Research Paper Series

Research Paper No. 1

December 1983

Corporate Mergers in Japan

Yasuo Hoshino

Toyo University
Business Research Institute

TOYO UNIVERSITY
BUSINESS RESEARCH INSTITUTE
28-20, 5 CHOME, HAKUSAN, BUNKYO-KU,
TOKYO, 112, JAPAN

CONTENTS

TABLES

Chapter 1

Chapter 2

INTRODUCTION

I. Introduction

Japanese business behavior is crucially different from that of Western countries in spite of the fact that the commercial code and institutions concerning business in Japan were amalgamated from European and American practices. As for mergers and takeovers, there are certain differences between them. Whereas mergers in the West are usually decided upon by the two parties for their mutual benefit and not by the third party, mergers in Japan are mainly arranged by the third party, the government, banks, or business leaders for the sake of meeting a government objective strengthening the business group, or avoiding duplicate investment as pointed out by Ballon et.al.(1976). Mergers have two characteristics in Japan (See Kaplan (1972)). One involves workers and labor unions. Since workers regard their company as the place to work and to live based on a life-long, seniority system, and Japanese unions are organized within and oriented to the company, so-called company unions, top management requires a wide range of agreement among workers and labor unions as well as major stockholders and related firms in mergers.[1]

The other is the Japanese financial system where as, a "main" bank, a single bank finances a significant portion of a firm's assets. Therefore, a merger between two firms necessarily involves a major adjustment between two main banks. Takeovers are very unpopular in Japan, if someone collects shares of a firm covertly in order to get a control of the firm, he usually ends up with reselling them to the existing management with a substantial premium and cannot acquire control of the firm, partly because of strong outside pressure, partly because it is against the Japanese business climate, corporate paternalism. Take-over bid (TOB)[2] which are made

possible by the 1971 revision of the Securities Exchange Law have hardly been used even by foreign corporations in Japan because of the strengthened power of stable shareholders who refuse to sell their shares to outsiders in order to maintain intersecting shareholdings within their business groups. Under these circumstances, there have been few studies of takeovers in Japan.

In the mid-1960s, there was a controversy about the desirability of corporate mergers in Japan. Along with the business community in Japan[3], the Ministry of International Trade and Industry (MITI) and the Ministry of Finance intended to extend guidance and support to mergers by big corporations. Their goal was to cope with the competition of American and European corporations, which were relatively larger in size than their Japanese counterparts at that time. They wanted to strengthen the international competitiveness and the financial structure of domestic enterprises by way of mergers.

On the other hand, there was a strong opposition in the academic circle[4] of economists who felt that the spirit of the Anti-monopoly Act must be maintained and that mergers would yield no economies of scale in the financial sphere of Japanese corporations. However, both side lacked an objective and quantitative basis for evaluating the effects of mergers.

Those who approve of mergers paid attention only to the short run enlargement of corporate size through mergers, believing "the bigger, the better". The opponents of mergers based their opinions on the neoclassical economic theory which asserts that free competition is Pareto-optimal, but they made no empirical analysis of the effects of mergers to support their theoretical case.

As for mergers, while there are many empirical as well as legal studies in the U.S. and the U.K. there are only some empirical works in

Japan. Especially, the performance of corporate mergers in Japan has hardly ever investigated quantitatively and extensively despite the hot arguments available empirical studies on mergers in Japan.

II. Brief Survey of Studies on Corporate Mergers in Western Countries

There exists a large volume of literature on corporate mergers in the Western countries[5]. Several selective quantitative works of them are as follow. Smith (1969) examined the performance of merging banks on the basis of year-end data of 81 pairs of merging and nonmerging banks in the U.S.. Bradford (1977,1978) analyzed saving and loan associations in the U.S. for two and three years comparisons, after mergers, between merging and nonmerging associations. Their results indicate that mergers had neutral effects on the performance of merging firms.

Singh (1971) examined to distinguish between the characteristics of (1) taken-over and non-taken-over firms (2) acquiring and acquired firms (3) acquiring and non-acquiring firms. He concluded that the past records of firms would lead to a relatively lower degree of discrimination between taken-over and non-taken-over firms, and between acquiring and non-acquiring firms. The take-over process is most likely to be neutral with respect to profitability. Lev and Mandelker (1972) examined the effects of a corporate merger upon various aspects of a firm's performance. They concluded that a particular merger has little effect on the firm's performance. Mandelker (1974) tested the perfectly competitive aquisitions' market hypothesis and concluded as follows. The acquired firms' stocks enable their stockholders to earn normal returns on the acquisition, and there is some indication that the stockholders of the acquring firms may be gaining somewhat from mergers.

Meeks (1977) found that in all seven post-merger years which were

observed, an average profitability showed a decline from the pre-merger level. Hughes, Mueller and Singh (1980) indicated that their univariate micro investigation failed to lend much support to the hypothesis that mergers improved efficiency. The profits of the merging companies rose relatively for the U.S. after tax among seven countries investigated. Neeley and Rochester (1982) analyzed mergers between saving and loan association in the U.S. and concluded that evidence of synergy, as measured by increases profitaility of merging associations in net income to assets, could not be verified. Only weak evidence for synergy, as measured by return on net worth, was provided for merging associations.

III. Overview of this book

This book consists of 6 chapters and appendixes. In chapter 1, merger activity and studies on mergers in Japan are described including six questionnaire type of surveys on objectives, motives and performance of mergers, and survey of analytical studies.

Chapter 2 is a first step to examine the performance of coporate mergers in Japan quantitatively based on financial data provided by Japan Operations Research Society.

Chapter 3 is an analysis of using the most extensive and longest financial data provided by Japan Development Bank. It examines the differences between merging and nonmerging firms before and after mergers in selected 13 industries, of which data are considered to be appropriate to mesure the performance of mergers based on data by year and by industry.

Chapter 4 deals with the data of 17 industries which include merging firms and nonmerging firms, of which data are not appropriate to measure the performance of mergers but are suitable for the comparison of financial characteristics between merging and nonmerging firms by year and by

industry.

In chapter 5, both data used in the previous two chapters are combined together and are analyzed to compare the financial characteristics between merging and nonmerging firms in each 30 industry.

Chapter 6 analyze aggregated data over 30 industries used in chapter 5 to compare the financial characteristics of merging and nonmerging firms as a whole.

Footnotes

1. In 1978, for example, the Sumitomo Bank, nucleus of the Sumitomo group and ranking 1st in profit and 3rd in volume of funds among Japanese banks, tried to merge the Kansai Sogo Bank, which is a medium-sized mutual loans and savings bank of Sumitomo affiliation, with the consent of the top managements of both companies in order to expand its business territory. But, the merger plan turned out to be a complete failure because of the strong objection of workers of the Kansai Sogo Bank including middle management and related companies. This case indicates that obtaining consensus among workers and related companies as well as top management is quite crucial in Japanese mergers. See Nishiyama (1981).

2. Before the revision of the Securities Exchange law, in 1967, the Japan Trading carried out TOB for its own share by the exchange of its 3.6 share with a new share of Mitsui & Co. in order to transfer of its business to the latter.

On April, 1972, after the revision, the Bendix Corporation of U.S. declared the take-over bid of Jidosha Kiki for the first time in Japan under the agreement between them and succeeded in obtaining shares up 4.9% to 20%. This is the first formal TOB in Japan. On January, 1976, Okinawa Electric carried out TOB to Okinawa Haiden and Chuo Haiden, resulting the success with issuing the convertible bonds in exchange for buying shares Yamaichi Securities (1977)

Minebea acquired and absorbed its four subsidiaries to obtain the technology of the equipments of office automation on October, 1981 and declared to pursue the TOB (Nikkei Business (1982)). Kyosera absorbed Yashica to diversify into photo and preciase technology on March, 1983. Merck Co. of U.S. second largest pharmaceutical company in the world

acquired Banyu Pharmaceutical, medium-scale maker mostly for physicians in Japan, resulting that the allocation of new shares and convertible bonds of the latter, reached up to 50.02 % of total shares. These three cases are acquisitions and not through TOB. But they have the same effects with TOB.

Thus, TOB in Japan after the revision of law is very uncommon, only two cases executed.

3. A typical view representing the business circle in Japan is in Suzuki (1971).

4. The Anti-Monopoly Policy Group composed of 90 economists made an opinion survey on the case of merger by the Yahata Steel Corporation and the Fuji Steel Corpooration, the new name after the merger is the Nippon Steel Corporation. The result of it is as follows.

(1) 86 out of 90 members agreed that the merger would substantially restricts competition in the steel industry.

(2) 81 of them mentioned that there would be few economies of scale and that the merger would lower the efficiency of the firm.

5. A very good surveys of literature on mergers in western countries can be seen in Mueller (1977), and Benston (1980) and Copeland and Weston (1983).

CHAPTER 1. MERGER ACTIVITY AND STUDIES ON MERGERS IN JAPAN

I. Definition and Characteristics of Corporate Merger

Corporate merger is the combining of two or more business organization into one, legally and economically. According to the Article 15-2 of the Anti-Monopoly law[1], every company in Japan shall, when contemplating becoming a party to a merger, file a prior report with the Fair Trade Commission in accordance with its regulation[2]. Consolidation is the fusion of two or more existing corporations into a newly organized organization (Bogen (1974)). Business organization intends to grow externally and internally. This external growth indicates the growth based on merger and consolidation as forms of business combination. The other form is transfer of business. There are three differences between merger and transfer of business. In most cases, merger indicates overall transfer of business, whereas usually transfer of business is carried out partially. Secondly, merged firm, that is, dissoluted firm does not need to take liquidation procedure in the former, but the latter cases need liquidation decision and procedure. Thirdly, merger is the institution of corporate law and transfer of business is the credit contract dealt in the civil code (Shoji Homu Kenkyukai (1982)).

The number of merger and transfer of business are shown in Table 1-1. There is a trend that more mergers can be seen than transfer of business in any year. One of high peaks on mergers occurred in the year of 1949, followed minor fluctuation around 300 - 400 for the period of 1950 to 1960. After 1961, gradual hike of the number of mergers continued up to the second peak of 997 cases in 1963. Next year 1964, it dropped a bit and thereafter 9 years' hike continued and registered the third peak and highest number of mergers, 1184 in 1972 with over 1,000 for six years from

1968 through 1973. After 1973, gradual decrease of mergers can be seen for four years and increased over 1,000 in 1977, then dropped again for three years and increased to 1,044 in 1981.

There are three forms of mergers, i.e. horizontal, vertical and conglomerate mergers. According to the annual reports of the Fair Trade Commission (1971-1982), the highest percentage of horizontal mergers to total mergers in number, is 36.2% in 1970 and the lowest one is 16.7% in 1980 during the period of 12 years ending the year of 1981 as shown in Table 1-2. The mean of this percentage is 23.9%. Likewise, by the value of total assets absorbed by mergers they are shown in Table 1-3, the highest percentage is 91.7% in 1971 and the lowest 10.7% in 1980 for the same period of years, indicating larger fluctuation of percentages by the value than by the number. The mean of this percentage is 47.36%, which is almost two times higher than the means by the number, meaning that horizontal merger in Japan is usually larger in the size of total assets absorbed than other forms of mergers.

The percentage of numbers of vertical mergers to total mergers is 13.35 on mean, and is fluctuating between 20.7 % in 1979 and 8.2 % in 1970. The vertical mergers have two types, forward vertical and backward vertical mergers. The mean of each type is 6.66 % and 6.69 %, respectively, almost equal occurrence of mergers between them.

The third form of mergers are conglomerate mergers, of which percentage is the lowest 44.1 % in 1970 and the highest 67.9 % in 1980. And 54.85% as the mean by the number of mergers is the highest occurrence among three forms of mergers. However, the percentage by the value absorbed is 32.35%, the second to the horizontal mergers (47.36%). Three types of conglomerate mergers, geographic market extension, product extension and the other type, namely, pure conglomerate mergers are shown in the table.

The geographic market extension, product extension and pure conglomerate mergers has 15.95 %, 11.02 % and 27.88 % for their means of percentages by the number and 11.69 %, 7.87 % and 12.78 % for their means of percentages by the total assets absorbed, respectively. This fact indicates that the size of total assets absorbed by conglomerate mergers in Japan is smaller than other types of mergers.

Table 1-4 shows the number of mergers by industry from 1970 through 1981. The number of merger in wholesale and retail industry occupies the highest percentage for all years, and increased from 36.76 % in 1970 to 44.06 % in 1981. On the contrary, manufacturing industry as a whole decreased about 10 % from 30.3 % in 1970 to 19.2 % in 1981.

II. Corporate Merger and Corporate Size

In this section, we investigate the relationship between the mergers' occurrence and the corporate size based on capital. The rate of merger based on capital is defined as followed.

rate of merger based on capital = number of mergers accepted based on capital / number of firms based on capital

Table 1-5 shows the number of mergers accepted based on capital: 1) less than ¥ 10 million, 2) more than ¥ 10 million, 3) more than ¥ 100 million, and 4) more than ¥ 1 billion. The largest share is occupied by the category of 2) more than ¥ 10 million, following 1) less than ¥ 10 million, 3) more than ¥ 100 million and 4) more than ¥ 1 billion.

The number of firms based on capital is given in Table 1-6. There is a trend that the smaller size of firms belonging to the category less than ¥ 10 million occupies 80.08 % of all firms. On the contrary, more than ¥ 1 billion firms are only 2,357, that is 0.16 % of all firms in 1981.

In Japan, the number of firms of all four categories are always

increasing every year even just after the year of the Oil Crisis in 1973.

Table 1-7 has the rate of merger based on capital, indicating that the bigger the size of firms, the higher the rate of mergers. In other word, firms of more than ¥ 1 billion based on capital have 1-4 mergers per 100 firms, followed 1-3 per 100 firms for more than ¥ 100 million, 2-10 per 1,000 for more than ¥ 10 million, 1-6 per 10,000 for less than ¥ 10 million.

The reason of this trend is the fact that the number of usually larger remaining merging firms is counted for the case of merger and the relatively smaller acquired corporations disappear, and have no contribution on the counting of the number of mergers.

III. Various Questionnaire's Surveys on Objectives, Motives and Performance of Mergers in Japan

There are several investigations by questionnaire research on the objectives, motives and performance of mergers in Japan as follows.

First, Yamaichi Securities Co. and Yamaichi Securities Research Institute (1977) conducted a survey on the fund raising of corporations in Japan, covering 1,345 (941 firms in manufacturing and 404 firms in nonmanufacturing industries) belonging to the stock exchanges of Tokyo (the first and second section), Osaka (the first section), and Nagoya (the first section) excluding banks and insurance companies. They received responses from 498 firms (37.0 %). The result of investigation on the objectives of merger is in Table 1-8. The raising efficiency of management ranks top with 60 of 156 merging firms (38.5 %), the second is enlargement of size, 40 firms (25.6 %) for merging firms. For those firms intending mergers, the first objective, raising the efficiency occupied 38 out of 63 firms (60.3%), indicating higher expectation for higher efficiency of mergers.

The performance of merger is given in Table 1-9. Of 151 firms, 135 (89.4 %) responded that there were the purposive performance of merger. Only three companies found nonpurposive performance of merger. The remaining 12 companies could not mention the performance, with no performance of one company.

Second, the Fair Trade Commission of Japan (1972-1982) has revealed the motives and objectives of merger as shown in Table 1-10 and 1-11 respectively, which is the most extensive and continuous investigation in Japan. The promoting party of mergers is considered to be common large stockholders in the first place with gradual increase from 1971 (35.2 %) to 1975 (53.4 %) and dropped to 45.1 % in 1967. From 1977 to 1981, the policy of parent company became the top and in 1981 talks among the parties occupies the highest share, 38.2 %.

For the objectives of merger, the unification of parent and child, brother and sister companies was the first ranking reason from 1971 (24.2 %) to 1975 (27.7 %) and it resurged as the first reason in 1981 (27.8 %), with the second ranking in other years. The reduction of administrative cost was the first reason from 1976 (27.2 %) to 1980 (30.0 %), and the second in other years.

Third, the 108 committee on management of Japan Academy Development Association conducted the investigation of mergers as shown in Table 1-12 (Furukawa (1973)). Of 136 responses, 47 merging firms (34.56 %) with 101 merged firms answered the questionnaire and 22 firms showed the supplement of product as the first reason of merger (28.9 %), second, reduction of costs and reduction competition in market with the same second ranking (15.8 %), followed saving the ailing firms (9.2 %). As a contribution of mergers to growth, 19 out of 46 firms admitted great contribution (41.3 %), 17 considerable contribution (37.0 %), 6 little contribution (6.0 %) and

only 4 (8.7 %) didn't respond as shown Table 1-13.

Fourth, MITI (1970) investigated the objectives of mergers conducted by questionnaire survey in 1969, and obtained the result as shown in Table 1-14, 1-15. The concentralization and specialization of production (28.1 %) is the top ranking reason, followed by the diversification of management (16.0 %) by the classification of objectives with respect to firm structure after mergers. And the reduction of administrative cost (26.0 %) is the top and the strengthening the sales forces is the second reason with respect to management after mergers.

MITI showed motives of merger and the relationships among firms before merger in Table 1-16. As for motives of merger, talks among the parties is the top ranking with 147 cases (72.4%), following policy of parent company with (24.1%). The relationship of parent and child company has 92 out of 203 cases (45.3 %) and the relationship of companies used to belong to the same parent company has 53 cases (26.1 %), following 19 cases (9.4 %) of the relationships between buyer and seller, 12 cases (5.9 %) of the relationship used to be the same company 15. Therefore, mergers among companies with the same origin occupies 157 cases (77.3 %).

Table 1-17 shows the performance of mergers, in which 95 cases (43.4%) indicate the category of the sales power has strengthened, following the utilization of manpower and technology became easy to be handled with 91 cases, the size of investment into facilities and equipment increased with 65 cases.

Of 220 cases investigated, 27 cases respond (11.9 %) with the ill effects of mergers in Table 1-18. Majority of ill effects is the increase of administrative cost such as sudden rising of personnel expenses etc. with 15 cases and followed by to maintain harmony among workers became difficult with 3 cases and to understand each other among directors of

board became difficult with 2 cases.

Fifth, Japan Accounting Association Research Group on a Study of Corporate Megers and Spin-offs (1980) disclosed the report of investigation as shown in Table 1-19. They received 116 responses out of 349 firms in 1979 and 1980, which have merged for the past about five years. The top ranking objective is the absorbtion of subsidiaries and spin-offs (53 firms). the second objective is expansion of market share or strengthening the sales forces (28 firms), following to reduce the administrative cost (21 firms).

Sixth, Ogura (1982) conducted a questionnair survey on financing decision covering all stock listed 1,650 corporations except finance and insurance industries, in Japan, in which 377 firms (57.6%) out of 655 responses (response rate 40.9%) indicated that corporate mergers have effects on fund raising, 215 firms (32.8%) with no effects and 63 firms (9.6%) with no answer. Of 377 firms with positive answer, 316 firms (83.8%) revealed the positive effects and the remaining 26 firms (6.9%) did not respond.

IV. Survey of Analytical Studies on Corporate Mergers in Japan

There are several analytical studies on corporate mergers as follows.

Economic Planning Agency (1968) compared four variables, that is, market share, sales per employee, selling and management expenses to sales and net profit to sales before and after mergers among stock listed corporations with more than ¥ 1 billion capital of post-merger for 9 years starting 1958. The market share became lower in 12 out of 14 firms and higher in two firms after mergers. The other three variables showed comparative inferiority to industry average. Arisawa (1969) pointed out the following four points based on his analysis of 16 merging firms in 16

industries relative to industry averages. 1) Market shares of most merging firms declined after mergers, especially when they merged marginal firms in order to save them. 2) Net sales per employee improved after mergers. 3) Selling and management expenses to net sales declined after mergers. 4) Net profit to net sales made a favorable turn after mergers.

Takayanagi (1970) examined seven stock listed firms which had merged from 1959 to 1963 with the result that average sales growth rate is 1.68 for pre-mergers' five years and 2.03 for post-mergers' five years, and average net profit growth rate is 1.42 and 1.49 for five years, before and after mergers respectively. For mergers of five marine transportation firms in 1963, the rate is 1.25 and 1.93 before and after mergers, respectively. MITI (1970) showed that after mergers, the number of firms with higher ratio of sales growth than industry average is 26 (43.3%) and those firms with lower ratio is 23 (38.3%) and those firms with nearly equal ratio is 11 (18.3%) of 60 responses. Second, selling, general and administrative expenses to net sales decresed in 35 firms (45.4%), (increased for one or two periods after mergers and decreased than before mergers in the latest two periods in 5 firms) increased in 10 firms (13.0%), same level in 22 firms (28.6 %), and mixing 10 (13.0%) of 77 responses after mergers. Third, bases on four financial ratios, liquidity ratio, fixd assets ratio, fixed assets to fixed liability, special reserve and equity, and equity ratio, financial safety of merging firms has rarely improved after mergers. On the improvement of performance, it says that it is difficult to draw a conclusion partly because the effects of business trend and partly because the longer term influencing mergers, at least five or six years.

Miwa (1978) analyzed two mergers, one in the steel industry and one in banking. He focused his analysis on the stock prices involved in each merger and found that the mergers had neutral effects. Futatsugi (1980)

studied banking mergers within the framework of business groupings, but he offered no clear judgement on the effects of mergers. Ikeda and Doi (1981, 1983) took a sample of 49 major mergers in the manufacturing industries. The mergers analyzed took place form 1965 to 1975, based on the annual reports of the Fair Trade Commission of Japan. They found no effects of mergers within three years after mergers, but found that merging firms performed better within five years after. Sudo (1981) analyzed 78 mergers of stock listed corporations in the first section of Tokyo Stock Exchange which occurred from 1957 to 1974. By comparing three effects of profitability, risk and growth before and after mergers, she found that mergers have no statistically significant effects on these ratios.

Footnotes

1. The formal name of this law is the Law relating to prohibition of private monopoly and methods of preserving fair trade. Nakane (1980).

2. This is the regulaton concerning application for approval and acknowledgement report as well as notification a provided for in Article 9-2 to Article 16 inclusive of the law relating to prohibition of private monopoly and methods of preserving fair trade. Nakane (1980).

3. There are three kinds of companies by the commercial code in Japan, namely, gomei-kaisha (general partnership). goshi-kaisha (limited partnership) and kabushiki-kaisha (corporation) and the fourth type is yugen-kaisha (subchapter s corporation) by the yugen-kaisha low. Gomei-kaisha and goshi-kaisha are not permitted to become kabushiki-kaisha by the change of organization of the commercial code, but can be merged into kabushiki-kaisha. Yugen-kaisha can be merged into kabushiki-kaisha, too. Shoji Homu Kenkyukai (1982), Osumi and Omori (1983).

4. After the revision of commercial code of Japan in 1950, the minimum par value of one share became ¥ 500, thus, those firms which required to obtain the shares with per value ¥ 50, ¥ 20, merged a company issuing these stocks, because of disadvantage of marketing ¥ 500-share. Yamaichi Securities Research Institute (1977). But, according to the Article 166-2 of the revision of commercial code in 1981, the per value becomes no less than ¥ 50,000.

Table 1-1. Number of mergers and transfer of business

year	Consolidation and merger (fusion)	Consolidation	Merger	Transfer of business
1947	23			22
1948	309			192
1949	571			196
1950	420			209
1951	331			182
1952	385			124
1953	344			126
1954	325			167
1955	338			143
1956	381			209
1957	398			140
1958	381			118
1959	413			139
1960	440			144
1961	591			162
1962	715			193
1963	997			223
1964	864			195
1965	894			202
1966	871			264
1967	995			301
1968	1,020	11	1,009	354
1969	1,163	7	1,156	391
1970	1,147	16	1,131	413
1971	1,178	21	1,157	449
1972	1,184	16	1,168	452
1973	1,028	8	1,020	443
1974	995	11	984	420
1975	957	7	950	429
1976	941	11	930	511
1977	1,011	18	993	646
1978	898	14	884	595
1979	871	8	863	611
1980	961	7	954	680
1981	1,044	3	1,041	771

1) Source: the Fair Trade Commission (1982)
2) No separate report on consolidations and mergers is obtained before 1967.

