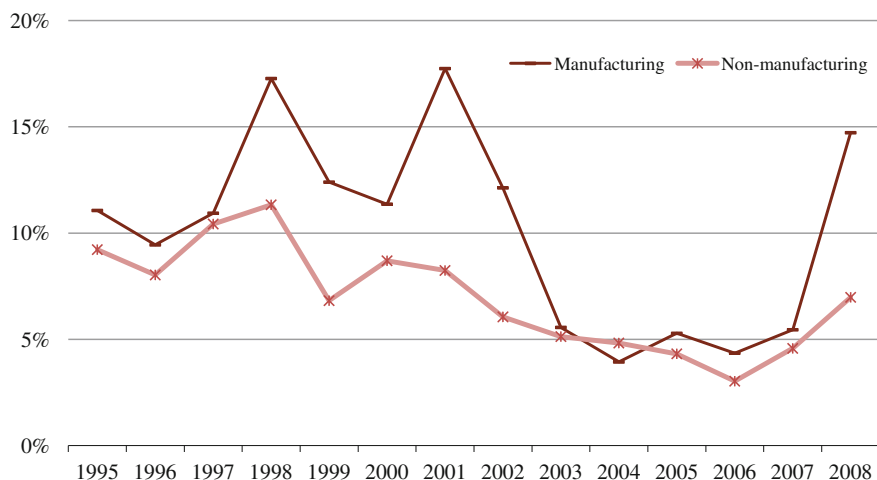


Fig. 2.7 Zombie ratio (excluding one-shot zombie firms) by industry

differences between manufacturing and non-manufacturing in terms of the dynamics of zombie firms and their choice of financial support measures. Firstly, for the time series variation in the alleged zombie ratios shown in Fig. 2.7, the ratio of manufacturing has peaks in 1998 and 2001 but fluctuates widely along with the change in the macroeconomic environment, while that of non-manufacturing reached its peak in 1998 and declined slowly but persistently thereafter. Secondly, as shown in Table 2.1, troubled firms in non-manufacturing industries tended to stay in the zombie status longer than those of manufacturing industries during the first sub-period, namely before the Koizumi–Takenaka reform. For example, in 1998 when the Japanese banking crisis reached its climax, the discrepancy between manufacturing and non-manufacturing for the average duration of zombie firms also peaked (0.97 years), where the average duration for manufacturing zombie firms was 1.89 years compared with 2.86 years for non-manufacturing zombie firms. Interestingly, this discrepancy almost disappeared in the second sub-period largely because of the reduction in duration in the non-manufacturing sector. Thirdly, partly as a consequence of the first and second differences, zombie firms in manufacturing industries relied more heavily upon evergreen lending and less upon interest relief than those in non-manufacturing industries. In a broad sense, manufacturing firms face a more volatile business environment than non-manufacturing firms and thus tend to suffer from cash shortages. Hence, evergreen lending is a suitable remedy for such volatile firms because they can quickly recover as soon as the adverse environment ends. By contrast, troubled firms in non-manufacturing industries tend to face low profitability and thus take more time to recover. Hence, interest relief is suitable for such firms, while evergreen lending without improvement in interest coverage could even worsen the debt problem.

Therefore, the type of restructuring and other factors that influence zombie firms' recovery can differ between manufacturing and non-manufacturing industries. To test this point, the multinomial logistic regressions for the two sub-periods are estimated by splitting the sample into manufacturing and non-manufacturing. To avoid collinearity due to the scarcity in the sample of debt relief and capital reductions associated with the sample split, two equations are estimated for each category: model 1, which omits the *Debt relief dummy*, *Debt relief ratio*, and *Capital reduction dummy*, and model 2, which omits the year dummies. However, the estimates of model 2 for manufacturing in the first sub-period cannot be obtained due to a scarcity of samples with debt relief or capital reductions.

In the first sub-period, as shown in Table 2.6, with respect to the quantitative and qualitative aspects of operational restructuring along with sales growth, the results for manufacturing are similar to that for the entire sample, while the results for non-manufacturing differ substantially. Specifically, for non-manufacturing zombie firms, neither cutting executives' bonuses nor downsizing employees and/or fixed assets was effective for the recovery. In addition, the significance of *Special losses* and *Special profits* as well as *Change in total sales* is not as robust as that for manufacturing. On the contrary, it seems that corporate governance issues and firm characteristics had more impact on the recovery of non-manufacturing zombie firms in the first sub-period compared with their manufacturing counterparts. In particular, both the coefficient of *Financial institutions' ownership* and that of *Non-financial institutions' ownership* take a significantly negative sign. This finding suggests that the widely accepted view that bank ownership and cross shareholdings were harmful for the recovery by facilitating procrastination may be plausible for non-manufacturing zombie firms but not for manufacturing zombie firms.