Table 1-2. Number of mergers by the forms

Year	Horizontal mergers	Vertical Mergers: For-ward	Back-ward	Sub total	Congromerates: Geo. exten.	Pro. exten.	Other (pure)	Sub total	Other*	Total	Cases (net)
1970	472 36.1%	47 3.6%	60 4.6%	107 8.2%	205 15.7%	109 8.4%	260 20.0%	574 44.1%	150 11.5%	1,303 100.0%	1,147
1971	389 28.5%	74 5.4%	102 7.5%	176 12.9%	238 17.5%	132 9.7%	315 23.1%	685 50.3%	113 8.3%	1,363 100.0%	1,178
1972	319 24.4%	89 6.8%	94 7.2%	183 14.0%	199 15.2%	129 9.9%	369 28.2%	697 53.3%	108 8.3%	1,307 100.0%	1,184
1973	264 23.2%	68 6.0%	91 8.0%	159 14.0%	135 11.9%	144 12.7%	330 29.0%	609 53.6%	104 9.2%	1,136 100.0%	1,028
1974	242 20.6%	89 7.6%	64 5.4%	153 13.0%	130 11.1%	143 12.2%	392 33.3%	665 56.6%	115 9.8%	1,175 100.0%	995
1975	261 23.4%	88 7.9%	71 6.3%	159 14.2%	129 11.5%	128 11.5%	357 31.9%	614 54.9%	84 7.5%	1,118 100.0%	957
1976	239 22.5%	70 6.6%	58 5.4%	128 12.0%	126 11.8%	143 13.4%	338 31.8%	607 57.0%	90 8.5%	1,064 100.0%	941
1977	267 23.3%	62 5.4%	111 9.7%	173 15.1%	141 12.3%	146 12.7%	337 29.4%	624 54.4%	83 7.2%	1,147 100.0%	1,011
1978	257 25.3%	93 9.1%	71 7.0%	164 16.1%	158 15.5%	122 12.0%	231 22.7%	511 50.2%	86 8.4%	1,018 100.0%	898
1979	213 20.5%	117 11.2%	99 9.5%	216 20.7%	160 15.4%	118 11.3%	236 22.7%	514 49.4%	98 9.4%	1,041 100.0%	871
1980	204 16.7%	49 4.0%	70 5.7%	119 9.7%	372 30.3%	119 9.7%	342 27.9%	833 67.9%	70 5.7%	1,226 100.0%	961
1981	278 23.2%	75 6.3%	48 4.0%	123 10.3%	279 23.3%	104 8.7%	412 34.5%	79.5 66.5%	—** —	1,196 100.0%	990 (54)
Means of %	23.98%	6.66%	6.69%	13.35%	15.95%	11.02%	27.88%	54.85%	7.82%	100.0%	

* Other mergers mean mergers for the change of organization[3] and the change of par value[4], but the mergers of this category is shown in parentheses in 1981.

The Fair Trade Commission (1971-1982).

** Data on other mergers are excluded in 1981.

Table 1-3. Total assets absorbed through mergers by forms

Year	Horizontal mergers	Vertical Mergers: For-ward	Back-ward	Sub total	Congromerates: Geo. exten.	Product exten.	Other (pure)	Sub total	Other	Total
1970	231,338	8,329	69,854	78,183	65,838	42,333	50,989	159,160	4,638	473,329
	48.9%	1.7%	14.8%	16.5%	13.9%	8.9%	10.8%	33.6%	1.0%	100.0%
1971	3,153,243	62,608	39,995	102,603	109,285	20,259	59,880	189,424	2,366	3,447,636
	91.4%	1.8%	1.2%	3.0%	3.2%	0.6%	1.7%	5.5%	0.1%	100.0%
1972	117,060	36,244	22,883	59,127	86,257	49,534	143,117	278,962	22,766	477,915
	24.4%	7.6%	4.6%	12.4%	18.0%	10.4%	30.0%	58.4%	4.8%	100.0%
1973	1,941,022	19,064	161,690	180,753	47,246	60,162	74,507	181,914	4,048	2,306,798
	84.1%	0.8%	7.0%	7.8%	2.0%	2.6%	3.2%	7.9%	0.2%	100.0%
1974	n.a.*									
1975	n.a.									
1976	482,660	30,739	33,202	63,941	75,263	76,363	103,237	254,863	1,106	802,480
	60.2%	3.8%	4.1%	7.9%	9.4%	9.5%	12.9%	31.8%	0.1%	100.0%
1977	951,784	38,106	67,450	105,556	81,202	83,318	93,529	258,049	1,701	1,317,090
	72.3%	2.9%	5.1%	8.0%	6.2%	6.3%	7.1%	19.6%	0.1%	100.0%
1978	331,966	65,639	54,161	119,800	99,897	93,886	62,126	255,909	3,163	710,838
	46.7%	9.2%	7.6%	16.8%	14.1%	13.2%	8.7%	36.0%	0.4%	100.0%
1979	181,848	192,638	457,873	650,511	120,210	132,858	51,050	304,118	16,769	1,153,246
	15.8%	16.7%	39.7%	56.4%	10.4%	11.5%	4.4%	26.3%	1.5%	100.0%
1980	162,692	26,811	637,553	664,364	398,020	149,454	146,361	684,835	4,764	1,516,655
	10.7%	1.8%	42.0%	43.8%	25.6%	9.9%	9.7%	45.2%	0.3%	100.0%
1981	374,133	335,589	90,430	426,019	275,804	113,628	770,688	1,160,120	___	1,960,272
	19.1%	17.1%	4.6%	21.7%	14.1%	5.8%	39.3%	59.2%	___	100.0%
Means of %	47.36%	6.34%	13.10%	19.44%	11.6%	7.87%	12.78%	32.35%	0.85%	100.0%

* No data is available in 1974, 1975 through the Fair Trade Commission (1975, 1976).

Table 1-4. Number of mergers by industry

Industry \ Year	1970	1971	1971	1973	1974	1975	1976	1977	1978	1979	1980	1981
Agricultural, forestry & fishery	13	11	10	19	16	7	4	9	12	7	3	6
Mining	9	7	17	14	17	6	10	11	3	10	5	2
Construction	63	70	80	95	88	86	84	76	97	77	63	79
Manufacturing												
Food	55	55	35	26	27	22	41	26	19	20	19	27
Textile	54	62	51	34	36	34	33	56	19	31	23	29
Wood	30	26	26	33	16	21	24	23	18	9	9	15
Paper & pulp	13	12	3	13	7	13	15	8	9	14	8	9
Printing & publishing	23	24	21	19	9	7	17	12	14	17	12	12
Chemical	38	32	28	31	42	31	16	16	21	32	19	19
Rubber & leather	6	5	12	5	6	5	2	5	4	3	8	3
Ceramics Soil	32	22	19	22	28	26	13	16	19	11	17	15
Steel	19	24	9	14	4	15	17	19	10	10	12	6
Nonnferro.	6	6	13	7	5	4	3	5	6	10	7	6
Metal	41	43	31	30	30	27	19	23	13	14	18	12
General machinery	27	40	45	49	36	34	35	45	28	26	21	27
Electrical machinery	29	22	29	22	25	29	14	23	22	12	7	21
Transporta. machinery	9	14	14	6	15	9	6	19	21	31	18	7
Precise machinery	10	1	2	6	8	3	7	11	4	4	9	6
Other manu.	3	23	29	9	4	12	19	22	10	13	7	15
Subtotal	395	411	367	326	298	292	281	329	237	257	214	229
percentage	30.3	30.2	28.1	28.7	25.4	26.1	26.4	28.7	23.3	24.7	17.5	19.2

Table 1-4. (Continued)

Whoesale & retail percentage	479 36.8	478 35.7	475 36.3	354 31.2	449 38.2	401 35.9	390 36.7	475 41.4	384 37.7	386 37.1	586 47.8	527 44.1
Real estate	117	124	128	97	82	118	108	82	90	64	79	110
Transporta. Warehousing	120	115	83	64	103	79	67	53	56	55	51	69
Service	93	119	134	146	101	108	96	94	104	106	144	123
Finance securities	14	27	12	21	13	12	19	16	33	75	70	42
Electric, Gas	0	1	1	_	1	4	2	2	1	3	_	2
Other					7	5	3	_	1	1	11	7
Total	1303	1363	1307	1136	1175	1118	1064	1147	1018	1041	1226	1196

1) Source: The Fair Trade Commission (1970-1982)

2) Manufacturing industries which include 12 industries and wholesale & retail industry are shown with the number of mergers and its percentage to the total mergers for the comparison. They are the second and first ranking in numbers of mergers, respectively.

3) No classification of other industry is given from 1970 to 1973.

Table 1-5. Number of mergers based on capital

Capital Year	Less than ¥ 10 million	More than ¥ 10 million	More than ¥ 100 million	More than ¥ 1 billion	Total
1965	396	375	109	14	894
1966	359	404	78	30	871
1967	408	444	103	40	995
1968	390	486	116	28	1,020
1969	398	567	162	36	1,163
1970	346	579	179	43	1,147
1971	342	639	158	39	1,178
1972	312	627	200	45	1,184
1973	236	567	188	37	1,028
1974	252	521	187	35	995
1975	241	535	145	36	957
1976	211	552	146	32	941
1977	211	570	183	37	1,011
1978	179	478	209	32	898
1979	177	470	186	38	871
1980	192	541	195	33	961
1981	173	586	241	44	1,044

Source: the Fair Trade Commission (1982)

Table 1-6. Number of firms based on capital

Capital Year	Less than ¥ 10 million	More than ¥ 10 million	More than ¥ 100 million	More than ¥ 1 billion	Total
1965	661,994	41,582	4,356	962	708,804
1966	668,778	44,428	4,445	1,012	718,668
1967	713,532	52,603	4,799	1,088	772,022
1968	737,497	59,593	5,428	1,137	803,655
1969	782,034	69,400	5,985	1,224	858,643
1970	813,479	79,058	6,614	1,348	900,499
1971	866,825	92,132	7,346	1,423	967,726
1972	918,736	100,208	7,808	1,518	1,028,270
1973	951,357	123,518	8,934	1,661	1,085,470
1974	1,000,138	136,657	10,058	1,755	1,148,608
1975	1,039,783	158,135	11,189	1,893	1,211,000
1976	1,070,356	175,324	12,118	1,973	1,259,711
1977	1,107,879	189,464	12,837	2,044	1,312,224
1978	1,128,030	206,190	12,973	2,142	1,349,335
1979	1,164,858	221,512	13,477	2,213	1,402,060
1980	1,199,254	233,947	14,066	2,282	1,449,549
1981	1,230,293	251,457	14,713	2,357	1,498,888

Source: Tax Agency (1978,1983)

Table 1-7. Rate of mergers based on capital

Capital Year	Less than ¥10 million	More than ¥10 million	More than ¥100 million	More than ¥1 billion	Total
1965	0.000598	0.009018	0.025022	0.014553	0.001261
1966	0.000536	0.009093	0.017547	0.029644	0.001211
1967	0.000571	0.009093	0.017547	0.029644	0.001288
1968	0.000528	0.008155	0.021370	0.024626	0.001269
1969	0.000508	0.008170	0.027067	0.029411	0.001354
1970	0.000425	0.007323	0.027063	0.031893	0.001273
1971	0.000394	0.006935	0.021508	0.027405	0.001217
1972	0.000339	0.006255	0.025614	0.033382	0.001151
1973	0.000248	0.004590	0.021043	0.022275	0.000947
1974	0.000255	0.003812	0.018592	0.019943	0.000866
1975	0.000231	0.003383	0.012959	0.019017	0.000790
1976	0.000197	0.003148	0.012048	0.016218	0.000746
1977	0.000190	0.003008	0.014256	0.018102	0.000770
1978	0.000159	0.002318	0.016110	0.014939	0.000666
1979	0.000152	0.002122	0.013801	0.017171	0.000621
1980	0.000160	0.002312	0.013508	0.014460	0.000663
1981	0.000141	0.002330	0.016380	0.018668	0.000693

Calculated from Table 1-5 and Table 1-6.

Table 1-8. Objectives of mergers by Yamaichi Securities

Objectives	Merging firms		Firms intending mergers	
	Number	Percentage	Number	Percentage
Enlargement of size	40	25.6 %	13	20.6 %
Raising efficiency of management	60	38.5 %	38	60.3 %
Rescue operation of ailing company	7	4.5 %	5	7.9 %
Reorganization of related corporations	9	5.8 %	0	0 %
Lowering the per value of stock	30	19.3 %	0	0 %
Maintaining the membership of stock listed company	2	1.3 %	0	0 %
For the response of consolidated financial statement	1	0.6 %	3	4.8 %
Miscellaneous	7	4.5 %	4	6.4 %
Total	156	100.0 %	63	100.0 %

Source: Yamaichi Securities (1977)

Table 1-9. Performance of mergers by Yamaichi Securities

Performance	Merging firms	
	Number	Percentage
Purposive performance	135	89.4 %
Nonpurposive performance	3	2.0 %
No performance	1	0.7 %
No response	12	7.9 %
Total	151	100.0 %

Source: Yamaichi Securities (1977)

Table 1-10. Motives of mergers by Fair Trade Commission

Motives	1971		1972		1973		1974	
	No.	Per.	No.	Per.	No.	Per.	No.	Per.
Talks among the parties	260	22.1	212	17.9	185	17.4	124	11.5
Policy of parent company	405	34.4	431	36.4	362	34.0	370	34.4
Policy of common large stockholders	415	35.2	443	37.4	456	42.8	523	48.6
Related bank's mediation	10	0.8	7	0.6	6	0.6	12	1.1
Related business's mediation	10	0.8	6	0.5	14	1.3	16	1.5
Government guidance	32	2.7	18	1.5	13	1.2	31	2.9
Miscellaneous	46	4.0	67	5.7	30	2.8	1	0.0
Total	1,178	100 %	1,184	100 %	1,066	100 %	1,077	100 %

Motives	1975		1976		1977		1978	
	No.	Per.	No.	Per.	No.	Per.	No.	Per.
Talks among the parties	103	10.4	149	15.9	126	12.5	127	14.1
Policy of parent company	338	33.9	353	37.5	447	44.2	401	44.7
Policy of common large stockholders	532	53.4	424	45.1	416	41.1	352	39.2
Related bank's mediation	3	0.3	2	0.2	3	0.3	1	0.1
Related business's mediation	5	0.5	5	0.5	1	0.1	5	0.6
Government guidance	15	1.5	6	0.6	14	1.4	10	1.1
Miscellaneous	0	0.0	2	0.2	4	0.4	2	0.2
Total	996	100 %	941	100 %	1,011	100 %	898	100 %

Table 1-10. (Continued)

Motives	1979 No.	1979 Per.	1980 No.	1980 Per.	1981 No.	1981 Per.
Talks among the paties	200	23.0	266	27.7	398	38.2
Policy of parent company	363	41.7	413	43.0	357	34.2
Policy of common large stockholders	293	33.6	248	25.8	235	22.5
Related bank's mediation	1	0.1	6	0.6	10	1.0
Related business's mediation	1	0.1	3	0.3	12	1.1
Government guidance	8	0.9	14	1.5	14	1.3
Miscellaneous	5	0.6	11	1.1	18	1.7
Total	871	100 %	961	100 %	1,044	100 %

1) Source: the Fair Trade Commission (1972-1982)

2) No data is given in 1970, which is different from Table 1-2, 1-3 and 1-4.

Table 1-11. Objectives of mergers by Fair Trade Commission

Objectives (reasons)	1971		1972		1973		1974	
	No.	Per.	No.	Per.	No.	Per.	No.	Per.
Obtaining the superiority in the industry	52	2.7	16	0.9	26	1.7	27	1.5
Diversification	45	2.4	26	1.4	27	1.7	32	1.8
Mass production	13	0.7	4	0.2	5	0.3	2	0.1
Integration	34	1.8	54	3.0	72	4.6	66	3.7
Continuing production	25	1.3	14	0.8	12	0.8	14	0.8
Strengthening the sales forces	180	9.5	179	9.9	100	6.4	116	6.6
Strengthening the ability of raising fund	103	5.4	72	4.0	72	4.6	87	4.9
Reduction of administrative cost	423	22.3	349	19.2	341	21.7	375	21.3
Strengthening the utilization of technology	35	1.8	17	0.9	28	1.8	49	2.8
Obtaining and utilization of manpower	137	7.2	90	5.0	79	5.0	66	3.7
Unification of parent and child, brother and sister companies	460	24.2	527	29.0	457	29.1	539	30.6
Supplement to established business	25	1.3	23	1.3	21	1.3	14	0.8
Reorganization of partner	149	7.8	157	8.6	106	6.8	153	8.7
Acquisition of ailing industry	5	0.3	10	0.5	8	0.5	10	0.6
Unification of production and sales	55	2.9	64	3.5	48	3.1	47	2.7
Change of organization	65	3.4	63	3.5	77	4.9	81	4.5
Change the par value of stock	19	1.0	30	1.6	27	1.7	35	2.0
Miscellaneous	76	4.0	122	6.7	63	4.0	50	2.8
Total	1,901	100 %	1,817	100 %	1,569	100 %	1,762	100 %

Table 1-11. (Continued)

Objectives	1975 No.	1975 Per.	1976 No.	1976 Per.	1977 No.	1977 Per.	1978 No.	1978 Per.
Obtaining the superiority in the industry	15	0.9	10	0.6	15	0.9	11	0.9
Diversification	27	1.6	25	1.6	20	1.5	8	0.6
Mass production	4	0.2	4	0.3	5	0.3	3	0.2
Integration	64	3.8	30	1.9	17	1.0	20	1.6
Continuing production	19	1.1	7	0.4	13	0.8	15	1.2
Strengthening the sales forces	122	7.2	179	11.4	169	9.9	147	11.6
Strengthening the ability of raising fund	70	4.1	88	5.6	154	9.0	175	13.8
Reduction of administrative cost	440	25.9	429	27.2	503	29.4	395	31.1
Strengthening the utilization of technology	55	3.2	21	1.3	35	2.1	40	3.2
Obtaining and utlization of manpower	45	2.6	65	4.1	62	3.6	25	2.0
Unification of parent and child, brother and sister companies	470	27.7	402	25.5	408	23.9	222	17.5
Supplement to established business	14	0.8	14	0.9	16	0.9	8	0.6
Reorganization of partner	124	7.3	122	7.7	110	6.4	69	5.4
Acquisition of ailing industry	14	0.8	22	1.4	4	0.2	4	0.3
Unification of production and sales	44	2.0	26	1.7	40	2.3	42	3.3
Change of organization	58	3.4	55	3.5	57	3.3	38	3.0
Change the par value of stock	23	1.4	28	1.8	25	1.5	24	1.9
Miscellaneous	92	5.4	48	3.1	51	3.0	23	1.8
Total	1,700	100 %	1,575	100 %	1,710	100 %	1,269	100 %

Objectives	1979 No.	1979 Per.	1980 No.	1980 per.	1981 No.	1981 Per.
Obtaining the superiority in the industry	4	0.3	9	0.7	16	1.2
Diversification	17	1.4	14	1.1	) ** 17	1.2
Mass production	n.a. *	n.a.	4	0.3		
Integration	10	0.8	34	2.6	) 80	5.8
Continuing production	5	0.4	9	0.7		
Strengthening the sales forces	125	10.4	160	12.4	121	8.7
Strengthening the ability of raising fund	93	7.7	93	7.0	80	5.8
Reduction of administrative cost	432	35.8	385	30.0	237	17.1
Strengthening the utilization of technology	26	2.2	36	2.8	141	10.2
Obtaining and utilization of manpower	32	2.7	50	3.9	50	3.6
Unification of parent and child, brother and sister companies	218	18.0	327	25.4	385	27.8
Supplement to established business	11	0.9	17	1.3	29	2.1
Reorganization of partner	81	6.7	50	3.9	75	5.4
Acquisition of ailing industry	3	0.2	5	0.4	9	0.7
Unification of production and sales	36	3.6	39	3.0	66	4.7
Change of organization	39	3.2	27	2.1	35	2.5
Change the par value of stock	43	3.6	18	1.5	19	1.4
Miscellaneous	33	2.7	12	0.9	26	1.8
Total	1,208	100 %	1,289	100 %	1,086	100 %

Source: the Fair Trade Commission (1972-1982)
* Not available
** The statistics of diversification and mass production , and integration and continuing production were integrated into one reason, respectively in 1981.

Table 1-12. Objectives and motives of mergers by Japan Academy Development Association

Objectives and motives	Merging firms Number	Percentage
Reduction of costs (Utilizing the scale merit)	12	15.8 %
Removal of overlapping production	5	6.6 %
Supplement of products	22	28.9 %
Development of innovative technology	3	4.0 %
Reduction of competition in market	12	15.8 %
Saving the ailing firms	7	9.2 %
Unification of production and sales	2	2.6 %
Integrated strengthening of production system	1	1.3 %
Expansion of market share	2	2.6 %
Expansion of business foundation	2	2.6 %
Expansion of business territory and labor forces	1	1.3 %
Change of organization	1	1.3 %
Change of the par value of stock	3	4.0 %
Request by government industrial policy	3	4.0 %
Total	76	100 %

1) Source: Furukawa (1973)

2) 47 merging firms responded with multiple answers.

Table 1-13. Contribution of mergers to growth by Japan Academy Development Association

Contribution to growth	Merging firms Number	Percentage
Great contribution to growth	19	41.3 %
Considerable contribution to growth	17	37.0 %
Little contribution to growth	6	13.0 %
No contribution to growth	0	0 %
Hindrance to growth	0	0 %
No response	4	8.7 %
Total	46	100 %

Source: Furukawa (1973)

Table 1-14. Objectives of mergers with respect to firm structure after mergers by MITI

Objectives	Merging firms Number	Percentage
Concentralization & specialization of production	79	28.1 %
Diversification of management	45	16.0 %
Optimization of the plant size	40	14.2 %
Supplement to established business	37	13.2 %
Acquisition of ailing industry	29	10.3 %
Miscellaneous	17	6.1 %
No response	34	12.1 %
Total	281	100.0 %

Table 1-15. Objectives of mergers with respect to management after mergers by MITI

Objectives	Merging firms Number	Percentage
Market share	52	11.0 %
Strengthening the sales forces	102	21.5 %
Strengthening the ability of raising fund	49	10.3 %
Reduction of administrative cost	123	26.0 %
Avoidance of double investment	68	14.3 %
Utilization of the technology of merged firms	17	3.6 %
Strengthening the ability of R & D	31	6.6 %
Miscellaneous	22	4.6 %
No response	10	2.1 %
Total	474	100.0 %

1) One company responds more than two items.

2) The numer of companies investigated is 204, which merged from 1963 through 1968.

3) The number of mergers is 219, because MITI conducted a survey of questionnaire to the largest and second largest firms when mergers with more than three firms occurred MITI (1970).

Table 1-16. Motives of mergers and relationships among firms before mergers by MITI

Motives / Relation -ship before mergers	Talks among the parties	Policy of parent company	Related bank's mediation	Trading companies' mediation	Total
Parent and child company	91		1		92
Used to belong to the same parent company	9	44			53
Used to be the same company	12				12
Buyer-seller of material	15	3	1		19
Competitors	11	1	3	2	17
Miscellaneous	9	1			10
Total	147	49	5	2	203

Source: MITI (1970)

There are 16 other mergers which have combined motives and guidance by MITI.

Table 1-17. Performance of mergers by MITI

Performance	Cases
The sales power has strengthened	95
The utilization of manpower and technology became easy to be handled	91
The size of investment into facilities and equipment increased	65
The fund-raising ability increased	63
Management became stabilized through diversification	37
Research and development has strengthened	33
To purchase and order the materials became easy	28
To hire new employee became easy	26
The waste of mixing transportation became none	22
The exporting power increased	22
To introduce technology became easy	8
Too early to conclude the performance	7
No performance	10
Miscellaneous	25
Total	535 (219)

Source: MITI (1970)

Table 1-18. Ill effects of mergers by MITI

Ill effects	cases
Increase of administrative cost such as sudden rising of personnel expenses etc.	15
To maintain harmony among workers became difficult	3
To understand each other among directors of board became difficult	2
Miscellaneous	7
No ill effects, No response	193
Total	220

Source: MITI (1970)

Table 1-19. Objectives of mergers by Japan Accounting Association Research Group

Objectives	Merging firms Number	Percentage
Expansion of market share or strengthenig the sales forces	28	14.7 %
To diversify management	13	6.8 %
To avoid or remove double investment	12	6.3 %
Strengthening the ability of resarch and development	6	3.2 %
To increase the ability of fund raising and the corporate credibility	13	6.8 %
To reduce the administrative cost	21	11.1 %
To absorb subsidiaries and spin-offs	53	27.9 %
To save the ailing firm	14	7.4 %
To change the par value from ¥ 500 to ¥ 50	14	7.4 %
Miscellaneous	16	8.4 %
Total	190	100.0 %

1) Source: Japan Accounting Association Research Group

2) 116 firms out of 349 responded the survey

3) One company responds more than two items.

CHAPTER 2 THE PERFORMANCE OF MERGERS (I)

I. Introduction

This chapter presents the first step analysis of the performance of corporate mergers in Japan. It conducts two tests on the performance of mergers. One is to compare financial ratios of merging firms before and after the merger. The other is to compare the financial performances of merging and nonmerging firms in the same industry before and after the merger. Both tests can be conducted in the context of univariate and multivariate models. Also, the comparative analysis is extended to merging and nonmerging firms in all industries taken together.

II. Comparisons of Merging Firms Before and After the Merger

The performances of corporate mergers before and after the mergers are compared on the basis of the financial data of fifteen corporations merged in 1970.[1] Over periods running from one to five years, Table 2-1 contains the means, standard deviations, t values and F values of five financial ratios, namely, net equity to total assets, current ratio, debt equity ratio, turnover ratio, and net profit to total assets.[2] For net profit to total assets, three out of five are significant with t-statistics at the level of less than 1 %. The performance of this ratio is always worse or smaller after the merger than before the merger. This ratio compares before and after the merger as follows: 2.91 vs. 1.33, 2.98 vs. 2.88, 3.35 vs. 1.55, 3.03 vs. 1.60, 3.09 vs. 1.25 from one to five years respectively.