In the second sub-period, as shown in Table 2.7, with respect to the quantitative aspects of operational restructuring, the reduction in both employees and fixed assets was effective for the recovery of manufacturing zombie firms, while only the reduction in fixed assets was effective in non-manufacturing. Moreover, for non-manufacturing the coefficient of the *Debt-asset ratio* takes a significantly negative sign, while the coefficient of the *Capital reduction dummy* takes a significantly positive sign. This finding confirms the crucial importance of financial restructuring for the recovery of non-manufacturing zombie firms in the second sub-period. On the contrary, *Change in total sales* had no significant effect on the recovery, even in the industry-level analyses. This finding implies that behind the dramatic decline in zombie firms in the second sub-period, cost cutting prevailed instead of innovation. Cost cutting was indeed the most secure and effective way for an individual zombie firm to recover. However, it was a typical case of the "fallacy of composition." Since restructuring efforts served as an additional cause of deflationary pressure, the recovery of zombie firms in the 2000s could not promote a full-fledged recovery of the Japanese economy.

Table 2.6 Estimation results for the first sub-period by industry (1995–2001)

	Manufacturing			Non-manufacturing Model 1			Non-manufacturing Model 2		
	Coefficient	p-value	dp/dx	Coefficient	p-value	dp/dx	Coefficient	p-value	dp/dx
Change in the number of employees	-0.678	0.264	-0.169	1.095	0.284	0.264	0.768	0.455	0.187
Change in fixed assets	-0.400	0.349	-0.100	0.176	0.772	0.042	0.291	0.616	0.069
No bonus payment dummy	0.489	0.006**	0.122	0.030	0.923	0.007	0.022	0.941	0.006
Special losses (normalized by total sales)	2.854	0.001**	0.711	0.615	0.594	0.148	2.212	0.099*	0.529
Special profits (normalized by total sales)	-2.710	0.012**	-0.675	-7.778	0.090 *	-1.872	-7.440	0.141	-1.779
Debt relief dummy							-3.700	0.048**	-0.408
Debt relief ratio							8.334	0.075*	1.998
Capital reduction dummy							-0.966	0.462	-0.198
Debt-asset ratio	0.491	0.160	0.122	-0.203	0.830	-0.049	-0.891	0.306	-0.221
Length of being zombie	-0.135	0.001**	-0.034	-0.186	0.003**	-0.045	-0.168	0.011**	-0.040
Financial institutions' ownership (in per cent)	0.002	0.757	0.001	-0.026	0.026**	-0.006	-0.038	0.000**	-0.009
Non-financial institutions' ownership (in per cent)	-0.006	0.277	-0.001	-0.019	0.019**	-0.004	-0.023	0.002**	-0.006
Foreign ownership (in per cent)	-0.002	0.831	-0.001	0.043	0.238	0.010	0.011	0.784	0.003
Change in total sales	1.835	0.002**	0.457	1.691	0.069*	0.407	1.001	0.248	0.239
Dummy of export manufacturing	0.080	0.602	0.020						
Employee size (in natural log)	0.058	0.641	0.014	0.257	0.160	0.062	0.254	0.151	0.060
Asset size (in natural log)	0.026	0.815	0.007	-0.304	0.056*	-0.073	-0.230	0.138	-0.055
Firm age (in natural log)	-0.010	0.973	-0.003	1.228	0.000**	0.296	1.192	0.001**	0.286
Year dummy1995	0.100	0.719	0.025	-0.169	0.733	-0.040			
Year dummy1996	0.460	0.091*	0.115	0.271	0.535	0.066			
Year dummy1998	0.306	0.271	0.076	0.124	0.779	0.030			
Year dummy1999	0.975	0.000**	0.237	1.712	0.000**	0.402			
Year dummy2000	0.869	0.002**	0.212	0.307	0.520	0.075			
Year dummy2001	0.227	0.435	0.057	1.083	0.017**	0.264			
Constant	-1.398	0.454		0.204	0.935		0.325	0.899	

(continued)

Table 2.6 (continued)