No statistically significant differences by t value are found on other variables. Though statistically not significant, there is a tendency that the turnover ratio and net worth to total liabilities and assets become lower after the merger and the liquid assets ratio and the debt-equity

catio become higher after the merger in every case. We can conclude that there is an upward trend in liquidity and downward trend in profitability and safety after the merger.

Table 2-2 shows the results of discriminant analysis of the five ratios. In the upper, extreme left-hand corner reporting the one-year comparison, the sum of the diagonal elements, 12 + 12 = 24, which represent the total number of correct discriminations, when divided into the total number of cases, 30, yields the measure of success, or accuracy, 80 %. For all comparisons, the accuracy is between 80 % and 83.33 %. Mahalonobis' generalized distribution and statistical significance is obtained for differences two, three, four, and five years before and after the mergers. This indicates the high probability of distinguishing the financial data between merging and nonmerging firms. But, this approach does not provide a distinction between negative and positive effects. Hence our primary concern is with the results of univariate analysis, which enables us to identify negative or positive effects for each variable and multivariate analysis is used to support the univariate analysis with respect to the distinction of two groups.

Nevertheless, there is a problem that the differences of performance before and after the merger is not only due to mergers but also to other external factors, especially, the so-called Nixon Shock in August 1971, after which the flexible exchange-rate system was introduced and revalued the Japanese currency and the Oil Crisis of 1973-1974. Therefore, we compare differences between merging and nonmerging firms in the same industry so as to eliminate the effects of external factors.

III. Comparisons of Merging and Nonmerging Firms

In this section, five financial ratios between merging and nonmerging

firms in the same industry are compared by the application of discriminant analysis. There are 10 industries analyzed and and two of them namely, the automobile and the organic chemical industries have statistically significant differences on financial ratios between merging and nonmerging firms like in Table 2-3. The automobile industry including Daihatsu Motor's merger of Asahi Industry in the first half of year 1970 has statistically significant differences on financial ratios between merging and non merging firms for all half-year periods after the merger except the second half of year 1975. Moreover, the three half-year periods before the merger are statistically significant. Therefore, the differences are considered not due to the merger but to the financial superiority of Daihatsu Motor, especially its debt-equity ratio, over other nonmerging firms in the same industry.

On the contrary, a different trend is observed about Nippon Synthetic Chemical Industry in the organic chemical industry with statistical significant differences. Just after the merger, in the second half of year 1970 there are seven half-years in succession in which there appeared clear statistical significant differences, with other nonmerging firms in the same industry. The turnover ratio, and net profit to total assets, can be obtained.

F and t tests could be performed on each of the five financial ratios in order to examine differences between merging and nonmerging firms as a whole in the 10 industries. The results are reported in Table 2-4. The mean is indifferent between merging and nonmerging firms except with statistical significance (by t ratio) for the first of 1966 on net profit to total assets, and for the first and second half of year 1969 on turnover ratio. For net profit to total assets however, 20 times out of 23 are significant by F values. Nonmerging firms always have higher standard deviations than

merging firms, indicating a much more stable trend of profitability for merging firms. The debt-equity ratio of merging firms has lower means and standard deviations for all half-year periods, 30 in all, among which 15 are significant by F values, pointing to a higher risk of financing for nonmerging firms. Two periods, the second half of 1974 and the first half of 1975, display significant differences between merging firms and nonmerging firms according to multiple discriminant analysis.

To conclude, it is not possible to discriminate between merging and nonmerging firms on the basis of a rather small sample of financial data.

IV. Comparisons in a Bigger Sample

The sample of merging firms which has been analysed in the preceding section consists of 15 cases only. The dates of many more merging firms can be obtained from magnetic tapes of financial data compiled by the Japan Development Bank,[2] Which cover 578 firms from the first half year of 1967 to the second half year of 1973. There are ninety firms which are subject to the effects of mergers,[3] assuming that merger's effects of the last five years. Firms are classified into two groups, namely, one consisting of merging firms with merging effects and another of nonmerging firms without them. The two groups are compared by the same method of analysis as before.

The results of the F and t tests are shown in Table 2-5. Concerning equity to total assets, the F ratio is statistically significant for the second half year of 1967 and the whole year of 1971 and 1972. It is clear that the standard deviation of nonmerging firms tend to be higher than that of merging firms for all years except 1967. The results of the t tests are significant for the first half year of 1967,1968, and second half year of 1970,whole year of 1971,1972, and 1973, in every period the mean of nonmerging firms is higher than that of merging firms. Therefore, merging

firms have lower but more stable values of equity to total assets. The standard deviation of the liquid assets ratio of merging firms is higher for all periods except for the whole year of 1967, the F test is significant in the whole years of 1967,1971, and 1973, the first half year of 1969,1972, and the second half year of 1968. The t test is significant only in the second half year of 1971 and first half year of 1972 and no clear trend is observed. For the debt-equity ratio, the F test is significant for the first half year of 1967, and the second half year of 1969,1970, and 1972 and the whole year of 1968, 1971, and 1973. The standard deviation of nonmerging firms is nine half-year periods out of 14. The mean of merging firms is higher except in the first half year of 1967 and the second half year of 1971, a result almost opposite to equity to total assets. Nevertheless, no statistically significant difference of t test can be found on debt-equity ratio. The F ratios of the turnover ratio are significant for the whole year of 1967 and the standard deviation of merging firms is higher than that of nonmerging firms for all periods. Net profit to total assets has significant results by the F test between merging and nonmerging firms on the whole years of 1967,1969,1970 and 1973, and the first half year of 1971. The mean of nonmerging firms is higher than that of merging firms except the second half year of 1969 and 1972, showing only one half-year period of statistical significance by t test.

We analyze the five financial ratios by multiple discriminant with the direct method of SPSS (Statistical Package for the Social Sciences). The accuracy of discrimination is at the lowest 56.92 in the second half year of 1973 and at the highest 76.82 % in the second half year of 1967. If aggregated data that is 578 x 14 = 8,092 cases are analyzed, the accuracy of discrimination is reduced to 59.76 %, indicating that external effects like economic growth and technological innovations play important roles.

The discrimination function of this aggregated analysis is as follows:

$$Z = 0.07759\ X_1 - 0.00988\ X_2 - 0.00001\ X_3 + 0.02912\ X_4 + 0.02912\ X_4 + 0.00270\ X_5 - 0.70972$$

where:

Z: Overall index

X_1: equity to tatal assets

X_2: liquid assets ratio

X_3: debt-equity ratio

X_4: turnover ratio

X_5: net profit to total assets

The centroid of the Z value is 0.03136 for nonmerging firms and 0.45356 for merging firms.

Given an actual figure of financial data of a company for each unknown variable from X_1 to X_5, Z value can be calculated and this company can be classified whether it is nonmerging firm or a merging firm by Z value. If Z value exceeds $(0.03136 - 0.43126)/2 = -0.21110$, this company is considered to be nonmerging, and if Z value is less than that, it is a merging firm.

V. Conclusion

We can conclude this chapter as follows.

1. There is a difference in financial performance before and after mergers in 15 corporate mergers examined here. After mergers, equity to total assets, the debt-equity ratio, the turnover ratio and net profit to total asssets are worse than before mergers. An improvement is found only in the case of the current ratio.

2. There is no clear distinction between merging and nonmerging firms in the same industry. Exceptions are Nippon Synthetic Chemical in the

inorganic chemical industry, whose performance was worsened, and Daihatsu Motor which is superior in the debt-equity ratio over other automobile corporations.

3. The comparison between 90 merging firms and 488 nonmerging firms shows that the two groups' financial performances can be distinguished with clearly adverse effects of mergers on equity to total assets.

The negative effects of mergers contradict the results of survey research[4] carried out by Yamaichi Securities Co.(1977). This research shows that the first majority, 38.46% of stock listed corporations in Japan pointing out to raise the efficiency of management as the prime objective of mergers. Our study indicates that there is a big gap between what top management expects and what they do.

The objective of mergers assumed in financial theory is to maximize the value of the firm to existing share-holders through external growth. It is assumed that operating economics can be achieved through mergers, which is known as synergism, as well as economies of scale. However, our findings show that there are adverse effects of mergers. The evidence seems to support new theory of the firm: that the object of mergers is to maximize management utility pointed out by (Baumol (1959), Williamson (1964), Mueller (1969)), assuming that management, perhaps mistakenly, believes size to be beneficial, or pursues size for empire building objective.

Footnotes

1. Merging firms are Ooji Paper, Sumitomo Corporation, Toshin Steel, Nippon Sheet Glass, Nippon Pulp Indusry, Daihatsu Motor, Kyodo Printing, Nippon Steel, Nippon Light Metal, Nishi-Nippon Railroad, Toyo Soda Manufacturing (Inorganic Chemical), KANEBO (Textile), Hitachi Shipbuilding and Engineering, PRESS KOGYO, and Nippon Synthetic Chemical Industry. Financial data of these corporations are from Mitsubishi Research Institute (1978). Analysis was carried out by HSAP Statistical Computing Package and SPSS. See Hitachi (1973), Tokyo University Computing Center (1977), Nie (1975).

2. The data, originally from the Japan Development Bank, is made by Cobol, transformed into the Fortran-type data by the Research Project of the Japan Operations Research Society, and is available to any member of the Society. See Operations Research Society of Japan (1976).

3. See Fair Trade Commission of Japan (1971) (1976).

4. This investigation was carried out for 1,345 stock listed corporations excluding banking and insurance industry in Japan on February 1977. They got responses from 498 firms composed of 338 manufacturing and 160 nonmanufacturing ones, 156 of which have merged before. According to this research, to raise efficiency of management is the first object for 60 firms and to enlarge size of firms is the second for 40 firms.

Table 2-1. F test and t test of 15 merging firms before and after the merger

Financial ratios \ Before and after merger	One Year		Two years		Three Years	
	Before	After	Before	After	Before	After
Equity to total assets	20.33	* 19.37	20.42	18.92	19.77	18.48
	7.93	11.41	5.04	11.50	5.67	18.48
Liquid assets ratio	61.95	** 113.18	110.97	117.94	110.25	116.54
	52.02	44.35	22.21	29.52	19.52	21.76
Debt-equity ratio	415.56	712.88	545.23	* 723.57	525.68	** 735.19
	652.21	827.22	384.79	768.44	258.44	562.06
Turnover ratio	1.17	1.01	1.17	1.02	1.18	1.08
	0.57	0.57	0.43	0.58	0.33	0.40
Net profit to total assets	2.91	1.33	2.98	**** 2.88	3.35	**** 1.55
	3.00	1.58	1.82	6.46	1.30	0.91

Financial ratios \ Before and after merger	Four Years		Five Years	
	Before	After	Before	After
Equity to total assets	21.02	* 18.11	21.37	17.55
	3.60	6.92	4.27	6.27
Liquid assets ratio	108.99	116.07	108.13	116.70
	17.86	18.61	17.10	16.54
Debt-equity ratio	515.70	* 737.69	506.31	749.09
	251.55	471.93	264.16	419.82
Turnover ratio	1.16	1.11	1.12	1.10
	0.33	0.34	0.34	0.33
Net profit to total assets	3.30	**** 1.60	3.09	**** 1.25
	1.42	* 0.76	1.26	* 0.70

Significant * at the 5 % level
** at the 1 % level
*** at the 0.5 % level
**** at the 0.1 % level

First raw of figures = Mean
Second row of figures = Standard Deviation

Table 2-2. Discriminant analysis of 15 merging firms before and after the merger

One Year			
	Before	After	Total
Before	12	3	15
After	3	12	15
Total	15	15	30
Accuracy	80.00 %		
Mahalanobis' distance	generalized 7.32		

Two Years			
	Before	After	Total
Before	12	3	15
After	2	13	15
Total	14	16	30
Accuracy	83.33 %		
Mahalanobis' distance	generalized 15.53*		

Three Years			
	Before	After	Total
Before	11	4	15
After	2	13	15
Total	13	17	30
Accuracy	80.00 %		
Mahalanobis' distance	generalized 21.20*		

Four Years			
	Before	After	Total
Before	12	3	15
After	3	12	15
Total	15	15	30
Accuracy	80.00 %		
Mahalanobis' distance	generalized 20.89**		

Five Years			
	Before	After	Total
Before	12	3	15
After	2	13	15
Total	14	16	30
Accuracy	83.33 %		
Mahalanobis' distance	generalized 31.03***		

Table 2-3. Mahalanobis' generalized distances by industry

Industries \ Period	F.1965	S.1965	F.1966	S.1966	F.1967	S.1967	F.1968	S.1968
Cotton spinning	7.34	5.50	0.43	2.45	1.88	2.37	3.57	2.35
Paper and pulp	1.88	2.37	0.16	1.48	0.28	1.16	0.64	1.40
Inorganic chemical	1.07	5.91	0.82	5.51	1.89	8.91	21.52	5.64
Organic chemical	2.78	4.29	0.57	3.06	2.89	6.37	8.89	17.87
Steel	0.92	1.54	1.38	1.71	0.53	0.27	0.17	0.56
Automobile	1.90	1.45	2.00	3.79	3.17	4.77	7.29	18.11*
Auto part	35.62*	11.59	9.49	4.71	2.77	2.08	1.39	2.87
Ship building	2.49	12.12	2.49	2.15	7.35	2.46	2.53	3.76
Retail trade	1.21	3.03	4.17	0.72	0.72	0.35	2.44	14.78
Railroad	4.09	3.44	2.97	3.87	2.81	3.38	2.89	3.11

Industries \ Period	F.1969	S.1969	F.1970	S.1970	F.1971	S.1971	F.1972	S.1972
Cotton spinning	2.28	1.75	1.46	2.40	2.53	5.67	1.78	1.22
Paper and pulp	1.94	1.43	1.20	2.59	6.07	0.23	0.15	0.62
Inorganic chemical	5.21	6.11	4.72	2.59	5.14	6.27	8.42	7.22
Organic chemical	15.77	10.82	7.10	8.01	125.02***	92.99***	135.55***	90.63***
Steel	0.10	0.56	1.75	8.01	0.38	0.49	0.60	2.68
Automobile	40.49***	50.73***	117.94***	23.79***	64.25***	52.83***	50.61***	64.74***
Auto part	5.37	1.42	1.64	1.56	3.17	3.91	3.90	3.44
Ship building	3.31	61.80	5.14	4.64	13.51	1.82	0.63	14.33*
Retail trade	1.19	2.35	1.31	1.60	1.59	2.86	2.61	3.30
Railroad	4.38	4.36	3.37	3.92	6.61	5.27	4.52	5.67

Table 2-3. (Continued)

Industries \ Period	F.1973	S.1973	F.1974	S.1974	F.1975	S.1975	F.1976
Cotton spinning	1.74	2.19	3.20	11.41	4.57	3.94	1.69
Paper and pulp	0.35	0.37	0.67	2.41	1.22	1.23	0.40
Inorganic chemical	6.66	1.68	1.87	2.78	3.27	2.28	2.60
Organic chemical	290.62***	41.64***	38.26	11.67	4.91	7.49	5.72
Steel	1.08	1.67	3.32	0.45	0.17	0.42	0.92
Automobile	188.47***	259.29***	26.33***	30.01***	92.80***	7.92	58.39***
Auto parts	2.51	1.56	1.23	1.07	1.34	2.17	1.22
Ship building	9.99	5.23					
Retail trade	5.08	7.71	5.92	11.52	14.42	13.51	12.00
Railroad	4.99	7.48	6.10	6.72	0.61	3.46	4.44

F = First half of year

S = Second half of year

Table 2-4. Tests between merging firms and nonmerging firms

Period		F.1965		S.1965		F.1966		S.1966	
Statistics			Standard		Standard		Standard		Standard
Financial ratio	Firm	Mean	Deviation	Mean	Deviation	Mean	Deviation	Mean	Deviation
Equiy to total assets	N	23.23	11.85	22.91	10.90	22.27	11.59	22.10	11.02
	M	25.33	9.47	23.93	8.96	23.53	8.29	23.33	8.66
Liquid assets ratio	N	100.59	27.61	101.48	28.40	102.05	28.45	101.88	29.12
	M	103.27	21.69	104.00	24.22	103.33	26.49***	105.13	23.75***
Debt-equity ratio	N	539.63	833.90	767.86	2316.30	646.64	1334.00	602.23	933.60
	M	421.67	427.73***	463.07	468.45***	448.47	451.40***	466.20	477.29***
Turnover ratio	N	1.01	0.66	1.02	0.66	1.07	0.69	1.12	0.71
	M	0.94	0.48	0.94	0.51	1.01	0.56***	1.07	0.56***
Net profit to total assets	N	0.86	3.73	1.02	3.30	1.70	3.01	2.96	3.76
	M	2.24	1.89***	2.23	1.66***	2.62****	1.80	4.14	2.98****
Mahalanobis' generalized distance		2.74		2.83		1.08		1.74	

Period		F.1967		S.1967		F.1968		S.1968	
Statistics			Standard		Standard		Standard		Standard
Financial ratio	Firm	Mean	Deviation	Mean	Deviation	Mean	Deviation	Mean	Deviation
Equity to total assets	N	21.89	10.34	21.04	9.88	20.74	9.76	20.10	9.78
	M	23.20	8.49	22.53	8.78	22.80	9.49	22.80	10.65
Liquid assets ratio	N	102.20	27.85	107.36	64.77	103.77	28.97	103.96	29.61
	M	107.20	22.74	107.47	24.44***	109.07	27.82	111.07	27.73
Debt-equity ratio	N	579.37	788.99	673.06	1347.70	579.03	625.30	600.93	646.22
	M	441.07	372.79***	475.67	448.27***	468.60	430.62	492.87	489.98
Turnover ratio	N	1.14	0.70	1.15	0.70	1.14	0.68	1.12	0.67
	M	1.11	0.57	1.12	0.57	1.13	0.59	1.14	0.63
Net profit to total assets	N	3.41	3.07	3.24	0.28	2.72	2.83	2.66	2.77
	M	3.53	2.12**	3.81	0.22	3.42	2.13*	3.38	1.90*
Mahalanobis' generalized distance		0.91		0.98		1.38		2.02	

Period		F.1969		S.1969		F.1970		S.1970	
Statistics			Standard		Standard		Standard		Standard
Financial ratio	Firm	Mean	Deviation	Mean	Deviation	Mean	Deviation	Mean	Deviation
Equity to total assets	N	19.84	9.86	19.28	9.94	18.50	9.96	18.09	9.61
	M	21.87	9.99	21.93	10.60	21.48	10.69	20.58	10.54
Liquid assets ratio	N	105.14	29.38	105.95	28.71	107.74	28.67	108.61	30.08
	M	111.87	29.24	113.20	27.10	118.07	29.11	119.12	29.04
Debt-equity ratio	N	615.68	690.63	666.95	744.76	694.66	836.00	709.73	755.16
	M	527.33	557.26	331.67	227.47	591.49	717.81	359.55	223.50
Turnover ratio	N	1.14	0.67	1.15	0.70	1.15	0.65	1.08	0.66
	M	1.13	0.61	1.30	0.30	1.15	0.60	1.29	0.23
Net profit to total assets	N	2.87	3.01	3.22	3.74	2.20	3.63	1.81	2.37
	M	3.44	1.95***	2.28	2.59	2.59	1.43***	1.87	1.59***
Mahalanobis' generalized distance		1.30		14.89		6.96		12.60	

Period		F.1971		S.1971		F.1972		S.1972	
Statistics			Standard		Standard		Standard		Standard
Financial ratio	Firm	Mean	Deviation	Mean	Deviation	Mean	Deviation	Mean	Deviation
Equity to total assets	N	17.19	9.82	16.79	9.85	16.71	9.86	16.84	10.29
	M	19.64	11.30	19.10	11.54	18.64	11.71	18.31	11.61
Liquid assets ratio	N	110.01	34.26	113.02	36.54	112.40	35.31	111.74	39.73
	M	119.59	33.43	119.47	31.50	118.25	29.52	114.12	25.78***
Debt-equity ratio	N	948.31	2208.75	837.50	1172.94	806.33	892.62	800.02	808.95
	M	702.16	895.05***	723.61	819.71**	710.56	667.43*	746.22	728.36
Turnover ratio	N	1.04	0.62	1.10	0.62	1.65	6.21	1.03	0.58
	M	1.10	0.57	0.98	0.57	0.79	0.59	1.10	0.68
Net profit to total assets	N	1.79	2.34	0.70	4.27	1.97	5.00	1.85	2.74
	M	1.25	1.61**	1.18	1.33***	1.13	1.16***	1.56	1.28***
Mahalanobis' generalized distance		5.91		8.19		5.66		3.65	

Period		F.1973		S.1973		F.1974		S.1974	
Statistics			Standard		Standard		Standard		Standard
Financial ratio	Firm	Mean	Deviation	Mean	Deviation	Mean	Deviation	Mean	Deviation
Equity to total assets	N	16.38	10.11	15.80	9.87	15.72	9.55	15.86	9.72
	M	18.11	11.29	17.08	10.92	17.12	11.14	17.14	10.10
Liquid assets ratio	N	113.40	38.46	112.26	33.65	111.44	31.27	111.66	31.89
	M	114.15	22.10***	113.35	20.02***	114.05	19.71***	109.88	14.32***
Debt-equity ratio	N	847.62	1131.25	882.45	972.56	837.51	849.66	810.55	780.65
	M	736.73	704.90***	780.15	763.01	765.37	732.56	732.85	693.97
Turnover ratio	N	1.10	0.62	1.18	0.65	1.12	0.66	1.13	0.66
	M	1.16	0.71	1.22	0.69	1.25	0.71	1.20	0.75
Net profit to total assets	N	2.40	3.11	2.69	2.94	2.20	2.64	0.98	3.15
	M	1.96	1.36***	2.40	1.71***	1.76	0.96***	1.42	0.63***
Mahalanobis' generalized distance		15.12		0.70		8.79		49.06****	

Period		F.1975		S.1975		F.1976	
Statistics			Standard		Standard		Standard
Financial ratio	Firm	Mean	Deviation	Mean	Deviation	Mean	Deviation
Equity to total assets	N	15.02	10.12	14.38	10.66	13.29	11.32
	M	15.97	9.24	15.81	9.20	13.84	9.64
Liquid assets ratio	N	114.50	30.87	115.23	32.74	114.15	32.09
	M	115.46	17.54***	115.39	16.74***	119.29	29.18
Debt-equity ratio	N	1228.75	4722.32	1534.39	1656.62	945.93	977.08
	M	777.92	663.86***	769.11	622.94***	806.66	650.24***
Turnover ratio	N	1.06	0.62	1.09	0.64	1.12	0.65
	M	1.13	0.80	1.15	0.81	1.15	0.79
Net profit to total assets	N	-0.61	4.67	-0.19	4.19	0.23	4.47
	M	-0.31	2.38***	0.45	1.86***	0.30	2.22***
Mahalanobis' generalized distance		24.22***		11.08		9.94	

N = Nonmerging firms
M = Merging firms

Table 2-5. Tests between merging firms and nonmerging firms by univariable

Period		F.1967		S.1967		F.1968		S.1968	
Statistics			Standard		Standard		Standard		Standard
Financial ratio	Firm	Mean	Dev.	Mean	Dev.	Mean	Dev.	Mean	Dev.
Equity to total assts	N	26.16**	12.76	25.54	12.11	25.54	13.40	25.22	13.47
	M	20.73	15.36	20.43	16.66	20.29	13.35	20.84	13.12
Liquid assets ratio	N	111.54	*38.40	112.57	****35.58	114.57	42.56	115.15	39.78
	M	120.84	48.05	125.23	84.40	117.95	32.75	117.87	34.62
Debt-equity ratio	N	704.29	1159.69	363.99	845.70	613.59	423.17	424.65	*736.59
	M	579.01	653.51	820.22	965.34	808.98	986.87	754.68	942.08
Turnover ratio	N	1.12	*0.60	1.13	0.59	1.15	0.63	1.15	0.62
	M	1.22	0.75	1.30	0.78	1.34	0.75	1.30	0.73
Net profit to	N	1.65	**1.99	1.75*	*1.92	1.77	2.18	1.91	1.75
total assets	M	1.20	1.38	0.89	2.44	1.61	1.76	1.67	1.64

Period		F.1969		S.1969		F.1970		S.1970	
Statistics			Standard		Standard		Standard		Standard
Financial ratio	Firm	Mean	Dev.	Mean	Dev.	Mean	Dev.	Mean	Dev.
Equity to total assets	N	24.87	13.57	24.63	13.60	24.38	13.88	24.54**	14.09
	M	21.29	12.00	20.97	12.09	19.82	10.94	17.97	13.85
Liquid assets ratio	N	116.53	48.51	118.24	38.39	116.30	37.39	119.17	37.68
	M	115.44	34.58	118.67	31.93	116.36	31.76	116.69	29.70
Debt-equity ratio	N	404.07	845.79	552.70	1576.85	459.10	900.48	146.70	****7303.95
	M	710.76	1008.40	733.75	1017.21	736.28	966.74	721.25	923.38
Turnover ratio	N	1.18	0.65	1.18	0.63	1.18	0.63	1.12	0.61
	M	1.28	0.68	1.22	0.67	1.18	0.64	1.15	0.67
Net profit to	N	1.92	****3.39	1.98	****1.78	1.81	****1.96	1.51	****2.06
total assets	M	1.08	1.43	2.03	2.72	1.40	1.08	-0.28	8.81

Table 2-5. (Continued)

Period		F.1971		S.1971		F.1972		S.1972	
Statistics Financial ratio	Firm	Mean	Standard Dev.	Mean	Standard Dev.	Mean	Standard Dev.	Mean	Standard Dev.
Equity to total assets	N	24.15**	***14.54	23.98	****15.01	23.60*	****14.76	23.15*	****14.40
	M	14.34	25.56	13.46	30.19	14.37	28.28	16.08	21.81
Liquid assets ratio	N	122.59	*41.47	125.14	****46.64	124.86	****52.25	123.19	43.48
	M	115.63	29.70	114.09	29.27	114.09	30.51	115.23	34.64
Debt-equity ratio	N	516.91	****1306.96	806.68	7713.05	476.58	693.28	403.90	****3423.24
	M	693.71	767.30	695.16	764.05	655.74	675.62	652.96	711.52
Turnover ratio	N	1.07	0.59	1.07	0.58	1.08	0.58	1.11	0.57
	M	1.02	0.61	0.95	0.62	0.94	0.60	0.95	0.62
Net profit to total assets	N	1.07	**** 2.05	0.94	1.66	1.07	1.64	1.31	1.69
	M	-0.97	10.70	0.92	1.33	0.85	1.82	1.32	2.00

Period		F.1973		S.1973	
Statistic Financial ratio	Firm	Mean	Standard Dev.	Mean	Standard Dev.
Equity to total assets	N	22.40**	14.26	21.23***	13.58
	M	16.17	15.26	15.41	12.37
Liquid assets ratio	N	122.42	**49.51	120.58	****42.65
	M	117.38	35.39	113.36	30.36
Debt-equity ratio	N	496.18	****939.13	501.30	****1303.09
	M	644.92	617.74	739.74	727.25
Turnover ratio	N	1.14	0.55	1.17	0.56
	M	0.97	0.66	1.06	0.67
Net profit to total assets	N	1.48	***2.17	1.52	**1.54
	M	1.32	1.49	1.23	1.19

CHAPTER 3 THE PERFORMANCE OF CORPORATE MERGERS (II)

I. Introduction

In the previous chapter, five financial ratios are analyzed and found the performance of mergers[1] to be rather negative, but our data were rather limited.