	Manufacturing	Non-manufacturing Model 1	Non-manufacturing Model 2
Number of observations	981	419	419
Wald chi-squared	1692.74	1340.26	565.62
Prob > chi-sq.	0.000	0.000	0.000
Log pseudolikelihood	−680.83	−254.84	−272.18
Pseudo R-squared	0.074	0.186	0.130

Notes

- 1. The left-out (benchmark) category for the dependent variables is “continues to be listed as a zombie” (coded as one). The estimation results of the dependent variable category “delisted” (coded as three) are not shown since they are outside the scope of the analyses
- 2. * and ** denote significance at the 0.10 and 0.05 levels, respectively. P-values were calculated based on heteroskedasticity robust standard errors (Huber-White estimator)
- 3. The year dummy 1997 was eliminated instead of 1995 or 1996 since we have no observations for the category “delisted” (coded as three) in 1995 and 1996
- 4. Marginal effects (dp/dx) denote the marginal impact of a given independent variable at its sample mean on the transition probability. However, in the case of the dummy variables, “marginal” represents a discrete change from zero to one

Table 2.7 Estimation results for the second sub-period by industry (2002–2008)

	Manufacturing Model 1			Manufacturing Model 2			Non-manufacturing Model 1			Non-manufacturing Model 2		
	Coeff.	p-val.	dp/dx	Coeff.	p-val.	dp/dx	Coeff.	p-val.	dp/dx	Coeff.	p-val.	dp/dx
Change in the number of employees	-1.018	0.012**	-0.236	-1.064	0.023**	-0.235	0.468	0.281	0.110	0.148	0.689	0.030
Change in fixed assets	-1.546	0.011**	-0.358	-1.462	0.017**	-0.316	-2.427	0.007**	-0.567	-1.976	0.045 **	-0.398
No bonus payment dummy	-0.174	0.528	-0.036	-0.306	0.263	-0.059	-0.401	0.302	-0.096	-0.595	0.123	-0.130
Special losses (normalized by total sales)	2.485	0.077*	0.586	2.739	0.059*	0.634	0.157	0.902	0.038	-0.049	0.971	0.006
Special profits (normalized by total sales)	-0.603	0.792	-0.125	-0.611	0.788	-0.096	-1.771	0.492	-0.416	0.393	0.897	0.064
Debt relief dummy				-19.702	0.000**	-0.664				-8.484	0.001**	-0.756
Debt relief ratio				104.800	0.000**	23.891				47.816	0.002**	10.083
Capital reduction dummy				0.302	0.823	0.083				3.539	0.005**	0.324
Debt-asset ratio	0.310	0.694	0.053	0.526	0.483	0.068	-2.403	0.037**	-0.564	-1.813	0.098 *	-0.388
Length of being zombie	-0.124	0.053*	-0.029	-0.075	0.245	-0.017	-0.107	0.168	-0.025	-0.063	0.434	-0.013
Financial institutions' ownership (in per cent)	0.014	0.176	0.003	0.022	0.032**	0.005	0.026	0.166	0.006	0.028	0.154	0.006
Non-financial institutions' ownership (in per cent)	-0.001	0.935	0.000	0.002	0.745	0.000	0.009	0.359	0.002	0.012	0.198	0.003
Foreign ownership (in per cent)	0.004	0.788	0.001	0.001	0.946	0.000	0.017	0.526	0.004	0.025	0.309	0.005
Change in total sales	1.027	0.160	0.247	0.963	0.162	0.232	-0.672	0.500	-0.158	0.252	0.809	0.055
Dummy of export manufacturing	-0.055	0.784	-0.014	-0.033	0.862	-0.011						
Employee size (in natural log)	0.281	0.053*	0.064	0.261	0.068 *	0.053	-0.293	0.118	-0.068	-0.097	0.601	-0.018
Asset size (in natural log)	-0.486	0.002**	-0.113	-0.487	0.002**	-0.107	0.102	0.667	0.024	-0.188	0.404	-0.042
Firm age (in natural log)	0.100	0.737	0.020	-0.079	0.777	-0.028	0.553	0.107	0.130	0.486	0.151	0.106
Year dummy2003	0.537	0.039**	0.118				0.203	0.666	0.047			
Year dummy2004	0.502	0.144	0.108				-0.158	0.733	-0.038			
Year dummy2005	0.318	0.433	0.065				0.411	0.440	0.094			
Year dummy2006	0.205	0.560	0.066				0.848	0.137	0.179			
Year dummy2007	-0.184	0.632	-0.044				0.953	0.149	0.192			
Year dummy2008	-1.543	0.000**	-0.371				-1.216	0.037**	-0.295			
Constant	6.362	0.007**		6.858	0.003**		-1.485	0.636		2.351	0.406	0.000