In this chapter, we use the most complete data of corporations listed on the Japanese Stock Exchanges available which are compiled by the Japan Development Bank and extend Chapter 2 not only in data and industries analyzed but also in financial ratios used.

II. Hypothesis, Data and Variables

Our first hypothesis to be varified in this chapter is that there are no financial differences between merging and nonmerging firms before and after mergers, this hypothesis will be tested in the next section. If we cannot find any differences between the merging and nonmerging firms before mergers but do find differences after mergers, or if we find the differences between them before mergers and none after mergers, the findings would indicate that mergers affect performance of firms.

The second hypothesis is that mergers have different effects in different industries. In some industries, the effects of mergers may be positive, while in others they may be negative. Therefore the original data based on each industry in each fiscal year are analyzed.

The third one is that mergers have many types of effects on financial ratios, which are considered to indicate profitability, liquidity, soundness, productivity and profit distribution of corporations analyzed.

Data[2] used in this and following 4,5,6 chapters were originally compiled by the Japan Development Bank, covering 1,559 nonfinancial

corporations listed in the stock exchanges of Tokyo, Osaka and Nagoya for the period from March 31, 1955, through March 31, 1977. The financial data bank classifies 195 industries, of which 13 industries are chosen subject to the following criteria: 1) an industry has at least two companies which merged, and the dates of mergers accepted by the Fair Trade Commission of Japan are separated by no more than two years, and 2) there are no mergers at least four years before the data period in each industry. Within each industry, the data are standardized for merging firms.[3]

To examine the effects of mergers, we form 61 variables[4], which are used for ordinal financial analysis from the original data bank in Japan. Factor analysis[5] is applied each industry in order to reduce the number of variables systematically, because it is considered that each industry has its own financial characteristics.[6] Each industry has 10 to 14 factors representing 1) profit distribution, 2) capital structure, 3) assets-utilization, 4) turnover, 5) profitability, 6) operating performance, 7) depreciation and retained earnings, 8) debt effectiveness, 9) profitability per share, 10) growth, and 11) productivity. The variable with the highest load is selected from each factor by using factor analysis for 13 industries as shown in Table 3-1. There are 11 factors which have over 1 eigenvalues, for example, in silk-reeling industry. These representative 11 variables are compared between merging and nonmerging firms by industry. These representative 11 variables are compared between merging and nonmerging firms by industry and by year before and after mergers.

The object of this analysis is to give guidance for top management who are concerned with the question of merging but who cannot get direct empirical evidence of the effects of mergers because of the lack of enough suitable studies.

III. Univariate Analysis by Industry and by Year

We test the differences[7] of each variable between merging and nonmerging firms before and after mergers by F and t tests within each industry in each fiscal year. Thirteen industries are considered to have suitable data for analysis: (1) Silk-reeling, (2) Printing, (3) Agricultural chemicals,[8] (4) Industrial inorganic chemicals,[9] (5) Ordinary steel and allied products, (6) Special steel and allied products, (7) Metalworking machinery and equipment, (8) Miscellaneous electrical machinery, equipment and supplies,[10] (9)Motor vehicle equipment, (10) Miscellaneous construction,[11] (11) Miscellaneous retail,[12] (12) Warehousing, and (13) Local sea transportation.

The result of t and F tests is given in Table 3-2.

In the silk-reeling industry, only one financial ratio--turnover period of commodity and product--has a statistically significant difference before and after mergers. The remaining 10 ratios, which were selected also by factor analysis from original 61 ratios, do not show a statistically significant difference before and after mergers. Mergers were carried out on April 1, 1966, and on January 1, 1968. There are statistically significant differences between merging and nonmerging firms by t statistics in the years of 1971 and 1976 after the merger. In the former case, means of financial ratios are 1.02 vs. 0.49 for merging and nonmerging firms respectively, and in the latter case, 1.19 vs. 0.49, indicating rather weak negative effects of mergers because of the longer period of turnover for merging firms.

In the printing industry, no significant differences between merging and nonmerging firms are found, indicating neutrality of the effects of mergers.

The agricultural chemicals industry has three financial ratios out of 11 which have significant differences by t test between merging and nonmerging firms. They are quick ratio (42.60 vs. 67.18) in 1968, account receivable to account payable (95.80 vs.147.18) in 1975, and (100.79 vs. 150.13) in 1976, and net profit to total assets (0.50 vs. 0.16) in 1966 for merging and nonmerging firms, respectively. The means of net sales to fixed assets have higher values and net sales per employee have lower values for all 11 years for nonmerging firms but no significant differences can be found before and after mergers.

Mergers took place in 1970, 1971, and 1972. Therefore, after mergers, the quick ratio of nonmerging firms comparatively becomes smaller, and account receivable to account payable becomes larger if compared with merging firms, indicating opposite trends from each other by the mergers. Net profit to total assets after mergers improved them before mergers. Thus, mergers contribute to the negative effects on profitability.

Selling and management expenses to net sales show no statistically significant differences before mergers, but significant differences by t statistics after mergers at the year 1974 and 1975 in the industrial inorganic chemicals industry. This ratio: 19.01 vs. 13.99 in 1974, 19.43 vs. 13.93 in 1975 for merging and nonmerging firms, is more favorable for nonmerging firms than merging firms after mergers, presenting negative effects of mergers. Two mergers occurred in 1965. The means of net sales growth ratio just after mergers (123.37 vs. 109.63 in 1966) decreased for nonmerging firms and total assets growth ratio (132.08 vs. 117.00 in 1970) decreased if compared with merging firms, which indicate positive effects of mergers. Mergers cause rather positive effects in this industry.

In ordinary steel and allied products, quick ratio has a significant difference in 1976 with the means of 58.56 vs. 34.21 at the 0.5% level

indicating higher quick ratio by mergers. Net sales to fixed assets are higher with a significant difference by t test in nonmerging firms at the year 1965. Mergers occurred in 1958, 1964, 1965, 1967, 1968, 1970, 1971. Thus, no clear distinction of the effects of mergers is given by this ratio. Net profit to total assets has statistically significant differences at the years 1963 and 1966, and at the years 1969 and 1970, and from 1972 through 1976 after mergers by F test. It also has significant differences at the year 1975 and 1976 by t test, showing rather big differences. Means of this ratio are 0.15 vs. 3.27 and 0.22 vs. 2.74 for merging vs. nonmerging firms, respectively. Higher profitability for nonmerging firms after mergers is obtained, indicating negative effects of mergers. The net sales growth ratio is higher for merging firms before mergers, especially, with a significant difference by t test in 1958 with the means of 87.25 vs.74.73. After mergers, no significant differences are provided. Value added to net sales has significant a difference in 1975 with the means of 14.82 vs. 25.02 for merging and nonmerging firms, respectively. Therefore, there exist negative effects of mergers.

In special steel and allied products, major mergers occured in 1964, 1967 and 1968. After mergers, ordinary profit to equity has significant differences by t test in 1965 (2.64 vs. 6.21) for merging and nonmerging firms and in 1971 (3.27 vs. 11.07), and net profit to total assets in 1974 (0.92 vs. 0.36) by t test, from 1965 to 1970 by F test, shows rather negative effects on ordinary profit to equity and positive effects on net profit to total assets. The means of equity growth ratio with statistically significant differences by t tests are 97.15 vs. 103.98 in 1963 before mergers and 105.35 vs. 59.65 in 1975 after mergers, meaning higher positive effects of mergers on equity growth ratio.

As a whole trend in this industry, weak positive effects of mergers

are found.

In the metalworking machinery and equipment, only net profit to equity has significant differences by t test. Means of this ratio are 3.42 vs. 1.63 in 1958, 4.82 vs. 2.16 in 1959, before mergers, 3.48 vs. 5.16 in 1968 after mergers. Hence, mergers took place in 1961, 1966, and 1967. This finding indicates strong negative effects of mergers on net profit to equity.

Miscellaneous electrical machinery, equipment and supplies has two ratios, depreciation to net sales, which has significant differences by t test in 1973 with the means of 1.42 vs. 2.70 in 1975 with the means of 1.47 vs. 3.24, in 1976 with the means of 1.15 vs. 2.26 for merging and nonmerging firms. Mergers occurred in 1965, 1966 and 1969. Therefore, mergers cause lower depreciation to net sales. Value added per employee has a significant difference in 1964 with the means of 25.63 vs. 14.64 before mergers with no differences after mergers. Both ratio indicate rather negative effects of mergers.

Major mergers took place in 1965, 1966, 1968 in the motor vehicle equipment industry. Four ratios have statistically significant differences by t test. Before mergers, the means of liquid assets ratio of merging firm are higher without significant differences, but after mergers, the means of nonmerging firms are higher, especially significant differences at the year 1975 with the means of 99.92 vs. 121.05, indicating negative effects of mergers. Debt to total assets has significant differences by t test from the year 1964 to 1969, 1971, 1972, 1973 and 1976, but even before mergers there is a difference between merging and nonmerging firms on this ratio. Thus, we cannot conclude that mergers cause these differences. Total assets growth ratio has a significant difference in 1975 with the means of 112.03 vs. 102.09, indicating higher growth rate of merging firms

after mergers. Value added per employee has rather clear distinction after and before mergers. For 1971 to 1973 after mergers, the means of this ratio are 48.88 vs. 41.60, 57.21 vs. 47.71, and 66.33 vs. 59.04 for merging and nonmerging firms without any significant differences before mergers, indicating the effects of improving the productivity by mergers.

Mergers occurred in 1968 and 1969 in miscellaneous construction industry. Means of liquid assets ratio of nonmerging firms are always higher than merging firms with statistically significant differences at the year 1965, 1970 and 1975. Same trend can be applied in the case of ordinary profit to total assets with a significant difference by t test at the year 1972 after mergers, This fact indicates the existence of the weak negative effects of mergers on profitability. Financial costs to debt and bills receivable have significant differences by both t and F tests in 1974 with the means of 7.92 vs. 5.06 and standard deviations of 0.23 vs. 3.15. After mergers, means of this ratio are higher in merging firms and rather negative effects of mergers can be estimated in this ratio. Equity per share has significant differences by both t and F tests at the year of merger in 1968. Merging firms have lower value than nonmerging firms on this ratio in all years. Before mergers value added per employee has significant differences by both t and F tests in 1965 and 1967, but statistically significant differences cannot be obtained after mergers even with larger values for nonmerging firms in all years, indicating that mergers have weak positive effects on productivity. On the contrary, value added to net sales after mergers has significant differences by to test in 1973 with the means of 11.28 vs. 19.67 without any significant differences before mergers, indicating negative effects of mergers in this ratio.

To sum up, mergers bring rather negative effects in this industry.

Mergers occurred in 1967,1968 and 1970 in the miscellaneous retail

industry. Net sales to tangible fixed assets with a statistically significant difference by t test have no clear distinction before and after mergers. Selling and management expenses to net sales have significant differences by t test in 1971, 1972 and 1973 after mergers, with no distinction before mergers. This ratio is always higher in nonmerging firms. Depreciation and retained earnings to equity has significant differences by t test, both of which have higher values for before mergers and not after merging firms, indicating negative effects of mergers. Total assets growth ratio has significant differences by t test in 1965 with the means of 115.19 vs. 104.00 and no clear distinction after mergers. As a whole, mergers cause negative effects in this industry.

Mergers occurred in 1969 in warehousing. Before mergers in 1967, there is a statistically significant difference by t test on depreciation ratio between merging and nonmerging firms, and no significant differences are found after mergers. Value added to net sales has significant differences in 1976 after mergers with the means of 20.22 vs. 57.79 and significant differences by t test before mergers, indicating negative effects of mergers.

In the local sea transportation, only turnover period of account payable has a statistically significant difference by t test in 1966 with the means of 2.04 vs. 1.41 for merging and nonmerging firms, respectively. Mergers are carried out in 1967 and 1969. Therefore, mergers have weak negative effects in this industry.

As a general trend, univariate analysis provides the result that mergers have negative effects on financial characteristics of merging firms. Univariate analysis, however, creates an important problem here. In our analysis, 1965 t tests were performed to compare the means of financial ratios between merging and nonmerging firms and same number on standard

deviations, and 128 stated items or 128/1965 x 2 = 3.26% of the comparisons showed a significant differences at the 5 % or less than this level.

Therefore, by pure chance, we might find the differences when comparisons are done between two subsets of firms. For this kind of criticism, there are two ways to respond it.

One is that the comparisons were performed before and after the date of mergers to find the differences of financial ratios between merging and nonmerging firms, but not general comparisons. Second is that to supplement our result of univariate analysis, multivariate analysis is employed as follows.

IV. Multivariate Analysis by Industry and by Year

In this section, the same data in the previous section are analyzed by the MAHAL method[13] of discriminant analysis to strengthen the result of univariate analysis, the result of which is shown in Table 3-3.

In the silk-reeling industry, only after mergers, distinction between merging and nonmerging firms can be made with statistically significant differences from 1972 to 1976, supporting the result of univariate analysis, that is , showing the negative effects of mergers.

In the printing industry, before mergers there are three years (1965, 1967, 1971) in which discrimination between merging and nonmerging firms is shown with statistically significant differences and a supplement for univariate analysis is provided.

Discrimination between merging and nonmerging firms can be found for two years, 1966 and 1967 before mergers, and 1971 and four years from 1973 to 1976 after mergers in agricultural chemicals industry. This fact supports the univariate analysis by which negative effects of mergers are

presented.

In the industrial inorganic chemical industry, discriminations are found for all years with statistically significant differences by F test, backing up the result of univaliate analysis.

Before mergers and during the period of the oldest two mergers, that is, from 1957 to 1964, 1966 and 1969, and three years after mergers, namely in 1974, 1975 and 1976, there are discriminations between merging and nonmerging firms in the ordinary steel and allied products. The same result with univariate analysis is applied only for the 1974 and 1975. The t test of univariate analysis shows differences in 1958, 1965, 1975, and 1976, three years of which are the same with the discriminant analysis.

In special steel and allied products, before mergers in 1963, there is a significant difference by F test at the 0.5% and 5% level during the period of mergers in 1964, 1965 and 1969 at the 0.5% level and after mergers two out of six years at the 5% level, indicating less frequency of significant differences after mergers.

Metalworking machinery and equipment has significant differences at the years 1958 and 1959 by F test, just the same years as with the t test. Six other years, 1965, 1966, 1967, 1969, 1970 and 1976 have also significant differences by F test, but not by t test in univariate analysis. Thus no support by this analysis is provided to the result of univariate analysis.

Miscellaneous electrical machinery equipment and supplies have statistical significant differences by F test eight out of ten years, and no computations are given in 1967, 1968 and 1979. The result cannot support the univariate analysis directly.

Eleven out of thirteen years, that is, all years from 1965 to 1976 except 1967 and 1968 show significant differences by F test for the

discrimination between merging and nonmerging firms in motor vehicle equipment industry, which support the characteristics of each financial ratio with positive, negative effect of mergers or just distinction of ratios between merging and nonmerging firms, but not direct support of the overall effect of mergers.

All three years before mergers, there are significant differences by F test at the level of less than 1%, and only two out of seven years after mergers have significant differences at the level of 5% in the miscellaneous construction industry. This fact coincides with the result of univariate analysis, which indicates positive effects of mergers.

In the miscellaneous retail industry, seven out of twelve years from 1965 to 1967 and from 1970 to 1973 have significant differences by F test, which agrees with the result of univariate analysis.

Three out of seven years before mergers in warehousing have significant differences at the 5% level and just the same years at less than 1% level after mergers, indicating slight differences which support positive effects of mergers by univariate analysis.

In the local sea transportation industry, all 12 years except 1965, 1967 and 1976 have significant differences by F test. Only one year 1966, however, has significant difference by t test for univariate analysis, which differs very much with the rest of multivariate analysis.

Roughly speaking, multivariate analysis support the result of univariate analysis, which indicated the negative effects of mergers on financial characteristics of merging firms.

V. Conclusion

Nine out of thirteen industries analyzed in this article have negative effects of mergers by the comparisons before and after mergers. They are

(1) Silk-reeling, (3) Agricultural chemicals, (5) Ordinary steel and allied products, (7) Metalworking machinery and equipment, (8) Miscellaneous electrical machinery, equipment and supplies, (10) Miscellaneous construction, (11) Miscellaneous retail, (12) Warehousing, and (13) Local sea transportation. Two industries showed positive effects: (4) Industrial inorganic chemicals, (6) Special steel and allied products. And the remaining two industries presented neutrality of the effects of mergers: (2) Printing, and (9) Motor vehicles equipment.

This finding indicates the big gap between what top managements expect and what they really do.[14] Managements usually merge other firms to raise efficiency of their corporations, to get bigger sales, and to reduce risk. The first motive of merger[15] may be rejected by our finding. If merger is intended to get bigger size of firm for the short run, this is not contradicted by the finding. Risk reduction by diversification as a managerial motive for merger might be more appropriate as pointed out by Amihud and Lev (1981). This hypothesis, however, cannot be supported by the results of any kind of surveys conducted in Japan. If the merger aim is to get more security against bankruptcy, a firm with lower profitability or liquidity usually plans to be merged by an other corporation of better financial condition, but does not wants to get lower profit because of higher safety.

Therefore, the most relevant reason for mergers according to this finding is to maximize the size of sales for the short run. This theory can explain the actual business behavior of Japanese corporations, not only the two very controversial cases of Nippon Steel Corporation and Daiichi Kangyo Bank but also many other cases in Japan.

Footnotes

1. Benefits to the stockholders of the merging and nonmerging firms will not be measured here. For this purpose, see Mandelker (1974) Dodd and Ruback (1977), Dodd (1980), Haugen and Langetieg (1975), and Firth (1979).

2. The financial data bank of the Japan Development Bank consists of two 2400-feet-long magnetic tapes compiled by Cobol.

3. In most cases, merged firms are not listed corporations in the stock exchanges. Thus, only financial ratios of merging listed firms are used for our analysis.

4. The 61 financial variables are showing in Appendix B.

5. As the type of factor analysis, IMAGE is used, as well as VARIMAX method of SPSS, see Nie (1975).

6. Factor analysis is applied to all industries analyzed at one time to compare the overall financial characteristics between merging and nonmerging firms.

7. In this section, the paired sample technique for testing the hypothesis are not employed. It is a necessary condition for the paired technique that the merging and nonmerging firms must be approximately identical in all relevant economic aspects except the merger. As a matter of fact, however, it is usually quite difficult to find a reasonably perfect match. By introducing the paired match technique, statistical models are influenced to a large extent by biases because of introducing controlled, nonmerging firms which are not matched well with merging firms, and because of gap between different industries. To lessen these biases, we compare the merging and nonmerging firms in each industry with merging firms are chosen as many as possible in each industry and are compared with merging firms in each industry before and after mergers. The list of these

corporations analyzed is in the appendix and in Hoshino (1981).

8. Except ammonium sulfate and urea.

9. Except soda, gas and barium sulfate.

10. Except electronic tube, semi-conductor, and LSI.

11. Except civil engineering and dredging.

12. Except department stores, super markets and food retail.

13. The MAHAL method is used as a criterion by which variables are selected to maximize the minimum values of Mahalanobis' distances between the two groups.

14. According to the survey of Yamaichi Securities Co. (1977). 89.04% (135 firms out of 156) of firms which responded, pointed out the positive effects of mergers as expected, 1.99% (3): positive effects of mergers unexpected, 39.5% (12): do not know, 0.66% (1): no positive effects of mergers.

15. The first motive of mergers in Japan is to improve efficiency of management: 38.47% (60), the second is to get bigger size: 25.64% (40), the third is to lower the per value of a share: 19.23% (30), the fourth is to save ailing firms: 5.77% (9). See Yamaichi Securities Co. (1977)

Table 3-1. Factors by industry after varimax rotation (1)

Industry / Factor	Silk-reeling	Printing	Agricultural chemicals	Industrial inorganic chemicals
1	Ordinary profit to total assets	Ordinary profit and financial costs to total assets	Net sales growth ratio	Ordinary profit to net sales
2	Net sales to total assets	Net profit to equity	Quick ratio	Depreciation and retained earnings to equity
3	Depreciation and retained earnings to equity	Net sales to total assets	Ordinary profit to total assets	Net sales to fixed assets
4	Personnel Expenses per employee	Value added per employee	Net sales per employee	Personnel expenses to value added
5	Turnover period of commodity and product	Value added to fixed assets	Inventory turnover period	Value added per employee
6	Net sales growth ratio	Inventory turnover period	Net sales to fixed assets	Liquid assets ratio
7	Liquid assets ratio	Total assets growth ratio	Account receivable to account payable	Turnover period of account receivable
8	Fixed assets growth ratio	Liquid assets ratio	Total assets growth ratio	Total assets growth ratio
9	Dividend to net profit	Depreciation expenses to net sales	Net profit to total assets	Value added to net sales
10	Net profit to net sales	Equty growth ratio	Ordinary profit to net sales	Selling and management expenses to net sales
11	Dividend to capital		Total liabilities to equity	Net sales growth ratio

Factor	Industry: Ordinary steel & allied products	Special steel & allied products	Metalworking machinery & equipment	Miscellaneous electrical machinery equipment & supplies
1	Quick ratio	Liquid assets ratio	Equity per share	Ordinary profit to net sales
2	Liquid assets ratio	Accounts receivable to account payable	Net profit to equity	Net sales to total assets
3	Total liabilities to equity	Net sales to fixed assets	Net sales per employee	Value added per employee
4	Net sales to fixed assets	Turnover period of account receivable	Quick ratio	Ordinary profit to equity
5	Net profit to total assets	Turnover period of commodity and product	Total assets growth ratio	Personnel expenses to equity
6	Debt to total assets	Ordianry profit to equity	Personnel expenses to net sales	Net sales to debt
7	Equity per share	Net profit to total assets	Net sales to fixed assets	Selling and management expenses to net sales
8	Net sales growth ratio	Operating profit to ordinary capital	Ratio of bill discounted to total bill	Total liabilities to equity
9	Total assets growth ratio	Personnel expenses to net sales	Account receivable to account payable	Net sales growth ratio
10	Net profit growth ratio	Debt to total assets	Ordinary profit to total assets	Quick ratio
11	Personnel expenses per employee	Total assets growth ratio	Net sales to total liabilities	Depreciation expenses to net sales
12	Value added to net sales	Equity growth ratio	Depreciation expenses to net sales	Accunt receivable to account payable
13		Personnel expenses per employee		

Industry Factor	Motor vehicle equipment	Miscellaneous construction	Miscellaneous retail	Warehousing	Local sea transportation
1	Liquid assets ratio	Ordianry profit to total assets	Equity per share	Ordinary profit to total assets	Ordinary profit to total assets
2	Net sales to tangible fixed assets	Value added per employee	Net sales to tangible fixed assets	Net sales to tangible fixed assets	Net sales to build. and equipment
3	Turnover period of account receivable	Net sale to tangible fixed assets	Turnover period of commodity and product	Value added to net sales	Depreciation and retained earnings to equity
4	Inventory turnover period	Net sales growth ratio	Depreciation and retained earnings to equity	Tangible fixed assets per employee	Net sales per employee
5	Turnover period of account receivable	Liquid assets ratio	Net profit to net sales	Quick ratio	Fixed assets to fixed liabilities special reserves and eqauity
6	Operating profit to ordinary capital	Quick ratio	Tangible fixed assets per employee	Total assets growth ratio	Value added per employee
7	Debt to total assets	Value added to net sales	Turnove period of account payable	Net profit to equity	Turnover period of account receivable
8	Retained earnings to equity	Retained earnings to eqiuty	Acc.receivable to acc. payable	Financial costs to debts and bills receivable	Total assets growth ratio
9	Total assets growth ratio	Equity per share	Total liabilities to equity	Equity per share	Net profit growth ratio
10	Value added per employee	Financial costs to debt and bills receivable	Total assets growth ratio	Ordinary profit to capital	Turnover period of account payable
11	Value added to net sales	Net sales to total assets	Depreciation ratio	Depreciation ratio	Selling and management expenses to net sales
12		Depreciation ratio	Quick ratio		Equity growth ratio
13			Selling and management expenses to net sales		

Table 3-2. Financial ratios between merging and nonmerging firms by year and by industry (1)

Industry	Silk-reeling		Agricultural chemicals							
Financial ratio	Turnover period of commodity and product		Quick ratio		Account receivable to account payable		Net sales to fixed assets		Net profit to total assets	
Firm / Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
1964	0.79 (0.45)	0.57 (0.20)								
1965	0.65 (0.39)	0.60 (0.22)								
1966	0.65 (0.39)	0.59 (0.18)	47.11 (10.31)	66.68 (16.73)	133.53 (72.89)	193.10 (57.39)	1.74 (0.87)	3.72 (2.38)	0.50 * (0.18)	0.16 (0.11)
1967	0.74 (0.32)	0.59 (0.17)	43.76 (12.31)	67.06 (18.64)	115.35 (48.16)	172.39 (54.37)	1.80 (1.04)	3.78 (2.37)	0.21 (0.30) *	0.29 (0.07)
1968	0.83 (0.40)	0.59 (0.17)	42.60 * (12.43)	67.18 (15.81)	115.12 (58.61)	164.24 (42.39)	1.90 (1.10)	3.71 (2.25)	0.81 (1.11)***	0.27 (0.08)
1969	0.91 (0.58)	0.51 (0.12)	43.76 (16.64)	66.19 (14.48)	117.45 (49.36)	158.30 (32.45)	1.75 (0.66)	3.45 (1.94)	0.40 (0.29)	0.27 (0.17)
1970	0.86 (0.24)	0.44 (0.14)	45.42 (16.28)	65.84 (12.43)	112.12 (61.16)*	149.78 (9.82)	1.53 (0.32)*	3.30 (1.70)	0.42 (0.25)	0.39 (0.35)
1971	1.02 * (0.26)	0.49 (0.20)	54.98 (10.62)	59.36 (17.63)	108.29 (47.90)	139.27 (12.62)	1.33 (0.44)*	3.26 (1.86)	0.58 (0.47) *	1.70 (2.88)
1972	1.20 (0.52)	0.53 (0.24)	63.62 (9.01)	64.42 (17.13)	122.64) (49.85)	158.86 (24.32)	1.35 (0.53)	3.10 (2.20)	1.10 (1.16)	2.23 (2.65)
1973	1.28 (0.72)	0.54 (0.26)	66.08 (15.10)	62.08 (26.16)	104.01 (28.72)	155.06 (30.95)	1.85 (0.68)	3.46 (2.39)	0.57 (0.55)	1.35 (0.90)
1974	1.66 (0.61)	0.60 (0.36)	58.08 (6.27)*	59.25 (31.05)	84.22 (32.82)	127.48 (28.69)	2.89 (1.02)	4.64 (2.70)	0.90 (0.77)	0.98 (0.50)
1975	1.61 (0.47)	0.55 (0.42)	59.84 (10.41)	64.18 (37.97)	95.80 * (29.87)	147.18 (24.40)	2.59 (1.47)	4.08 (2.54)	0.22 (0.18) *	0.69 (0.86)
1976	1.19 * (0.09)	0.49 (0.28)	64.32 (13.99)	67.47 (38.06)	100.79 * (20.87)	150.13 (22.02)	2.41 (1.28)	3.76 (2.04)	0.45 (0.49)	0.96 (1.51)

1) Numbers are means, numbers with parentheses are standard deviations
2) * significant at the 5% level, ** 1%, *** 0.5%, **** 0.1%.
3) The printing industry is not shown in this table because of no significant differences by t test between merging and nonmerging firms.
4) Computations were carried out by T-TEST of SPSS. See Nie (1975).
5) Rectangular area indicates the years of mergers accepted by the Fair Trade Commission of Japan.

Industry	Agricultural chemicals		Industrial inorganic chemicals						Ordinary steel & allied products	
Financial ratio	Net sales per employee		Sell.and manage. ex. to net sales		Net sales growth ratio		Total assets growth ratio		Quick ratio	
Firm Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
									45.73	51.40
1957									(17.34)	(31.80)
									44.24	59.00
1958									(16.54)	(30.80)
									52.55	56.38
1959									(9.40)	(19.63)
									51.62	57.84
1960									(8.14)	(16.83)
									44.18	45.54
1961									(7.00)	(13.89)
									41.61	49.19
1962									(11.97)	(10.61)
									48.77	55.51
1963									(11.63)	(15.78)
			17.65	13.06	108.76	114.78	120.19	118.79	48.58	54.37
1964			(3.69)	(3.35)	(8.23)	(14.16)	(19.86)	(22.06)	(14.77)	(17.48)
			16.99	12.84	115.40	110.69	106.89	105.77	44.68	49.77
1965			(4.17)	(3.27)	(10.29)	(12.24)	(1.24)	(7.52)	(14.92)	(16.05)
	208.89	175.80	17.24	13.21	123.37 *	109.63	108.09	105.93	52.57	57.26
1966	(23.26)*	(112.86)	(5.25)	(4.09)	(3.59)	(8.60)	(2.59)	(8.03)	(14.38)	(10.47)
	222.59	200.31	17.76	13.63	119.36	118.96	107.25	121.78	49.57	49.99
1967	(33.61)	(123.27)	(5.48)	(4.51)	(7.63)	(8.35)	(3.42)	(15.32)	(15.35)	(12.10)
	253.63	216.36	17.30	13.44	119.64	121.39	117.25	121.35	50.62	52.79
1968	(43.61)	(128.68)	(4.67)	(4.63)	(11.49)	(11.88)	(4.80)	(14.14)	(15.86)	(10.45)
	278.22	219.03	17.48	13.17	114.57	120.86	116.07	120.44	53.18	61.80
1969	(51.47)	(119.05)	(4.94)	(4.31)	(5.54)	(13.00)	(10.12)	(19.92)	(10.90)	(8.49)
	316.83	237.07	17.74	13.10	111.16	114.62	132.08**	117.00	50.97	51.59
1970	(72.23)	(115.23)	(3.61)	(4.71)	(11.19)	(9.33)	(10.90)	(6.76)	(12.49)	(11.94)
	360.29	269.46	18.27	13.51	109.20	101.50	109.00	107.18	51.18	56.10
1971	(103.17)	(116.88)	(3.96)	(4.70)	(8.71)	(6.92)	(4.96)	(7.20)	(8.29)	(13.52)
	416.22	266.93	19.50	13.89	103.50	109.52	105.36	106.29	54.30	63.31
1972	(148.92)	(124.11)	(5.89)	(4.18)	(10.18)	(9.03)	(6.19)	(8.75)	(3.39)*	(15.40)
	584.70	321.30	19.32	13.83	124.11	130.64	110.97	124.26	59.60	63.79
1973	(228.04)	(163.24)	(5.39)	(3.65)	(8.94)	(17.04)	(11.33)	(16.39)	(6.17)	(16.82)
	929.91	481.08	19.01 *	13.99	132.79	121.95	122.31	116.68	49.12	44.99
1974	(387.35)	(238.01)	(3.73)	(3.14)	(19.49)	(24.38)	(11.84)	(24.13)	(3.51)	(10.77)
	846.36	500.17	19.43 *	13.93	109.19	107.02	105.31	112.27	56.83	40.29
1975	(401.01)	(283.94)	(3.55)	(3.56)	(13.71)	(12.80)	(11.05)	(12.64)	(5.16)	(8.15)
	831.89	506.57	19.40	14.42	105.02	113.80	103.39	107.56	58.56***	34.21
1976	(346.10)	(238.89)	(5.47)	(4.44)	(13.84)	(9.52)	(5.45)	(11.15)	(7.33)	(10.46)

Industry	Ordinary steel & allied products								Special steel & allied products	
Finan. ratio	Net sales to fixed assets		Net profit to total assets		Net sales growth ratio		Value added to net sales		Ordinary profit to equity	
Firm Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
	74.86	111.08	0.77	0.97	102.02	99.42	14.48	14.98		
1957	(22.94)	(67.17)	(0.19)	(0.45)	(11.42)	(10.48)	(3.83)	(5.93)		
	46.26	64.71	0.42	0.56	87.25 *	74.73	14.92	17.48		
1958	(13.47)	(37.42)	(0.25)	(0.34)	(9.64)	(8.34)	(5.34)	(6.53)		
	57.73	65.55	0.71	0.83	184.94	154.01	15.44	17.26		
1959	(19.79)	(26.40)	(0.11)	(0.39)	(56.36)	(25.24)	(6.01)	(8.70)		
	47.38	60.43	0.72	0.84	120.72	126.74	15.85	17.44		
1960	(12.48)	(23.38)	(0.24)	(0.42)	(9.62)	(16.83)	(6.92)	(8.60)		
	43.67	61.35	0.73	0.82	127.15	123.94	16.15	16.67		
1961	(11.53)	(24.58)	(0.19)	(0.35)	(16.81)	(13.06)	(5.29)	(7.52)		
	28.39	40.25	0.44	0.53	81.22	80.06	17.80	17.97		
1962	(5.88)	(10.80)	(0.33)	(0.26)	(11.94)	(14.22)	(4.26)	(7.06)		
	32.33	46.21	0.53	0.42	125.80	125.33	16.64	15.69	2.33	3.52
1963	(7.23)	(13.57)	(0.05) *	(0.30)	(6.34)	(14.05)	(4.00)	(6.42)	(1.34)	(1.58)
	31.70	48.74	0.60	0.42	112.84	115.21	18.04	15.57	2.64	1.17
1964	(3.53)	(12.91)	(0.15)	(0.31)	(14.36)	(9.79)	(2.91)	(5.94)	(1.60)	(1.44)
	29.36 *	44.52	0.72	0.79	109.26	104.83	18.43	16.91	2.64 *	6.21
1965	(5.21)	(11.52)	(0.52)	(0.53)	(10.45)	(7.03)	(3.96)	(5.86)	(0.87) *	(4.18)
	33.28	49.82	0.43	1.33	126.58	128.46	16.67	19.55	4.10	3.48
1966	(5.81)	(14.06)	(0.29) *	(1.44)	(6.36)	(16.66)	(3.94)	(7.65)	(4.58)	(2.77)
	36.99	51.31	0.39	0.49	118.68	116.46	15.17	15.11	5.78	7.95
1967	(8.60)	(15.93)	(0.23)	(0.22)	(1.74)	(9.97)	(3.35)	(4.67)	(4.16)	(5.32)
	37.06	50.15	0.40	0.45	111.15	106.18	15.03	15.06	5.00	3.43
1968	(11.91)	(17.94)	(0.13)	(0.19)	(5.10)	(7.75)	(2.98)	(4.53)	(3.01)	(1.31)
	40.67	66.51	0.56	1.02	125.65	140.50	16.06	15.88	7.27	8.04
1969	(13.50)	(31.86)	(0.10) *	(0.62)	(6.48)	(17.44)	(2.27)	(4.87)	(2.20)	(5.36)
	38.92	62.13	0.48	0.67	113.83	107.42	16.17	15.03	8.16	6.18
1970	(12.33)	(31.08)	(0.07) *	(0.54)	(2.73)	(7.29)	(2.64)	(3.50)	(3.17)	(2.53)
	31.47	47.05	0.17	0.36	94.46	90.05	14.55	15.46	3.27 *	11.07
1971	(8.56)	(25.57)	(0.12)	(0.26)	(1.04)**	(10.77)	(3.54)	(3.23)	(1.75)	(5.47)
	33.59	60.09	0.27	0.84	116.97	132.31	16.73	15.85	4.78	2.32
1972	(9.58)	(43.18)	(0.03)***	(0.74)	(4.56)	(15.60)	(2.47)	(3.59)	(5.32)	(3.68)
	44.61	84.64	0.52	1.33	136.77	146.66	17.21	16.40	9.15	12.67
1973	(14.06)*	(62.79)	(0.17) *	(1.02)	(7.97)	(19.81)	(2.58)	(3.64)	(4.03)	(4.48)
	52.83	82.83	0.34	0.37	123.18	117.56	14.11	13.02	7.23	5.75
1974	(20.51)	(57.97)	(0.06) *	(0.40)	(3.99)*	(22.44)	(2.27)	(3.50)	(4.45)	(4.46)
	42.56	53.15	0.15 *	3.27	91.90	79.48	14.82 *	25.02	3.99	39.92
1975	(15.76)	(29.77)	(0.09)***	(3.17)	(3.66)*	(17.25)	(1.60)*	(10.31)	(1.51)***	(45.77)
	46.41	53.18	0.22 *	2.74	120.41	109.44	14.07	19.94	3.55	19.08
1976	(17.09)	(28.92)	(0.04)****	(2.90)	(5.47)	(16.56)	(1.85)*	(8.67)	(1.71)**	(20.85)

Indus.	Special steel and allied products				Metalworking machin.& equip.		Miscellaneous electrical machinary equipment & supplies			
Finan. ratio	Net profit to total assets		Equity growth ratio		Net profit to equity		Depreciation to net sales		Value added per employee	
Firm Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
1958					3.42 *	1.63				
					(0.98)	(1.17)				
1959					4.82 **	2.16				
					(0.46)	(1.16)				
1960					4.35	3.55				
					(0.55)	(1.76)				
1961					4.71	3.81				
					(1.66)	(1.67)				
1962					3.75	3.10				
					(2.15)	(0.95)				
	0.56	0.43	97.15 *	103.98	2.22	2.82				
1963	(0.28)	(0.22)	(4.78)	(2.68)	(1.59)	(0.64)				
	0.46	0.27	104.29	99.11	1.75	1.88	3.21	4.45	25.63****	14.64
1964	(0.20)	(0.22)	(15.02)	(16.27)	(1.36)	(0.80)	(0.67)	(1.46)	(8.00)	(4.16)
	1.55	0.82	85.29	82.42	1.32	1.86	3.59	4.39	17.23	15.24
1965	(2.40)***	(0.62)	(29.44)	(15.51)	(1.07)	(0.58)	(0.85)	(1.11)	(1.02)	(4.36)
	0.48	0.29	120.55	107.54	1.33	2.29	3.37	3.79	22.00	19.02
1966	(0.41) *	(0.15)	(42.52)	***(10.48)	(0.60)	(1.29)	(0.88)	(1.42)	(5.40)	(6.06)
	1.14	0.65	119.58	122.76	2.65	3.09	3.53	3.86	25.27	22.19
1967	(0.99) *	(0.40)	(15.66)	(21.78)	(0.29)	(2.17)	(0.99)	(1.54)	(5.95)	(8.20)
	0.62	0.31	106.06	103.89	3.48 *	5.16	3.12	3.57	28.40	26.24
1968	(0.60) *	(0.19)	(6.46)	(3.50)	(0.16)*	(1.53)	(0.63)	(1.41)	(8.21)	(9.76)
	1.11	0.45	109.31	120.27	4.47	6.02	2.96	3.50	34.06	33.57
1969	(0.47) *	(0.15)	(16.52)	(28.68)	(0.88)	(1.77)	(0.67)	(1.30)	(9.25)	(11.90)
	1.07	0.43	121.63	122.53	3.83	5.12	3.24	4.19	36.32	38.82
1970	(0.82)****	(0.15)	(12.14)	(30.83)	(0.72)	(1.28)	(1.08)	(1.93)	(8.69)	(15.02)
	0.42	0.66	107.92	83.34	1.54	2.36	2.83	4.07	38.85	41.19
1971	(0.25)	(0.45)	(18.89)	(31.49)	(1.51)	(1.00)	(0.91)	(1.63)	(9.61)	(14.96)
	0.72	0.35	97.42	110.08	1.64	1.39	1.88	3.24	51.91	48.68
1972	(0.39)	(0.29)	(14.36)	(15.50)	(0.72)	(0.59)	(0.17)	(1.25)	(10.53)	(17.30)
	1.14	0.77	121.28	131.92	1.23	1.06	1.42 *	2.70	66.07	61.17
1973	(0.70)	(0.39)	(57.71) *	(18.02)	(0.65)	(0.70)	(0.22)	(0.93)	(14.05)	(23.81)
	0.92 *	0.36	117.49	105.59	7.28	2.72	1.73	3.17	71.29	70.09
1974	(0.47)	(0.30)	(14.59)	(34.63)	11.09)**	(2.66)	(0.32)	(1.50)	(11.46)	(23.17)
	0.33	1.20	105.35 *	59.65	3.19	3.72	1.47****	3.24	72.01	72.23
1975	(0.20) *	(1.05)	(6.36) *	(38.46)	(2.91)	(3.89)	(0.09)*	(1.67)	(15.63)	(18.73)
	0.42	0.57	105.57	493.39	2.45	6.99	1.15 *	2.26	95.75	92.53
1976	(0.35)	(0.47)	(17.96)***	(978.12)	(2.52)	(9.56)	(0.13)	(0.91)	(12.51)	(29.54)

Industry	Motor vehicle equipment								Miscellaneous construction	
Finan. ratio	Liquid assets ratio		Debt to total assets		Total assets growth ratio		Value added per employee		Liquid assets ratio	
Firm Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
	121.95	121.11	33.77 *	43.75	116.19	123.48	20.40	20.15		
1964	(24.07)	(20.26)	(9.58)	(8.61)	(10.01)	(10.31)	(4.25)	(4.68)		
	122.35	123.46	34.50 *	45.79	160.94	107.81	21.55	19.68	97.08	*114.15
1965	(24.07)	(25.62)	(9.99)	(8.98)	(140.17)****	(14.10)	(6.27)	(3.54)	(15.49)	(12.02)
	111.59	123.52	32.77 *	44.23	119.92	111.05	23.23	22.41	99.65	115.34
1966	(18.14)	(29.25)	(11.92)	(9.20)	(24.75)***	(9.65)	(6.18)	(3.55)	(14.82)	(11.90)
	111.84	114.92	30.73 *	41.75	120.18	126.42	25.56	26.56	99.54	117.58
1967	(19.66)	(22.54)	(13.37)	(9.22)	(20.94)***	(8.14)	(8.57)*	(3.87)	(8.93)	(15.83)
	106.39	116.28	32.07 *	43.73	119.98	122.18	30.29	29.65	103.08	114.37
1968	(16.34)	(19.69)	(13.54)	(9.17)	(12.94)	(12.37)	(10.32)**	(4.23)	(6.75)	(10.73)
	106.62	116.80	34.30 *	45.62	119.42	119.83	37.81	37.72	102.65	116.36
1969	(21.32)	(18.03)	(12.30)	(9.69)	(4.74)	(8.99)	(8.95)*	(4.73)	(9.04)	(11.61)
	109.87	117.87	36.16	46.23	115.16	118.18	41.73	38.23	107.63	*118.64
1970	(20.37)	(17.30)	(12.91)	(9.08)	(11.48)	(9.39)	(10.79)*	(5.45)	(7.89)	(13.61)
	108.65	117.09	35.94 *	47.45	108.94	110.54	48.88 *	41.60	109.55	120.34
1971	(24.16)	(19.33)	(12.69)	(7.45)	(10.38)	(6.26)	(9.43)	(6.40)	(2.45)	(13.95)
	106.88	114.34	32.73***	47.19	116.47	110.25	57.21 *	47.71	113.38	119.42
1972	(21.56)	(17.91)	(12.64)	(7.64)	(5.18)	(10.14)	(5.79)	(9.04)	(4.06)	(13.94)
	97.62	110.06	31.70 *	44.44	130.93	125.17	66.33 *	59.04	107.83	118.60
1973	(16.33)	(16.93)	(14.44)	(8.79)	(11.43)	(9.54)	(3.64)*	(9.65)	(2.29)	(13.80)
	104.12	116.03	34.93	43.65	108.15	112.71	74.43	68.60	104.58	118.71
1974	(19.30)	(24.55)	(12.21)	(8.46)	(9.30)	(12.04)	(7.00)	(8.86)	(3.36)	(15.51)
	99.92	*121.05	36.12	44.78	112.03 ****	102.09	84.94	75.21	106.67	*115.00
1975	(16.35)	(22.23)	(11.04)	(8.02)	(6.84)	(4.85)	(8.06)	(11.93)	(1.30)*	(14.99)
	107.06	120.07	30.34 *	42.62	106.87	107.53	102.37	89.78	104.04	118.26
1976	(15.54)	(20.79)	(12.34)	(12.00)	(7.17)	(6.97)	(13.31)	(16.82)	(2.87)	(19.07)

Industry	Miscellaneous construction									
Financial ratio	Ordinary profit to total assets		Financial costs to debt and bills receivable		Equity per share		Value added per employee		Value added to net sales	
Firm / Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
	1.13	2.28	9.84	3.69	4.04	5.24	19.22****	27.78	12.48	23.60
1965	(0.39)	(1.27)	(5.01)	(7.83)	(0.87)	(2.14)	(0.75) *	(7.91)	(2.82)	(10.11)
	1.12	2.19	9.26	6.51	3.69	5.61	20.06	30.00	12.87	22.57
1966	(0.55)	(1.25)	(7.42)	(9.51)	(1.08)	(2.72)	(3.50)	(8.86)	(4.17)	(9.37)
	1.24	1.90	6.20	9.45	4.02	6.04	24.21 **	34.30	12.19	22.77
1967	(0.35)	0.98)	(3.25)	(25.33)	(1.08)	(3.16)	(1.13) *	(12.50)	(4.21)	(9.64)
	1.10	1.93	7.00	3.76	3.27****	6.23	28.17	38.92	11.71	22.18
1968	(0.49)	(0.96)	(5.15)	(4.20)	(0.19)*	(2.80)	(5.04)	(14.17)	(4.11)	(9.53)
	1.53	2.12	5.51	4.47	4.23	6.46	39.58	44.21	12.70	21.20
1969	(0.83)	(0.85)	(0.91)	(3.38)	(0.65)	(2.83)	(11.44)	(14.83)	(2.80)	(9.26)
	1.64	2.07	6.75	4.24	3.83	6.89	42.05	51.57	11.68	20.72
1970	(0.90)	(0.63)	(2.24)	(2.91)	(0.60)	(3.60)	(9.16)	(16.25)	(2.92)	(8.47)
	1.48	1.76	6.23	3.39	4.13	7.24	43.74	53.41	12.18	20.23
1971	(0.67)	(0.93)	(1.92)	(3.13)	(0.59)	(3.68)	(6.49)	(13.27)	(3.43)	(7.58)
	0.99***	1.96	4.84	2.49	4.39	7.77	49.71	58.40	12.12	20.07
1972	(0.12)*	(1.16)	(1.64)	(3.27)	(0.81)	(4.12)	(5.23)	(11.91)	(3.54)	(7.08)
	0.50	1.76	5.09	2.06	4.48	8.24	53.44	67.15	11.28 *	19.67
1973	(0.16)	(1.04)	(0.49)	(3.41)	(1.01)	(4.54)	(4.35)	(13.74)	(2.73)	(6.01)
	0.80	1.01	7.92****	5.06	4.47	8.12	63.37	69.21	11.07	18.75
1974	(0.47)	(0.78)	(0.23)*	(3.15)	(1.47)	(4.54)	(8.73)	(12.21)	(2.61)	(6.51)
	0.86	1.42	7.84	4.76	4.51	8.06	74.28	85.92	12.91	22.47
1975	(0.72)	(1.01)	(1.32)	(6.13)	(1.61)	(5.22)	(5.50)	(18.91)	(1.39)	(7.86)
	0.71	1.56	5.70	2.24	4.20	8.67	84.04	92.29	14.08	22.09
1976	(0.54)	(0.83)	(1.59)	(5.76)	(2.02)	(5.21)	(7.98)	(24.03)	(1.35)	(8.13)