(continued)

Table 2.7 (continued)

	Manufacturing Model 1	Manufacturing Model 2	Non-manufacturing Model 1	Non-manufacturing Model 2
Number of observations	599	599	248	248
Wald chi-squared	1885.35	1860.41	1333.76	972.18
Prob > chi-sq.	0.000	0.000	0.000	0.000
Log pseudolikelihood	−437.64	−457.79	−165.81	−169.25
Pseudo R-squared	0.124	0.084	0.156	0.139

Notes

- 1. The left-out (benchmark) category for the dependent variables is “continues to be listed as a zombie” (coded as one). The estimation results of the dependent variable category “delisted” (coded as three) are not shown since they are outside the scope of the analyses
- 2. * and ** denote significance at the 0.10 and 0.05 levels, respectively. P-values were calculated based on heteroskedasticity robust standard errors (Huber-White estimator)
- 3. Marginal effects (dp/dx) denote the marginal impact of a given independent variable at its sample mean on the transition probability. However, in the case of the dummy variables, “marginal” represents a discrete change from zero to one

2.9 Concluding Remarks

Although CHK defined zombie firms as being unable to survive without financial support, the bankruptcy of such firms was rare in reality. This chapter investigated why most such alleged zombie firms finally recovered in Japan during the lost two decades. Based upon the framework of Fukuda and Nakamura (2011) and Nakamura and Fukuda (2013), which modified the methodology of CHK by introducing two original criteria (profitability and evergreen lending), a group of zombie firms were identified from among listed firms. We showed that the percentage of zombie firms and their time series variation were far more consistent with the trend of non-performing loan ratios compared with the method of CHK. Further, nearly half of zombie firms recovered to non-zombie status every year on average, while evergreen lending accounted for the majority of financial support to zombie firms on average, although interest relief gained in importance as duration increased.

Moreover, multinomial logistic regressions were estimated to investigate which factors were effective in reviving alleged zombie firms and we found that reducing the number of employees and selling unutilized fixed assets helped revive troubled firms. However, these quantitative aspects of operational restructuring did not have significant effects for the recovery before the fundamental reform of accounting rules and bank supervision policies at the beginning of the 2000s; rather, the qualitative aspects of operational restructuring such as *Special losses* and *Special profits* as well as sales growth were important for the recovery. This finding may reflect the fact that compared with zombie firms in the 2000s, those in the 1990s still had a relatively great margin of resilience thanks to the positive legacies of the past such as prime assets and technological advantages. In such a circumstance, they still had the opportunity to recover through constructive reforms without drastically downsizing employees and/or fixed assets. Specifically, they might recover relatively quickly by disclosing their true financial health without manipulating the special loss and special profit account and by expanding sales through intensive innovation. Nevertheless, given that the recovery was not as conspicuous in the 1990s, most troubled firms are considered to have missed this opportunity by postponing such constructive reforms.

By contrast, the regression results for the second sub-period showed that zombie firms in this period were cornered and had no choice but to engage in drastic downsizing under the transparent accounting rules. It was too late to carry out constructive reforms since they had exhausted the positive legacies of the past. Although cost cutting was the most secure and effective way for an individual zombie firm to recover, restructuring without innovation was not useful for overcoming prolonged deflation, even in a favorable external macroeconomic environment.

CHK and other economists who emphasized structural reforms believed, in essence, that the removal of inefficient zombie firms from the market and the reallocation of their productive resources to efficient firms would be the necessary

and sufficient condition for the full-fledged recovery of the Japanese economy. Indeed, this condition was satisfied not by the liquidation of zombie firms, but instead by drastically downsizing the productive resources of zombie firms. Moreover, even though the recovery of zombie firms was achieved in a way not useful for overcoming the prolonged deflation (i.e., cost cutting without innovation), it might have been better than the deflationary impact expected by the liquidation of these firms. Nevertheless, the Japanese economy could not break away from secular stagnation, and the metabolism in industries did not seem to make remarkable progress, even after the substantial decline in zombie firms. Hence, it is important to empirically examine whether the reallocation of productive resources was accelerated after the recovery of zombie firms, and if not, what the reason was. These issues are addressed in the next chapter.

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