Industry	Miscelleneous retail								Warehousing	
Financial ratio	Net sales to tangible fixed assets		Sell. & manage. expenses to net sales		Depreciation and retained earn. to equity		Total assets growth ratio		Depreciation ratio	
Firm / Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
									5.09	4.74
1962									(1.53)	(1.14)
									6.18	5.20
1963									(1.43)	(1.06)
									6.17	5.81
1964									(1.11)	(0.78)
	7.44	10.72	20.60	12.91	6.47	3.41	115.19	*104.00	5.32	5.93
1965	(2.56)	(6.06)	(5.63)	(6.56)	(2.62)	(3.04)	(2.54)	*(13.43)	(0.25)	(0.82)
	7.33	11.52	20.77	13.08	7.31 *	3.40	116.16	111.41	5.15	5.75
1966	(2.88)	(7.26)	(5.75)	(7.36)	(3.13)	(2.75)	(6.02)	(19.11)	(0.84)	(0.78)
	6.55	11.30	20.73	15.28	5.62 *	3.42	124.36	112.12	5.14 *	5.84
1967	(1.77)	*(7.73)	(5.51)	(13.22)	(1.19)	(1.31)	(13.88)	(12.81)	(0.54)	(0.27)
	5.64	*10.89	21.00	14.73	5.63	4.09	121.05	111.07	5.27	5.56
1968	(1.36)	*(7.31)	(5.17)	(10.55)	(1.67)	(1.77)	(15.86)	(9.10)	(0.06)	(0.87)
	5.54	10.40	21.25	16.12	6.30	4.48	119.85	116.90	5.62	6.96
1969	(1.84)	(6.98)	(5.79)	(13.48)	(2.73)	(1.96)	(9.86)	(17.22)	(0.54)	(2.19)
	5.44	9.12	21.96	15.28	6.20	4.47	113.35	106.50	5.13	6.36
1970	(2.01)	(5.12)	(5.02)	(8.07)	(2.23)	(2.20)	(13.34)	(12.01)	(0.33)	(1.11)
	5.83	9.39	22.29 *	14.63	5.44	5.82	116.63	113.20	5.18	6.28
1971	(2.72)	(4.96)	(4.26)	(6.47)	(1.70)	(2.37)	(9.13)	(16.51)	(0.61)	(0.84)
	6.24	11.53	22.27 *	13.80	5.55	4.67	115.85	124.13	5.00	6.03
1972	(3.32)	(8.52)	(4.90)	(6.44)	(2.40)	(2.56)	(11.57)	(29.16)	(0.18)	(1.32)
	6.14	10.20	22.64 *	14.59	5.13	5.77	116.39	116.75	4.66	5.55
1973	(3.32)	(6.17)	(3.64)	(6.52)	(1.98)	(2.52)	(9.13)	(17.18)	(1.27)	(1.05)
	6.81	9.36	23.00	17.38	4.24	9.18	116.99	105.80	5.45	6.47
1974	(4.08)	(6.69)	(3.51)	(7.27)	(1.89)	**(18.76)	(10.76)	(8.44)	(0.29)	(1.01)
	6.85	9.31	23.67	17.31	4.16	11.18	107.08	104.29	5.72	6.06
1975	(3.85)	(6.19)	(3.05)	(7.10)	(2.33)	**(21.59)	(5.54)	(5.86)	(0.19)	(0.64)
	7.14	10.90	24.19	16.79	4.47	11.79	106.49	107.24	5.12	5.55
1976	(3.55)	(7.87)	(3.98)	(7.61)	(2.66)*	(20.63)	(6.11)	(11.39)	(0.23)	(0.67)

Industry	Warehousing		Local sea transportation	
Financial ratio	Value added to net sales		Turnover period of acc. payable	
Firm / Year	Merg.	Non-merg.	Merg.	Non-merg.
	47.53	63.79		
1962	(29.54)	(12.21)		
	45.77	65.68		
1963	(28.81)	(11.46)		
	46.67	63.55		
1964	(32.55)	(12.19)		
	51.21	65.65	2.17	1.63
1965	(30.07)	(16.58)	(0.42)	(0.61)
	48.58	64.95	2.04 *	1.41
1966	(35.41)	(13.05)	(0.22)	(0.24)
	48.37	66.19	2.02	1.55
1967	(34.49)	(12.71)	(0.37)	(0.40)
	49.65	66.05	2.10	1.74
1968	(35.36)*	(12.03)	(0.50)	(0.60)
	48.65	66.59	2.23	1.81
1969	(32.22)	(11.44)	(0.07)	(0.68)
	48.16	63.75	2.18	1.98
1970	(33.10)*	(10.90)	(0.06)	(1.13)
	51.26	63.46	2.24	1.96
1971	(33.81)	(14.34)	(0.35)	(1.27)
	51.38	60.98	1.90	1.59
1972	(30.27)	(13.38)	(0.37)	(0.72)
	48.93	58.86	1.68	1.57
1973	(35.67)	(13.12)	(0.04)	(0.77)
	51.93	59.80	1.59	1.49
1974	(37.16)*	(11.64)	(0.08)	(0.71)
	51.61	54.18	1.93	1.37
1975	(39.00)*	(12.34)	(0.34)	(0.46)
	20.22 *	57.79	2.07	1.34
1976	(5.76)	(16.83)	(0.73)	(0.44)

Table 3-3. Discriminant analysis between merging and nonmerging firms (1)

Industry / Year	Silk-reeling	Printing	Agricultural chemicals	Industrial inorganic chemicals	Ordinary steel & allied products	Special steel & allied products	Metalworking machinery and equipment
1957					* 9.59		
1958					*** 39.94		* 3138.83
1959					* 5.52		** 10.03
1960					**** 170.91		190.45
1961					* 1010.42		2.31
1962					**** 21.31		2.29
1963					**** 24.85	*** 16.25	3.54
1964	114.45	173.29		*** 6.84	** 7.28	* 5.73	58.61
1965	29.50	* 1928.05		* 5.63	3.06	*** 12.58	* 861.76
1966	11.00	9.12	* 1573.53	*** 8.48	*** 9.81	4.78	** 1319.59
1967	1.48	* 39.32	* 258.42	*** 8.62	3.09	2.28	* 1188.92
1968	86.67	4.68	18.33	*** 10.50	11.45	6.34	188.53
1969	30.73	4.75	18.37	** 7.98	* 4.04	*** 19.69	*** 50.84
1970	11.84	197.21	88.59	**** 21.77	2.77	31.52	* 1072.49
1971	170.29	* 405.70	* 2926.37	* 9.90	2.12	* 20.83	4.95
1972	** 10778.66	1.31	78.30	* 5.76	2.69	* 6.84	1.96
1973	* 29.15	1.62	* 840.19	* 3.91	6.50	238.37	1.07
1974	* 228.52	4.28	* 7.39	* 9.32	* 4.90	8.43	1.16
1975	* 609.41	12.78	** 36.77	* 3.96	*** 13.21	8.67	2.82
1976	** 3778.16	2.46	* 371.31	* 4.71	**** 358.47	74.70	**** 31740.73

Mis. = Miscellaneous

* significant at the 5% level, ** 1% level, *** 0.5% level, **** 0.1% level.

Industry Year	Mis. electrical machinery equipment and supplies	Motor vehicle equipment	Mis. construc-tion	Mis. retail	Ware-housing	Local sea trans-portation
1962					* 6.80	
1963					2.40	
1964	*** 5.57	*** 6.56			* 7.75	
1965	** 4.63	**** 7.30	*** 5.26	** 7.12	* 5.25	15.52
1966	* 4.27	* 3.55	** 4.29	*** 15.84	2.26	* 3820.97
1967		3.78	** 5.03	* 5.31	3.00	98.04
1968		5.69	2.75	2.52	144.95	** 8249.19
1969		** 4.23	* 4.17	1.56	4.33	*** 31.47
1970	1.20	* 3.01	* 3.43	* 3.39	2.11	** 8134.78
1971	1.34	* 3.74	2.00	* 4.74	** 469.79	* 966.31
1972	* 3.12	*** 6.20	2.63	* 5.63	2.81	* 605.50
1973	* 3.19	** 5.38	* 4.26	* 5.26	1.09	* 1073.43
1974	* 4.40	* 4.30	3.01	3.28	*** 619.73	* 24.12
1975	** 4.61	**** 10.77	2.42	1.97	83.59	* 2114.52
1976	*** 5.28	* 4.16	2.77	2.29	*** 117.81	83.11

CHAPTER 4 FINANCIAL COMPARISON BETWEEN MERGING AND NONMERGING FIRMS BY YEAR AND BY INDUSTRY

I. Introduction

The objective of this chapter is to examine empirically comparative financial characteristics between merging and nonmerging firms by industry and by year in Japanese publicly held corporations.

Negative effects of mergers in eleven out of thirteen industries in Japan was shown in the previous chapter by comparing financial characteristics between merging and nonmerging firms before and after mergers. Here, our study is extended by relaxing the criterion that no mergers occurred for at least four years before the data period in each industry. Because this criterion is rather strong and affects over 60% of all industries, 17 industries which cannot satisfy this criterion were omitted in this study.

This chapter examines these 17 industries, using only one criterion: that an industry has at least two companies which merged, and the dates of mergers accepted by the Fair Trade Commission of Japan are separated by no more than two years. In these industries, the data periods do not permit comparative measurement of direct effects of mergers, so comparisons of financial characteristics between merging and nonmerging firms are examined based on each fiscal year and each industry to investigate the superiority of financial characteristics between merging and nonmerging firms.

II. Hypothesis, Data

Our hypothesis is that there are no financial differences between merging and nonmerging firms based on year and industry. Data period in this chapter is the same with the previous chapter, that is, nonfinancial

publicly held firms for the period of March 31, 1955 to March 31, 1977. We relax the second conditions used in the chapter 3, showing the data coverage of mergig firms. The condition is that at least three years' data period covers for analysis. There are 30 industries satisfying this condition and 13 industries analyzed by chapter 3 are excluded. Therefore, the remaining 17 industries are chosen subject to the criterion mentioned previously. These 17 industries are, (1) Beverages, (2) Miscellaneous food,[1] (3) Pulp mills and paper mills, (4) Industrial organic chemicals,[2] (5) Wire and cable, (6) Bearings and valves, (7) Electric industrial apparatus, (8) Ship and boat building and repairing, (9) Civil engineering and construction, (10) Trading companies, (11) Metals, minerals wholesale trade,[3] (12) Department stores, (13) Real estate, (14) Railroad transportation, (15) Deep sea transportation, (16) Hotels, (17) Motion pictures and amusement.

Merging and all stock listed nonmerging firms belonging to these industries are compared to examine the differences of the financial characteristics by each year and industry between two groups.

To compare the financial characteristics between merging and nonmerging firms, 61 financial ratios are formed from the original data bank in Japan. Factor analysis is applied to each industry in order to reduce the number of financial ratios systematically.[4] Each industry has 10 to 14 factors as shown in Table 4-1 representing 1) profit distribution, 2) capital structure, 3) assets-utilization, 4) turnover, 5) profitability, 6) operating performance, 7) depreciation and retained earnings, 8) debt effectiveness, 9) profitability per share, 10) growth, and 11) productivity. The variable with the highest load is selected from each factor by using factor analysis for 17 industries.

III. Univariate Comparative Analysis by Year and by Industry

Seventeen industries are to be compared between merging and nonmerging firms based on each fiscal year and each industry as shown in Table 4-2.

In the beverage industry, mergers were carried out in 1955, 1956, 1962-62 and 1968. There are five financial ratios which have statistically significant differences by t test. Means of inventory turnover are 3.26 vs. 2.52 in 1963, 3.12 vs. 2.39 in 1964 for merging and nonmerging firms, respectively, both of which have statistically significant differences at the 5% level. For merging and nonmerging firms, means of ratios from 1963 to 1971, 1973 and 1974 have significant differences by t test with respect to turnover period of accounts payable. These two ratios indicate slower turnover for merging firms. Ordinary profit to total assets has two significant differences by t test in 1961 (1.46 vs. 2.73) and in 1967 (0.91 vs. 3.35), showing clear inferiority of profitability to merging firms. Depreciation and retained earnings to equity has one significant difference by t test in 1974 (3.12 vs. 5.05) with higher ratios for nonmerging firms. Means of value added per employee always have higher values for nonmerging firms, and from 1961 through 1976 with statistically significant differences by t test, meaning higher productivity for nonmerging firms.

As a whole, nonmerging firms have better financial characteristics compared with merging firms.

Similarly, mergers occurred in 1961-63 in the miscellaneous food industry, before the data period from 1966 to 1976. Dividend to net profit have significant differences between merging and nonmerging firms with the means of 11.89 vs. 60.40 in 1966 and 17.28 vs. 52.02 in 1967, showing

higher rate of payment in nonmerging firms. Means of net profit to equity are 1.59 vs. 4.40 for merging and nonmerging firms in 1972 with a 5% significant difference by t test. The depreciation ratio has significant differences for merging and nonmerging firms with the means of 11.09 vs. 15.42 in 1966, 10.97 vs. 15.46 in 1967 and 11.02 vs. 14.94 in 1968 with higher depreciation ratios for nonmerging firms. F test shows a significant differences at the year of 1969 with the standard deviations of 5.37 vs. 0.90 for merging and nonmerging firms. Means of total assets growth ratio for nonmerging firms are higher for all years except 1967, 1968 and 1970, and one out of 11 years has a significant difference by t test. All four ratios indicate inferior ratios of merging firms.

Finally, in the pulp mills and paper mills industry, net sales to fixed assets are 1.47 vs. 1.75 in 1970, 1.26 vs. 1.63 in 1971 on means with statistically significant differences by t test, and 0.16 vs. 0.47 in 1970 and 0.17 vs. 0.49 in 1971 on standard deviations with F test's differences, the means of inventory turnover period are 2.21 vs. 1.61 for merging and nonmerging firms, both of which indicate higher turnover for nonmerging firms. Operating profit to net sales has no clear distinction between two groups. Equity growth ratio has a significant difference by t test on the means of 97.86 vs. 118.55 for merging and nonmerging firms in 1962 and differences by F test for 1962, from 1964 to 1968 and from 1970 to 1973, all of them show higher values for nonmerging firms, showing the superiority of nonmerging firms over merging firms. Debt to total assets has always higher values for merging firms than nonmerging firms even without significant differences. Net sales per employee has higher ratios for merging firms with 13 out of 15 years than merging firms, meaning superiority of merging firms. The dates of mergers accepted by the Fair Trade Commission of Japan are spreading over the period of analysis,

namely, 1962, 1964, 1965, 1966, 1968, 1970, 1972 and 1975.

As a conclusion, no clear superiority of financial ratios between merging and nonmerging firms is provided in this industry.

By the same way, in nine out of seventeen industries analyzed in this paper, nonmerging firms have superiority on financial characteristics to merging firms. These industries are: (1) Beverages, (2) Miscellaneous food, (4) Industrial organic chemicals, (9) Civil engineering and construction, (10) Trading companies, (11) Wholesale trade in metals, minerals, (12) Department stores, (13) Real estate, and (15) Deep sea transportation. Nonmerging firms have inferiority in four industries: (6) Bearings and valves, (7) Electric industrial apparatus, (14) Railroad transportation, and (17) Motion pictures and amusement. The remaining four industries have neutrality, namely, no significant differences on financial ratios between merging and nonmerging firms are shown. Those industries are (3) Pulp mills and paper mills, (5) Wire and cable, (8) Ship and boat building and repairing, and (16) Hotels.

IV. Multivariate Comparative Analysis by Year and by Industry

The same data are to be analyzed to compare the financial characteristics between merging and nonmerging firms by discriminant analysis in each year and industry, aiming to strengthen the result of univariate analysis. As a stepwise procedure, largest distance between closest group (MAHAL) method was used and for setting minimum criteria, 0.1 was specified for each of F-to-enter and F-to-removal, as well as FIN and FOUT of SPSS. The result is shown in Table 4-3.

In the beverages industry, after a series of mergers from 1960 to 1963, there are statistically significant differences by F test for

discrimination in every year supporting indirectly the result of univariate analysis.

Second, in the miscellaneous food industry, the F test for discriminant analysis has significant differences for five out of 11 years with no calculation in 1948, which supports to some extent the univariate analysis.

Finally, eleven out of 15 years have statistically significant differences between merging and nonmerging firms by discriminant analysis of 25 financial ratios. No distinctions are given in 1967, 1969, 1970 and 1973, which supports the result of univariate analysis.

By the same way, the remaining 14 industries are examined. Of 17 industries, 13 supports the result of univariate analysis, they are (1) beverages, (2) miscellaneous food, (3) pulp mills and paper mills, (4) industrial organic chemicals, (5) wire and cable, (6) ship and boat building and repairing, (7) civil engineering and construction, (8) trading firms, (9) wholesale trade in metals, minerals, (10) department store, (11) railroad transportation, (12) deep sea transportation, and (13) motion pictures and amusement.

However, in the bearing and valve industry, and electrical industrial apparatus industry, the result of discriminant analysis is not coincide with that of univariate analysis. Namely, the former has not distinction on financial ratios between merging and nonmerging firms, based on multivariate analysis, which is different with the result of univariate analysis, which presented significant differences by t test on two ratio, ordinary profit to total assets and total assets growth ratio. The latter has only one significant difference by F test in 1971 during 13 years based on multivariate analysis. On the other hand, the univariate analysis showed no significant differences at all in any financial ratios between merging

and nonmerging firms, indicating multivariate analysis has more power to distinguish the financial characteristics between merging and nonmerging firms in this case.

Since, both analyses are supplement each other as shown above, it is necessary to examine the financial characteristics by both methods.

The last two industries, hotels and real estate cannot be computed by discriminant analysis because of the shortage of data.

V. Conclusion

The theory of mergers assumes that the managers of merging firms are acting for the maximizing the wealth of their stockholders. If this is so, the combined entity must be more valuable to stockholders than when the firms were operated separately. However, our finding indicates that the merging firm is less valuable than nonmerging firms in the same industry as a general trend. This means that the stockholders' wealth maximizing theory is totally irrelevant to corporations in Japan. Especially, in Japanese business practices, dividend is considered to be a kind of cost. Besides, the very existence of this "dividend cost" concept itself indicates that the stockholders are considered at best only outside interested party.[5] See Matsumoto (1982)

Moreover, stockholders' meeting in Japan is of no use at all as an organ of decision making about their collective bill. In other words, it has already fallen into formality. See Hirata (1981)

Under these business circumstances, the stockholders' wealth maximizing theory has no ground to be proven not only its irrelevance with the evidence of statistical analysis, but also contradiction with reality of business practices in Japan.

Recently in Japan, two new trends have developed: (1) mergers in which

an ailing firm is merged for survival,[6] and (2) dividing the growing portion of business from the inactive portion for the transfer of business. Further research on mergers and transfer of business is greatly necessary in Japan, as is also a comparison between the U.S. and Japan.

Footnotes

1. Except dairy products, fodder, suger, bread, brewing and edible oil.

2. Except plastic and synthetic rubber.

3. Except oil and trading companies.

4. The image factoring (IMAGE) of factor method and VARIMAX of rotational method from SPSS were used for factor analysis. Nie (1975)

5. One of the important reasons why shareholders are considered to be only outsider is that equity to total assets ratio is very low in Japan, that is, 15.9 % in manufacturing and 16.3 % in nonmanufacturing industries in 1980. See Japan Development Bank (1981)

6. Ataka & Co., for example, which was merged by C. Itoh & Co., because it was driven to the verge of bankruptcy by the " oil crisis". See Sasaki (1981).

Table 4-1 Factors by industry after varimax rotation (2)

Industry / Factor	Beverages	Miscellaneous food	Pulp mills and paper mills	Industrial organic chemicals
1	Ordinary profit to total assets	Dividend to net profit	Ordinary profit to net sales	Net sales to fixed assets
2	Value added per employee	Fixed assets to fixed liabilities, special reserve and equity	Net sales to fixed assets	Ordinary profit to total assets
3	Net sales to fixed assets	Turnover ratio	Net sales per employee	Value added per employee
4	Depreciation and retained earnings to equity	Net sales to fixed assets	Personnel expenses to net sales	Net profit to equity
5	Total capital growth ratio	Turnover period of commodity and product	Quick ratio	Turnover period of commodity and product
6	Inventory turn-over period	Net profit to equity	Inventory turn-over period	Dividend to capital
7	Selling and Management expenses to net sales	Operating profit to ordianry capital	Depreciation and retained earnings to equity	Selling and management expenses to net sales
8	Financial costs to debt and bills receivable	Net profit to net sales	Equity per share	Net profit to net sales
9	Turnover period of accounts payable	Depreciation ratio	Total assets growth ratio	Total assets growth ratio
10	Depreciation ratio	Debt to total assets	Ratio of bill discounted to total bill	Personnel expenses to net sales
11		Total assets growth ratio	Debt to total assets	Turnover period of accounts receivable
12		Personnel expenses per employee	Operating profit to net sales	Financial costs to debt and bills receivable
13			Accounts receivable to accounts payable	Turnover period of accounts payable
14			Equity growth ratio	

Industry Factor	Wire and cable	Bearings and valves	Electrical Industrial apparatus	Ship and boat building and repairing
1	Dividend to capital	Ordinary profit to total assets	Total liabilities to equity	Net sales to total assets
2	Quick ratio	Net sales to fixed assets	Accounts receivable to account payable	Operating profit to net sales
3	Net sales to total assets	Turnover period of account payable	Net sales to fixed assets	Liquid assets ratio
4	Turnover period of accounts payable	Liquid assets ratio	Turnover period of accounts receivable	Value added per employee
5	Selling and management expenses to net sales	Value added per employee	Turnover period of commodity and product	Financial costs to debt and bills receivable
6	Ordinary profit to net sales	Depreciation and retained earnings to equity	Ordinary profit to total assets	Personnel expenses to net sales
7	Financial costs to net sales	Account receivable to account payable	Net profit to equity	Depreciation and retained earnings to equity
8	Net sales growth ratio	Personnel expenses to net sales	Personnel expenses to net sales	Depreciation expenses to net sales
9	Equity growth ratio	Debt to total assets	Debt to total assets	Fixed assets growth ratio
10	Personnel expenses per employee	Total assets growth ratio	Total assets growth ratio	Net profit to net sales
11	Value added ratio		Value added per employee	Net sales growth ratio

Indus. Fac.	Civil engineering and construction	Trading companies	Metals, minerals wholesales trade	Department stores	Real estate
1	Ordinary profit to total assets	Net sales per employee	Sell. and manage. expenses to net sales	Ordinary profit and financial costs to total assets	Ordinary profit to net sales
2	Net sales to total assets	Ordinary profit, financial costs to total assets	Net profit to total assets	Net sales per employee	Net sales to tangible fixed assets
3	Value added per employee	Net profit to total assets	Turnover period of account receivable	Personnel expenses to net sales	Turnover period of commodity and product
4	Net profit to equity	Retained earnings to equity	Depreciation and retained earnings to equity	Net sales to buildings and equipment	Value added per employee
5	Personnel expenses to net sales	Selling and management expenses to net sales	Net sales growth ratio	Account receivable to account payable	Net sales to total liabilities
6	Inventory turonver period	Net sales growth ratio	Net sales to tangible fixed assets	Retained earnings to equity	Ordinary profit to equity
7	Net sales to tangible fixed assets	Operating profit to ordinary capital	Value added per employee	Total assets growth ratio	Total assets growth ratio
8	Fixed assets to fixed liabilities, special reserve and equity	Net sales to buildings and equipment	Ordinary profit to equity	Turnover period of commodity and product	Personnel expenses growth ratio
9	Total liabilities to equity	Account receivable to account payable	Operating profit to net sales	Net sales to fixed assets	Turnover period of accounts payable
10	Net sales growth ratio	Ordinary profit to equity	Turnover period of com. and prod.	Net sales to debt	Liquid assets ratio
11	Depreciation ratio		Financial costs to debt and bills receivable	Depreciation expenses to net sales	Retained earnings to equity
12	Debt to total assets		Dividend to net profit		Financial costs to net sales
13	Net profit to growth ratio		Liquid assets ratio		Selling & mana. exp. to net sales
14	Financial costs to debt and bills receivable				Equity per sahre
15					Net profit growth ratio

Indus. Fac.	Railroad trans.	Deep sea trans.	Hotels	Motion pictures and amusement
1	Net sales to tangible fixed assets	Ordinary profit to net sales	Ordinary profit to net sales	Ordinary profit to total assets
2	Ordinary profit and financial cost to total assets	Net sales to tangible fixed assets	Net sales to tangible fixed assets	Net sales to total assets
3	Ordinary profit to equity	Value added per employee	Turnover period of commodity & product	Financial costs to debt and bills receivable
4	Personnel expenses to net sales	Net sales to total liabilities	Value added per employee	Net sales per employee
5	Net sales per employee	Ordinary profit to equity	Net sales to total liabilities	Depreciation & retained earn. to equity
6	Liquid assets ratio	Total assets growth ratio	Ordinary profit to equity	Turnover period of acc. payable
7	Dividend to net profit	Personnel exp. to net sales	Total assets growth ratio	Turnover period of account receivable
8	Net sales to operating capital	Turnover period of acc. payable	Personnel exp. to net sales	Total assets growth ratio
9	Fixed assets growth ratio	Liquid assets ratio	Turnover period of acc. payable	Selling and management expenses to net sales
10	Depreciation & retained earnings to equity	Depreciation & retained earnings to equity	Liquid assets ratio	Net profit to net sales
11	Depreciation ratio	Financial costs to net sales	Depreciation and retained ear. to equity	Financial costs to net sales
12	Acc. receivable to acc. payable	Selling and management exp. to net sales	Financial cost to net sales	Ordinary profit to equity
13	Selling & management expenses to net sales	Equity per share	Sell. and management exp. to net sales	
14		Net profit growth ratio	Equity per share	
			Net profit growth ratio	

Table 4-2 Financial ratios between merging and nonmerging firms by year and by industry (2)

Industry	Beverages									
Finan. ratio	Inventory turnover period		Turnover period of accounts payable		Ordinary profit to to. assets		Depreciation & retained earn.to equity		Value added per employee	
Year	Merg.	Non-merg	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
	3.00	3.00	1.52	1.11	2.36	2.34	4.54	2.79	18.52	24.50
1959	(0.63)	(0.33)	(1.03)	(0.66)	(0.61)	(0.78)	(2.89)	(1.11)	(3.80)	(7.04)
	3.01	2.57	1.75	1.24	1.67	2.76	3.76	2.83	18.86	29.42
1960	(0.44)	(0.33)	(1.07)	(0.44)	(0.48)	(0.73)	(1.33)	(0.97)	(2.56)	(9.98)
	2.96	2.22	1.82	1.56	1.46****	2.73	3.12	3.80	18.89 *	36.11
1961	(0.65)***	(0.02)	(0.59)	(0.40)	(0.14)	(0.38)	(1.31)	(1.30)	(3.33)	(11.50)
	3.14	2.39	2.03	1.67	0.99	2.09	2.38	4.05	17.64 *	35.96
1962	(0.61)	(0.27)	(0.38)	(0.51)	(0.59)	(0.84)	(0.94)	(1.21)	(3.13)	(11.15)
	3.26 *	2.52	2.26 *	1.27	1.07	2.23	2.40	4.04	19.25 *	37.85
1963	(0.45)	(0.23)	(0.45)	(0.41)	(0.72)	(1.02)	(0.85)	(1.35)	(3.22)	(10.32)
	3.12 *	2.39	2.19 ***	1.13	1.01	2.66	3.27	4.61	21.19 *	45.25
1964	(0.49)	(0.17)	(0.27)	(0.36)	(0.81)	(1.10)	(1.61)	(1.28)	(3.69)	(13.60)
	2.99	2.55	2.02 **	1.25	1.08	2.40	2.84	4.15	21.81 *	48.95
1965	(0.69)	(0.52)	(0.15)	(0.38)	(0.91)	(1.52)	(1.01)	(1.52)	(2.21)*	(13.00)
	2.60	2.49	1.92****	0.99	1.34	3.00	3.35	3.88	25.37 *	53.76
1966	(0.56)	(0.52)	(0.12)	(0.09)	(0.87)	(1.65)	(1.49)	(1.26)	(0.79)***	(15.43)
	2.50	2.40	2.13****	0.85	0.91 *	3.35	3.24	3.99	26.99 *	61.11
1967	(0.52)*	(0.08)	(0.13)	(0.20)	(0.86)	(1.43)	(1.28)	(1.05)	(2.14)*	(14.06)
	2.50	2.56	2.40****	0.99	0.83	2.71	2.86	4.07	31.39 ***	65.88
1968	(0.58)**	(0.05)	(0.30)	(0.25)	(0.95)	(1.67)	(1.20)	(0.96)	(4.69)	(13.24)
	2.48	2.48	2.45****	1.04	1.03	2.95	3.17	4.40	37.52 **	71.08
1969	(0.46)	(0.17)	(0.41)	(0.26)	(0.59)	(1.95)	(1.30)	(1.14)	(6.45)	(15.45)
	2.22	2.22	2.34****	1.03	1.16	2.59	3.25	4.33	42.06 *	79.06
1970	(0.50)	(0.38)	(0.33)	(0.28)	(0.59)	(1.74)	(1.27)	(1.44)	(8.72)	(18.92)
	2.30	2.06	2.05***	1.21	0.84	2.45	3.06	4.36	44.22 *	86.83
1971	(0.67)	(0.49)	(0.45)	(0.36)	(0.32)*	(1.71)	(1.16)	(1.56)	(8.57)	(23.06)
	2.50	2.14	2.75	1.80	0.48	2.12	3.28	4.43	48.16 *	99.86
1972	(0.64)	(0.69)	(0.68)	(0.97)	(0.23)*	(1.39)	(1.60)	(2.06)	(11.87)	(37.61)
	2.31	2.04	2.85 *	1.61	0.42	1.77	2.93	5.26	56.75 *	117.71
1973	(0.74)	(0.64)	(0.65)	(0.47)	(0.28)*	(1.40)	(0.99)	(1.68)	(12.30)	(34.84)
	2.68	2.62	2.93 *	1.29	0.55	1.59	3.12 *	5.05	68.26 *	133.65
1974	(0.81)	(0.37)	(0.94)	(0.24)	(0.44)	(1.10)	(1.03)	(0.95)	(14.98)	(32.90)
	2.79	2.84	2.67	1.16	0.55	1.64	3.44	4.73	72.88 **	147.55
1975	(0.80)	(0.44)	(1.06)*	(0.16)	(0.59)	(0.78)	(1.15)	(1.30)	(17.77)	(32.21)
	2.60	2.96	2.66	1.24	0.72	1.88	3.05	5.81	84.98 *	169.36
1976	(0.76)	(0.37)	(1.18)	(0.49)	(0.48)	(1.05)	(0.95)	(2.75)	(19.18)	(48.33)

1) Numbers are means, numbers with parentheses are standard deviations.
2) * significant at the 5% level.
   ** Significant at the 1% level.
   *** significant at the .5% level.
   **** significant at the .1% level.
3) Electrical industrial apparatus industry is omitted here, because no significant differences between merging and nonmerging firms by t test are found.
4) Rectanglur area indicates the years of mergers accepted.

Industry	Miscellaneous food								Pulp mills and paper mills	
Finan. ratio	Dividend to net profit		Net profit to equity		Depreciation ratio		Total assets growth ratio		Net sales to fixed assets	
Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
1962									1.39	1.33
									(0.50)	(0.44)
1963									1.47	1.45
									(0.41)	(0.43)
1964									1.45	1.45
									(0.34)	(0.34)
1965									1.28	1.35
									(0.22)	(0.24)
	11.89 *	60.40	5.59	2.37	11.09 *	15.42	97.22	103.23	1.39	1.50
1966	(14.21)	(24.94)	(3.69)**	(1.03)	(3.82)	(2.03)	(4.88)	(5.94)	(0.20)	(0.30)
	17.28 *	52.02	4.24	2.68	10.97 *	15.46	116.06	109.26	1.41	1.63
1967	(14.88)	(23.26)	(2.91)**	(0.83)	(4.21)	(2.57)	(20.83)***	(4.94)	(0.27)	(0.33)
	21.85	50.49	2.92	2.51	11.02 *	14.94	117.96	110.56	1.54	1.68
1968	(23.61)	(23.09)	(2.38)*	(0.96)	(2.81)	(2.12)	(25.74)**	(7.37)	(0.32)	(0.41)
	26.78	50.04	3.48	3.12	9.08	7.50	102.84	111.69	1.59	1.76
1969	(28.04)	(23.04)	(0.75)	(1.03)	(5.37)****	(0.90)	(6.35)	(9.50)	(0.27)	(0.40)
	30.01	40.91	2.84	3.08	6.93	7.34	111.71	110.70	1.47 *	1.75
1970	(34.44)	(26.50)	(0.78)	(0.62)	(2.10)	(1.00)	(17.36)	(8.94)	(0.16)**	(0.47)
	53.22	35.83	1.56	2.94	6.94	7.48	102.01 *	116.91	1.26 *	1.63
1971	(59.25)	(24.61)	(0.88)	(1.21)	(1.65)	(1.22)	(1.42)	(9.41)	(0.17)*	(0.49)
	39.69	41.81	1.59 *	4.40	7.42	7.57	108.37	119.40	1.41	1.72
1972	(34.79)	(25.62)	(0.29)*	(3.25)	(1.54)	(1.99)	(3.92)	(17.62)	(0.27)	(0.54)
	48.11	37.38	2.79	3.97	7.33	7.91	122.51	126.52	1.88	2.06
1973	(15.97)	(21.14)	(1.52)	(2.99)	(1.66)	(1.99)	(12.60)	(12.83)	(0.47)	(0.49)
	46.69	39.22	2.34	3.47	7.23	8.69	110.61	117.77	1.78	2.15
1974	(4.72)	(23.74)	(0.57)	(2.08)	(1.03)	(2.60)	(10.42)	(11.81)	(0.46)	(0.61)
	19.07	40.18	3.86	8.37	6.57	7.46	100.95	111.23	1.47	1.81
1975	(32.94)	(25.48)	(5.46)	(15.70)	(0.93)	(2.56)	(3.34)	(20.81)	(0.33)	(0.54)
	8.57	34.16	2.79	4.47	6.89	7.27	103.73	106.66	1.82	1.97
1976	(14.85)	(25.23)	(1.76)	(4.88)	(1.03)	(1.87)	(12.03)	(15.97)	(0.77)	(0.66)

Industry	Pulp mills and paper mills						Industrial organic chemicals			
Finan. ratio	Inventory turnover period		Operating profit to net sales		Equity growth ratio		Net sales to fixed assets		Turnover period of accounts receivable	
Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
1958							1.37	2.14	2.31 *	1.60
							(0.54)	(1.15)	(0.82)	(0.48)
1959							1.32 *	2.33	2.65 *	1.71
							(0.33)***	(1.32)	(0.87)	(0.61)
1960							0.34	2.34	2.65 *	1.76
							(0.32)****	(1.85)	(0.84)	(0.71)
1961							1.25	2.28	2.78 *	1.89
							(0.30)****	(1.73)	(1.00)	(0.72)
1962	1.80	2.13	7.55	9.26	97.86 **	118.55	1.19	1.94	3.14	2.37
	(0.89)	(0.84)	(1.49)*	(3.44)	(10.84) *	(23.81)	(0.35)**	(1.20)	(1.91)	(0.92)
1963	1.50	1.81	10.28	10.42	117.63	109.06	1.25	1.90	2.95 *	2.20
	(0.75)	(0.93)	(1.42)*	(4.06)	(20.22)	(13.04)	(0.37)*	(1.03)	(0.80)	(0.63)
1964	1.51	1.73	9.15	10.49	108.44	111.96	1.18 *	1.87	2.80 *	2.01
	(0.65)	(0.84)	(1.66)	(2.22)	(6.83)****	(29.23)	(0.28)**	(1.03)	(0.48)	(0.57)
1965	1.62	1.68	6.38	8.09	96.93	88.28	1.19	1.91	2.72 *	2.01
	(0.55)	(0.81)	(2.74)	(3.12)	(7.04)****	(27.03)	(0.22)****	(1.16)	(0.82)	(0.61)
1966	1.40	1.39	7.97	7.88	105.36	121.40	1.28 *	2.23	2.65	2.04
	(0.49)	(0.72)	(2.70)	(4.07)	(12.08)****	(75.50)	(0.21)****	(1.45)	(0.79)	(0.56)
1967	1.50	1.36	8.06	9.15	100.41	136.18	1.39	2.47	2.83	2.23
	(0.59)	(0.61)	(1.51)	(2.46)	(5.20)****	(79.41)	(0.22)****	(1.78)	(0.82)	(0.55)
1968	1.45	1.40	8.42	9.99	112.01	127.48	1.36 *	2.48	2.87	2.25
	(0.51)	(0.67)	(1.96)	(2.92)	(15.54)****	(67.18)	(0.32)****	(1.68)	(0.86)	(0.62)
1969	1.33	1.31	8.29	9.03	113.10	112.44	1.32 *	2.44	2.77	2.38
	(0.40)	(0.62)	(2.36)	(2.98)	(21.41)	(12.47)	(0.34)***	(1.38)	(0.83)	(0.58)
1970	1.49	1.35	7.79	8.34	113.18	110.77	1.28 *	2.34	2.99	2.49
	(0.33)	(0.52)	(2.23)	(3.61)	(17.58) *	(38.93)	(0.29)***	(1.27)	(0.88)	(0.64)
1971	1.81	1.51	5.30	5.25	99.08	120.91	1.19 *	2.14	3.06	2.46
	(0.47)	(0.60)	(3.09)	(2.99)	(3.43)****	(116.41)	(0.20)****	(1.28)	(0.91)	(0.72)
1972	1.56	1.39	7.67	6.89	106.37	149.43	1.23 *	2.13	3.07	2.49
	(0.38)	(0.63)	(3.13)	(3.35)	(20.40)****	(145.22)	(0.23)****	(1.39)	(0.66)	(0.66)
1973	1.40	1.22	11.65	11.75	115.98	122.93	1.65	2.66	3.32 *	2.68
	(0.52)	(0.52)	(2.09)*	(5.01)	(10.27)**	(30.72)	(0.36)****	(1.96)	(0.48)	(0.58)
1974	2.21 *	1.61	8.55	9.86	118.64	120.64	2.11	3.12	2.77 *	2.24
	(0.49)	(0.60)	(3.82)	(3.99)	(21.03)	(31.76)	(0.44)****	(1.97)	(0.38)	(0.53)
1975	2.49	2.20	5.36	6.76	78.96	90.06	2.01	2.62	2.61	2.29
	(0.51)	(0.79)	(3.67)	(3.99)	(32.94)	(29.96)	(0.39)*	(1.25)	(0.54)	(0.63)
1976	1.78	1.96	8.24 *	5.90	202.68	196.16	2.00	2.80	2.86	2.31
	(0.53)	(0.97)	(1.70)	(2.61)	(286.02)	(406.81)	(0.37)**	(1.41)	(0.47)	(0.65)

Industry	Wire and cable				Bearings and valves				Ship & boat build. & repair.	
Finan. ratio	Financial costs to net sales		Equity growth ratio		Ordinary profit to total assets		Total assets growth ratio		Liquid assets ratio	
Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
	4.10 *	3.02	98.83	103.40					145.42	129.99
1963	(0.13)*	(1.01)	(4.36)	(6.16)					(18.21)	(18.62)
	4.00 *	3.18	101.28	103.83	1.44	1.72	106.25	115.20	144.28	125.92
1964	(0.14)*	(0.77)	(2.27)	(3.14)	(1.44)	(1.12)	(62.03)****	(14.34)	(12.56)	(24.31)
	4.12 *	3.13	106.15 *	102.32	1.44	0.99	103.43	99.84	155.25	132.45
1965	(0.07)***	(1.02)	(1.96)	(2.76)	(0.85)	(0.57)	(15.29)	(9.80)	(18.28)	(16.74)
	3.62	2.71	109.04	109.31	2.75 *	1.44	114.80	109.19	153.53	156.90
1966	(0.22)*	(1.15)	(9.62)	(5.37)	(0.93)	(1.03)	(17.96)	(9.72)	(19.91)	(32.630
	3.12	2.57	117.10	100.26	3.17	2.52	134.83	119.75	154.19	181.36
1967	(0.38)	(0.93)	(20.29)	(34.06)	(2.47)	(1.74)	(21.89)	(14.39)	(23.45)	(31.09)
	2.91	2.24	116.00	133.50	3.02	3.08	129.75	123.33	166.44	185.42
1968	(0.26)	(0.63)	(14.70)*	(62.76)	(0.93)	(1.32)	(32.29)**	(11.81)	(29.93)	(33.74)
	2.71	2.14	118.15	128.61	3.36	3.02	124.84	132.18	161.31	182.06
1969	(0.30)	(0.52)	(13.45)	(20.95)	(1.01)	(1.26)	(17.78)*	(8.53)	(23.86)	(26.40)
	3.12	2.62	104.24	121.42	3.18	3.00	124.57	131.52	157.56	177.90
1970	(0.84)	(0.64)	(10.15)	(22.44)	(0.71)	(1.20)	(8.13)	(10.35)	(23.54)	(21.48)
	3.23	2.73	103.46	102.57	1.78	1.32	114.68	107.14	144.55 *	185.98
1971	(0.71)	(0.69)	(6.98)	(6.25)	(0.84)	(0.92)	(16.59)	(14.76)	(24.37)	(13.91)
	2.07	2.14	117.89	125.56	1.22	0.99	115.15	111.08	122.21 *	183.60
1972	(0.64)	(0.75)	(10.98)	(20.17)	(1.02)	(1.01)	(25.54)***	(8.14)	(21.50)	(35.74)
	2.45	2.12	124.12	124.44	1.48	1.65	116.33	122.45	122.15	142.11
1973	(0.85)	(0.68)	(29.16)	(17.77)	(0.57)	(1.02)	(3.67)*	(14.34)	(13.68)	(19.19)
	3.37	3.62	104.66	98.85	3.59	1.32	124.62 *	105.76	121.91	130.03
1974	(1.92)	(0.71)	(8.95)	(15.19)	(4.18)****	(0.97)	(16.45)	(14.18)	(9.86)	(18.01)
	3.31	4.35	91.93	81.83	1.03	0.77	103.10	100.49	135.10	139.57
1975	(1.61)	(1.17)	(10.57)	(27.79)	(0.62)	(0.84)	(16.02)	(10.40)	(8.80)	(9.62)
	3.19	3.61	96.44	87.32	0.79	0.67	101.88	105.31	143.67	149.71
1976	(1.32)	(1.25)	(22.44)	(16.03)	(1.29)*	(0.53)	(12.28)	(9.47)	(10.29)	(5.11)

Industry	Ship and boat building and repairing									
Finan. ratio	Net sales to total assets		Operating profit to net sales		Net profit to net sales		Depreciation expenses to net sales		Financial costs to debt and bills receiv.	
Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
	0.59	0.49	7.29	5.59	3.16	2.78	3.86	4.45	1.67	1.59
1963	(0.08)	(0.13)	(1.53)	(1.22)	(1.88)	(2.67)	(0.90)	(0.93)	(0.96)	(1.99)
	0.60	0.74	6.50 *	4.58	2.55	1.68	4.09	3.52	1.51	2.42
1964	(0.05)	(0.13)	(1.49) *	(0.13)	(0.63)	(1.13)	(0.44)	(0.29)	(1.01)	(1.12)
	0.59 *	0.74	5.20	6.83	2.11	1.66	3.85	3.69	1.67	1.72
1965	(0.07)	(0.08)	(1.73)	(3.09)	(0.46)	(0.81)	(0.59)	(0.73)	(0.95)	(2.69)
	0.61	0.77	5.62	6.51	1.78	1.54	3.87	3.37	1.37	1.47
1966	(0.05)*	(0.19)	(1.65)	(1.52)	(0.40)	(0.65)	(0.57)	(0.63)	(1.10)	(1.44)
	0.64	0.73	5.78	5.48	1.86	1.48	3.28	3.18	1.35	1.05
1967	(0.06)*	(0.27)	(1.01)	(0.62)	(0.40)	(0.59)	(0.70)	(0.50)	(0.94)	(0.91)
	0.66	0.68	7.17	5.95	2.14	1.43	3.14	3.32	1.79	0.97
1968	(0.13)	(0.24)	(1.34)	(1.93)	(0.53)	(0.93)	(0.73)	(0.71)	(1.14)	(1.20)
	0.60	0.66	8.01	5.01	2.16	1.35	3.33	2.57	1.66	0.75
1969	(0.08)	(0.17)	(1.39)	(1.39)	(0.93)	(0.93)	(0.67)	(0.10)	(1.19)	(0.95)
	0.57	0.60	7.88	5.31	2.39	1.30	3.42	2.90	1.57	0.48
1970	(0.07)*	(0.22)	(1.63)	(1.73)	(0.49)	(0.74)	(0.77)	(0.79)	(1.18)	(1.28)
	0.52	0.54	8.52	8.73	1.53	1.10	3.30	2.56	1.39	0.87
1971	(0.08)	(0.15)	(1.34)	(2.67)	(0.55)	(0.89)	(0.77)	(1.05)	(1.05)	(0.75)
	0.50	0.42	9.66	10.26	1.58	1.25	3.67 *	2.17	1.48	0.72
1972	(0.10)	(0.11)	(1.47)	(3.64)	(0.47)	(1.14)	(0.87)	(0.22)	(0.96)	(0.52)
	0.54	0.37	11.13	10.74	2.82	1.14	3.51	2.56	0.80	0.16
1973	(0.12)	(0.03)	(2.15)	(6.47)	(1.64)	(0.99)	(0.37)	(0.91)	(1.21)	(0.32)
	0.60 *	0.40	6.96	4.40	1.67	1.55	3.35	3.36	1.08	1.26
1974	(0.10)	(0.09)	(0.47)***	(5.03)	(0.52)	(1.40)	(0.36)*	(1.19)	(2.06)	(1.01)
	0.55	0.47	7.23	4.60	2.23	0.91	3.41	4.04	2.50***	3.65
1975	(0.09)	(0.09)	(2.36)	(3.88)	(1.09)	(0.95)	(0.45)	(1.20)	(0.38)	(0.26)
	0.56	0.49	8.23	6.32	2.08**	0.81	2.85	3.46	2.45 *	3.49
1976	(0.08)	(0.08)	(2.12)	(1.98)	(0.51)	(0.32)	(0.40)*	(1.52)	(0.43)	(0.43)

Industry			Civil engineering and construction				Trading companies			
Finan. ratio	Fixed assets growth ratio		Fixed assets to fixed liabili. & equity		Depreciation ratio		Operating profit to ord. profit		Ord. profit & finan. costs to total asset	
Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
1962							3.01	2.11	-0.37	0.33
							(0.52)	(0.09)	(0.55)	(0.13)
	117.59	118.16					2.49*	1.88	-0.10	0.40
1963	(17.24)	(14.70)					(0.32)	(0.06)	(0.39)	(0.21)
	124.31	120.17					2.56**	1.84	-0.25	0.24
1964	(7.84)	(17.68)					(0.25)	(0.28)	(0.34)	(0.45)
	106.66	105.42					2.45	1.80	-0.33	0.23
1965	(14.42)	(6.20)					(0.51)	(0.37)	(0.34)	(0.28)
	123.16 *	114.60	94.00***	80.72	22.19	17.06	2.53	2.32	-0.37	0.19
1966	(4.98)	(4.69)	(4.60)	(22.11)	(11.60)*	(6.15)	(0.45)	(0.43)	(0.41)	(0.18)
	118.35	126.86	92.86	80.92	21.47	17.41	2.38	2.32	-0.30	0.26
1967	(10.27)	(8.48)	(20.48)	(25.41)	(9.78)	(7.14)	(0.36)	(0.46)	(0.36)	(0.08)
	113.25	113.22	82.16	80.87	21.87	17.08	2.33	2.23	-0.37	0.19
1968	(6.99)	(10.59)	(18.52)	(30.49)	(9.88)	(6.97)	(0.34)	(0.18)	(0.41)	(0.20)
	114.90	117.88	78.71	75.42	15.71	12.40	2.14	2.24	-0.28	0.16
1969	(8.10)	(10.27)	(12.81)	(26.87)	(6.82)	(5.68)	(0.29)	(0.25)	(0.370	(0.15)
	118.36	113.31	73.17	71.73	15.24***	10.31	2.15	2.36	-0.29	0.11
1970	(13.81)	(11.12)	(9.58)	(26.80)	(5.02)	(3.07)	(0.27)	(0.40)	(0.27)	(0.04)
	148.11	140.09	56.49	70.02	11.77	10.22	1.94	2.33	-0.13	0.32
1971	(32.95)	(22.40)	(19.09)	(28.98)	(3.70)	(3.06)	(0.34)	(0.01)	(0.37)	(0.12)
	145.27	173.18	54.28	70.61	12.49	9.98	2.08	1.85	0.24	0.43
1972	(30.05)	(19.06)	(19.88)	(30.85)	(4.93)*	(2.67)	(0.53)	(0.16)	(0.34)	(0.04)
	110.06	183.89	50.96	63.97	12.68	9.79	2.59	2.23	0.01	0.12
1973	(8.21)***	(86.06)	(12.14)	(21.70)	(4.11)*	(2.08)	(0.46)	(0.03)	(0.22)	(0.18)
	107.74	115.92	47.27	65.66	11.37	9.52	2.63	2.97	-0.75 *	-0.14
1974	(9.12)	(25.72)	(16.56)	(25.25)	(3.31)	(2.02)	(0.39)	(0.54)	(0.30)	(0.30)
	93.45	99.13	52.61	69.60	10.33 *	7.97	2.00	1.33	-0.57 *	-0.05
1975	(13.33)	(10.55)	(12.75)	(46.16)	(2.34)	(1.84)	(0.42)	(0.50)	(0.27)	(0.08)
	102.61	96.02	48.89	70.18	10.28	7.22	2.05	1.48	-0.37 *	0.14
1976	(6.43)	(4.13)	(21.19)	(37.84)	(3.54)**	(1.57)	(0.35)	(0.45)	(0.23)	(0.25)

Industry	Trading companies						Metals, minerals wholesales trade			
Finan. ratio	Retained earnings to equity		Net sales growth ratio		Net sales per employee		Ordinary profit to equity		Net profit to total assets	
Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
1962	0.86 * (0.38)	1.76 (0.80)	103.66 (1.54)*	107.23 (5.20)	2640.06 (604.98)	3414.24 (507.29)				
1963	0.93 (0.25)	1.42 (0.50)	130.33 (11.74)	127.22 (0.12)	3080.70 (611.36)	4045.04 (589.48)				
1964	0.63 (0.34)	0.70 (0.30)	121.22 (6.96)	115.98 (0.99)	3444.38 (600.22)	4459.90 (728.51)	3.76 *** (0.35)*	7.85 (2.11)	0.37 (0.21)	0.52 (0.37)
1965	1.20 (1.30)	0.87 (0.03)	106.36 * (4.16)	118.78 (10.85)	3479.25 * (523.62)	4756.24 (696.24)	2.04 (1.82)	4.78 (2.55)	0.28 (0.29)	0.30 (0.21)
1966	4.22 (9.46)	1.15 (0.14)	114.49 (8.38)	117.27 (1.14)	3893.31 (472.82)	4652.84 (663.09)	2.45 (0.97)**	9.72 (10.32)	0.24 (0.16)	0.34 (0.24)
1967	0.88 (0.67)	1.34 (0.18)	114.32 (7.79)	120.68 (5.04)	4419.82 (474.63)	5240.95 (266.38)	2.97 (1.15)***	32.94 (65.20)	0.22 (0.14)	0.40 (0.19)
1968	0.93 (0.67)	1.63 (0.17)	114.33 (5.58)	115.57 (2.34)	4931.21 * (564.08)	5945.56 (152.63)	3.78 (1.07)**	12.45 (13.30)	0.23 * (0.16)	0.43 (0.11)
1969	1.32 (0.61)	1.76 (0.27)	120.80 (7.03)	129.69 (1.37)	5864.09 (744.82)	7148.50 (214.46)	6.49 (4.02)*	5.10 (18.64)	0.51 (0.62) *	0.37 (0.21)
1970	1.61 (0.52)	1.70 (0.06)	120.72 (5.28)	123.48 (2.91)	6960.90 (1069.82)	8363.13 (256.42)	7.28 (6.06)	13.53 (18.88)	0.55 (0.65) *	0.35 (0.21)
1971	0.68 (0.30)	1.11 (0.25)	108.51 (5.65)	110.81 (0.70)	7304.32 (1175.79)	8850.10 (100.43)	4.35 (4.94)*	15.51 (27.79)	0.09 (0.05)	0.23 (0.20)
1972	2.38 (0.66)	1.96 (0.49)	119.66 (5.39)	117.06 (3.92)	8580.18 * (1181.31)	10880.48 (832.22)	5.23 (5.15)*	14.59 (25.27)	0.52 (0.77)	0.38 (0.32)
1973	2.57 (0.57)	1.95 (0.19)	149.76 (10.12)	142.62 (2.75)	12702.47 (1970.24)	16793.32 (3838.17)	4.37 (2.29)*	15.05 (15.64)	0.23 (0.13) *	0.73 (0.86)
1974	1.21 (0.80)	1.70 (0.13)	125.10 (6.14)	124.79 (1.29)	15583.45 * (2447.06)	21196.37 (3712.80)	6.95 (5.83)	6.67 (2.54)	0.33 (0.30)	0.29 (0.22)
1975	1.09 (0.84)	1.46 (0.22)	99.52 (8.85)	94.37 (3.95)	15392.69 (3361.76)	19469.35 (4182.21)	2.64 (1.60)*	8.10 (9.40)	0.16 (0.17)***	1.22 (2.74)
1976	0.66 (0.64)	1.47 (0.50)	108.29 (4.70)	109.79 (6.60)	16806.86 (3455.71)	20459.21 (4784.72)	5.24 (4.77)	5.88 (3.50)	0.23 (0.37)	0.33 (0.36)

Industry	Metals, minerals wholesales trade						Department stores		Real estate	
Finan ratio	Operating profit to net sales		Financial costs to debt and bills receiv.		Depreciation and retained earnings to equity		Net sales to debt		Net sales to tangible fixed assets	
Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg
1962										
1963										
1964	2.94 (3.27)	3.78 (2.78)	2.40 * (2.70)	6.41 (2.85)	3.07 (3.13)***	36.74 (89.87)				
1965	3.45 (4.85)	3.22 (2.86)	2.99 (2.96)	5.79 (2.45)	2.96 (2.86)***	17.54 (40.94)				
1966	2.30 (2.66)	3.08 (2.43)	2.70 (2.10)	4.91 (1.93)	2.79 (2.45)***	50.17 (27.50)	5.12 * (0.32)*	4.61 (1.28)		
1967	1.66 (1.40)	2.46 (0.81)	2.96 (1.82)	4.83 (2.15)	3.38 (3.16)***	42.83 (106.11)	3.19 * (0.85)*	4.72 (1.21)		
1968	1.34 * (0.57)	2.49 (0.78)	3.04 (1.26)	5.13 (1.93)	4.64 (5.92) *	17.24 (36.32)	4.93 (1.04)*	30.19 (69.56)		
1969	5.07 (7.97)****	2.22 (1.22)	2.91 (1.31)	4.85 (1.72)	5.75 (6.82)	9.25 (14.53)	5.44 (1.05)*	14.72 (21.47)		
1970	6.68 11.03)****	2.22 (0.82)	2.84 * (1.58)	5.13 (1.63)	6.33 (7.38)	10.37 (19.10)	5.17 (1.21)*	13.20 (22.09)		
1971	4.21 (6.69)****	1.33 (0.91)	3.21 (1.91)	4.71 (1.73)	3.46 (4.20) *	10.72 (21.63)	4.56 (1.79)*	11.89 (21.59)		
1972	5.26 (8.83)****	2.05 (1.06)	2.80 (1.91)	4.26 (2.01)	5.07 (7.09)	11.32 (21.59)	4.43 (1.75)*	10.56 (16.84)	1.66 (0.66)	17.66 (21.11)
1973	0.90 * (0.55)	3.11 (1.56)	2.45 * (1.16)	5.02 (2.06)	2.08 (0.71)***	13.16 (26.86)	4.37 (1.49)*	12.36 (21.81)	1.54 (0.56)	10.09 (9.39)
1974	1.53 (1.42)	2.89 (1.65)	4.19 * (1.81)	6.43 (1.27)	2.41 (1.86)	3.47 (0.80)	4.19 (1.32)*	13.85 (27.13)	1.45 (0.44)	6.90 (3.66)
1975	0.92 (0.35)	1.59 (0.83)	4.30 (5.34)	6.26 (3.04)	1.18 (0.36)***	10.78 (18.70)	3.97 (1.28)*	24.53 (64.15)	0.88 * (0.16)	5.01 (1.95)
1976	0.58 **** (0.28)	1.68 (0.43)	3.14 (3.81)	4.55 (1.61)	1.12 * (0.69) *	4.81 (3.64)	3.96 (1.14)*	60.31 (178.97)	1.09 (0.04)	5.40 (2.80)

Industry	Railroad transportation								Deep sea transportation	
Financial ratio	Liquid assets ratio		Ordinary profit to equity		Selling and management expenses to net sales		Depreciation ratio		Ordinary profit to net sales	
Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg	Merg.	Non-merg.
	66.74	134.05	3.48 *	2.10	3.12 *	6.58	6.99	6.11	1.40	2.25
1962	(11.43)	(27.95)	(1.25)	(1.16)	(1.52)	(3.47)	(1.64)	(2.57)	(0.88)***	(3.01)
	74.48	105.83	4.07 *	2.50	3.10	6.26	6.59	6.00	3.44	5.84
1963	(21.71)*	(66.65)	(1.26)	(1.18)	(1.56)	(3.46)	(0.93)	(1.25)	(2.49)	(4.82)
	91.10	114.53	3.56	2.44	3.18	6.12	6.82	6.85	4.04	6.21
1964	(32.46)	(88.13)	(1.19)	(1.13)	(1.45)	(3.50)	(0.85)	(0.91)	(2.89)*	(6.77)
	117.90	131.60	3.63	2.96	3.07	5.83	6.59	6.62	4.14	6.81
1965	(57.25)	(86.35)	(0.59)*	(2.66)	(1.49)	(3.03)	(0.72)	(0.97)	(2.48)*	(6.05)
	113.32	125.63	5.13 *	2.70	3.07	6.01	6.36	6.05	7.20	9.57
1966	(53.51)	(71.14)	(2.11)	(1.55)	(1.42)	(3.16)	(0.80)	(1.59)	(2.53)	(3.82)
	114.78	143.39	4.54 *	2.76	3.05	5.71	6.44	5.60	6.73	10.44
1967	(48.97)	(88.20)	(1.03)	(1.33)	(1.53)	(2.74)	(0.73)	(1.62)	(2.53)	(4.58)
	128.52	148.01	4.11 *	2.67	3.17 *	5.64	6.50	5.63	6.03	8.14
1968	(68.88)	(65.98)	(0.83)	(1.12)	(1.61)	(2.15)	(0.72)	(1.48)	(1.59)*	(4.38)
	137.29	142.35	4.16 *	2.44	3.01 *	5.49	6.04	5.64	4.04	6.42
1969	(83.09)	(48.32)	(1.21)	(1.38)	(1.55)	(2.00)	(0.64)	(1.19)	(1.77)	(2.53)
	152.16	152.03	4.15	2.86	3.24 *	5.54	6.15	5.62	6.41	7.17
1970	(80.25)	(42.85)	(1.48)	(1.11)	(1.86)	(2.09)	(0.63)	(1.04)	(2.45)	(1.92)
	156.62	193.59	4.12	3.70	5.03	4.92	6.47 *	5.49	3.84	3.22
1971	(68.33)	(69.38)	(0.86)	(1.27)	(4.74)***	(1.62)	(0.62)	(0.93)	(2.72)	(2.23)
	136.73	201.40	3.98	3.24	4.82	3.44	6.29 *	5.36	4.11	5.51
1972	(36.43)	(95.46)	(0.43)*	(1.59)	(3.95)**	(1.57)	(0.68)	(0.87)	(2.81)	(3.16)
	120.34 *	190.96	2.32	2.58	4.98	3.65	5.33	5.14	5.63	6.37
1973	(27.36)*	(83.44)	(1.04)	(1.09)	(4.22)*	(1.74)	(1.21)	(0.71)	(1.68)	(3.44)
	124.51	176.94	2.68	2.45	5.23	4.53	5.57 *	4.63	5.51	5.24
1974	(37.88)	(67.16)	(1.28)	(1.77)	(4.06)	(2.25)	(0.82)	(0.76)	(2.51)	(4.19)
	130.35	175.39	3.64	5.19	11.39	6.69	4.95	4.52	1.10 *	4.79
1975	(35.28)	(58.50)	(2.90)*	(11.84)	(8.44)	(4.52)	(1.55)	(0.82)	(1.10)*	(2.77)
	127.99	165.01	2.22	5.85	10.30	6.65	4.70	4.37	1.14 *	4.52
1976	(26.73)	(58.94)	(1.20)***	(12.77)	(7.86)	(3.94)	(1.60)	(0.90)	(0.83)***	(2.84)

Industry			Hotels		Motion picture and amusement			
Financial ratio	Value added per employee		Financial cost to debt and bills receivable		Selling and management expenses net sales		Net sales per employee	
Year	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.	Merg.	Non-merg.
	26.47	28.42			13.71	26.52	139.73	70.26
1962	(10.96)	(14.77)			(2.67)*	(18.85)	(199.25)****	(14.48)
	46.43	76.74			14.14	28.53	142.80	74.78
1963	(13.98)****	(78.19)			(5.95)	(15.53)	(189.22)****	(15.91)
	69.00 *	40.90			13.82 *	27.48	167.92	92.02
1964	(28.47)	(16.01)			(5.15)	(11.77)	(226.81)****	(14.60)
	59.58	51.53			14.32	27.36	155.86	103.57
1965	(16.89)	(9.53)			(6.02)	(13.06)	(210.62)****	(26.07)
	77.16	68.31			13.28	27.46	162.71	116.11
1966	(18.17)	(8.55)			(5.90)	(13.13)	(182.97)****	(39.59)
	86.71	82.85			11.22 *	25.52	201.38	149.65
1967	(18.51)	(22.95)			(4.55)	(12.46)	(200.83)*	(71.92)
	97.23	88.91			12.09 *	28.16	224.10	178.61
1968	(15.62)	(29.52)			(4.95)	(13.19)	(231.36)	(141.89)
	101.07	97.33			12.81 *	29.04	255.49	228.39
1969	(23.02)	(33.14)			(4.77)	(14.08)	(258.23)	(211.42)
	129.22	117.81			12.27 *	29.42	293.52	292.13
1970	(39.23)	(41.58)			(6.33)	(16.25)	(268.95)	(317.60)
	135.31	111.79			8.63 **	25.92	397.69	252.75
1971	(47.61)	(34.86)			(4.51)*	(16.53)	(265.57)	(153.50)
	138.94	110.77			10.90	27.29	392.27	239.21
1972	(46.91)	(42.02)			(7.48)	(18.79)	(251.29)*	(104.68)
	217.86	190.67			10.25	27.16	455.68	266.74
1973	(67.87)	(83.35)			(6.36)	(18.06)	(239.44)	(122.24)
	288.55	237.74	4.33 *	8.06	10.20	20.42	600.66	316.04
1974	(80.61)	(61.70)	(1.86)	(1.35)	(6.36)	(10.66)	(278.37)	(128.50)
	223.35	200.53	4.79	8.64	9.70	20.49	633.55 *	339.83
1975	(50.01)	(58.90)	(0.57)	(2.77)	(5.71)	(11.41)	(259.22)	(154.69)
	220.84	205.58	3.85	8.40	9.87 *	27.02	514.77	384.97
1976	(70.29)	(60.81)	(0.19)*	(2.42)	(6.46)	(15.01)	(140.12)	(196.67)

Table 4-3 Discriminant analysis between merging and nonmerging firms (2)

Industry / Year	Beverages	Miscellaneous food	Pulp mills and paper mills	Industrial organic chemicals	Wire and cable	Bearings and valves	Elect. indus. appara.	Ship and boat building and repairing
1958				3.66*				
1959	12429.10**			3.54*				
1960	160.39			3.99**				
1961	151.71			2.59				
1962	10.97		4.47**	2.72				
1963	211.78		4.87***	3.46*	18.76			27.06*
1964	13.22*		3.82*	3.12	3.93	3.99	1.79	611.91*
1965	367.53***		3.99*	2.79	9.23***	3.05	1.41	3443.83*
1966	45.64**	50.68****	3.19*	2.50	396.84***	5.11	2.21	621.37*
1967	512.24****	21.63**	1.76	2.35	9.90	2.82	1.21	74.28
1968	88.94****	124.07****	4.54*	3.63*	4.04	1.75	1.78	5.48
1969	41.88***	4.18	1.54	2.96	3.72	3.47	1.61	4714.67****
1970	26209.09***	45.78***	1.85	2.83	12.98*	1.64	2.98	274.88*
1971	1258.92*	3.99	4.10**	3.59*	2.18	1.73	2.40*	36.94
1972	314.51*	4.38	2.88*	5.61**	1.53	3.23	1.42	1148.02*
1973	5013.85**		1.06	6.55***		2.16	1.57	37.00
1974	5184.71*	1.36	3.34*	11.69****	1.09*	4.98	2.06	241.94*
1975	7903.93**	213.50	3.84*	3.10*	1.44		1.91	6301.60**
1976	56.60**	5.89*	4.47**	3.17*	4.34	1.88	1.88	111.65

Industry Year	Civil engin. and construc.	Trading companies	Metals minerals wholesal trade	Depart-ment stores	Railroad trans.	Deep sea trans.	Motion pictures and amusement
1962		9.60 *			14.16 ****	2.92	7.84 ***
1963		48.24			12.90 ****	3.36	3.68 *
1964		991.86 *	11.71 **		16.46 ****	2.86	23.93 ****
1965		893.30 *	6224.75 **		16.00 ****	3.95	23.73 ****
1966	2.00	9.19 *	347.91 *	4.32 *	7.70 ****	3.48	15.57 ****
1967	1.69	15.09 *	5.06 *	6.27 **	12.29 ****	1.38	18.55 ****
1968	2.06	7283.89 **	11.87 **	6.18 **	16.14 ****	1.44	124.76 ****
1969	2.01	29884.67 ****	10.74 **	3.45 *	10.84 ****	9.30 ***	17.97 ****
1970	3.04 *	121.06	4.50 *	3.11	6.65 ***	5.08 *	3.10
1971	1.30	650.26 *	19.01 *	7.09 *	5.74 **	8.26 ***	4.18 *
1972	2.48	70.11	5.02 *	5.43 *	5.49 **	2.29	8.66 ***
1973	2.47 *	349.05 *	5.30 *	12.78 *	4.16 *	2.48	4.55 *
1974	1.89	157.00	2780.42 *	5.27 *	19.14 ****	1.25	3.41
1975	3.46 *	27105.21 ***	11.07 *	3.53 *	3.06 *	3.91	7.06 **
1976	5.83 *	181.72	84.61 *	4.06 *	3.78 *	5.14 *	4.05 *

Hotels, real estate industries cannot be computed for discriminant analysis because of shortage of data.

CHAPTER 5 INDUSTRIAL COMPARISON OF FINANCIAL CHARACTERISTICS BETWEEN MERGING AND NONMERGING FIRMS

I. Introduction

In chapter 2, we stated that after mergers, net profit to total assets are worse than before mergers, based on the examination of 15 merging firms, and that the comparison between 90 merging and 488 nonmerging firms showed negative effects on net worth to total assets in the merging firms compared with nonmerging firms.

The difference suggests that it is quite difficult to segregate and measure the effects of mergers because of the difficulty of comparing across industries, and because of comparisons made at times before and after mergers.

In this chapter, we compare the financial characteristics of merging and nonmerging firms in general by using combined and yearly aggregated data of chapter 3 and 4 based on industry to avoid these biases as much as possible. Our study does not measure the direct effect of mergers, but compares the financial characteristics of merging and nonmerging firms.

II. Hypothesis, Data

Our hypothesis is that there are no differences in financial ratios between merging and nonmerging publicly traded firms by industry in Japan. We test this hypothesis by both univariate and multivariate analyses in the 30 industries.

Factor analysis was applied to reduce the number of 61 variables of 30 industries for the period from 1955 through 1977. We selected one representative financial ratio with the highest load (underlined) from each factor to reduce the number of financial ratios by using factor analysis

for 30 industries. There are 15 factors whose eigenvalue is larger than unity. Thus, 15 financial ratios have been selected for the comparison of financial characteristics between merging and nonmerging firms as shown in Table 5-2, which means that we have at least one representative financial ratio for each class of financial ratios except profit distribution ratios, like in Appendix B.

In Japan, the rate of sales growth and level of profit are considered the most important as pointed out by the survey conducted by Shimizu (1980). Therefore, net profit growth ratio, total assets growth ratio, net sales to tangible fixed assets, operating profit to ordinary capital, ordinary profit to equity, retained earnings to equity and equity per share are very important ratios. Next to these ratios, liquid assets ratio, value added per employee and other costs or expenses related ratios come up.

III. Industrial Comparison by Univariate Analysis

We compare 15 financial ratios between merging and nonmerging firms by using t and F tests in each of 30 industries the result of which is shown in Table 5-2.

We make a two-tailed test of the null hypothesis of no significant differences between merging and nonmerging firms.

In the printing industry, five ratios have statistically significant differences by t test: turnover period of commodity and product (0.20 vs. 0.32), personnel expenses to net sales (14.93 vs. 22.76), financial costs to debt and bills receivable (4.99 vs. 6.69), selling and management expenses to net sales (7.50 vs. 13.05), and equity per share (5.23 vs.4.01) for merging and nonmerging firms, respectively. On all of them, merging firms have advantages over nonmerging firms. F test of these ratios, except the last one, shows statistically significant differences at the 0.1% level

and indicates larger dispersion of ratios in nonmerging firms than merging firms, i.e., instability of financial ratios in nonmerging firms. The same fact can be found in other nine ratios with statistical differences by F test.

In the ordinary steel and allied product industry, in which the merger[1] between Yahata Steel Corporation and the Fuji Steel Corporation caused a big controversy in the late 1960s in Japan, means of ratios having statistically significant differences are 4.52 vs. 5.83 on ordinary profit to net sales, 1.90 vs. 2.90 on net sales to tangible fixed assets, 1.16 vs. 1.48 on net sales to total liabilities, 4.30 vs. 7.70 on ordinary profit to equity, 0.88 vs. 3.84 on retained earnings to equity, and 7.42 vs. 6.58 on selling and management expenses to net sales for merging and nonmerging firms on all of which nonmerging firms have better financial characteristics than merging firms with statistical differences by t test. F test shows statistical differences of 12 ratios at the 0.1% level and indicates that nonmerging firms have bigger dispersion to merging firms, meaning more instability of ratios in nonmerging firms, except selling and management expenses.

Finally, in the warehousing industry, means of five ratios, 7.10 vs. 10.32 on ordinary profit to net sales, 0.92 vs. 1.33 on net sales to total liabilities, 1.92 vs. 0.88 on turnover period of accounts payable, 121.32 vs. 146.03 on liquid assets ratio, 3.41 vs. 4.37 on equity per share for merging and nonmerging firms, respectively, are favorable for nonmerging firms. By contrast, four other ratios are 0.05 vs. 0.29 on turnover period of commodity and product, 4.40 vs. 3.88 on ordinary profit to equity, 40.74 vs. 50.58 on personnel expenses to net sales, 6.45 vs. 12.66 on selling and management expenses to net sales, indicating better performance for merging firms. Therefore, no definite comparative advantages can be established in

this industry.

By the comparison of financial ratios between merging and nonmerging firms for the remaining 27 industries by the same way, 14 out of 30 industries demonstrate better performance for nonmerging firms compared to merging firms, as shown in the category A of Table 5-3. Only five industries have superiority for merging firms in the category B, and the remaining 11 industries show no significant differences.

As a general trend, we can conclude that merging firms have inferior financial characteristics to nonmerging firms.

IV. Industrial Comparison by Discriminant Analysis

We apply stepwise discriminant analysis[2] for the same data to distinguish merging and nonmerging firms by 61 financial ratios based on each industry, aiming to strengthen the result of univariate analysis. As a stepwise procedure, largest distance between closest groups (MAHAL) method was used and for setting minimum criteria, 0.1 was specified for each of F-to-enter and F-to-removal automatically, as well as FIN and FOUT of SPSS. The result is shown in Table 5-4.[3]

In the upper hand left corner reporting the case of the beverages industry, the sum of the diagonal element, 72 + 72 = 144, which represents the total number of correct discriminations, when divided into the total number of cases 144, yields the measure of correct classification, or accuracy, 100%. Of 28 industries, 18 industries have accuracy over 90%, 7 industries between 90% and 80% and the remaining 3 industries less than 72%. For all industries, the accuracy is between the highest (100% in the beverages and the trading companies) to the lowest (67.56% in the motion pictures and amusement). In two industries, real estate and hotels, the number of cases is not enough for computation. The F test for discriminant

analysis shows statistically significant differences at the 0.1% level between merging and nonmerging firms of all the rest 28 industries. Both results indicate that different statistical characteristics between merging and nonmerging firms are measured statistically. This finding supports the result of univariate analysis.

If we compare the effects of the number of financial ratios to apply for discriminant analysis with the same stepwise method between 61 and 15, the representative financial ratios, the discriminant analysis of real estate and hotels industries is obtained and the accuracy of these industries is 100% for each of them. However, accuracy of other industries is reduced in 20 industries and increased in seven industries, with no effect in only one industry, in the case of 15 variables compared with the case of 61 variables, all of which are shown in Table 5-5. If we employ only four variables, that is, liquid assets ratio, total liabilities to equity, turnover ratio and net profit to total assets like in chapter 2, the classification accuracy of all industries becomes lower than the level by 15 variables. Discrimination by F test between merging and nonmerging firms is not found in four industries, the pulp mills and paper mills, the electrical industrial apparatus, the civil engineering and construction and the miscellaneous retail industry.

There is a general trend that the more variables we use for discriminant analysis, the higher classification accuracy we get.

The discriminant function of the beverage industry, for example, is given in Table 5-6.

The centroid of Z, the discriminant value is 0.93516 for merging firms and - 0.93516 for nonmerging firms. Thus, if Z value is positive for a given sample, this sample is considered to be nonmerging firm and if

negative, to be merging firm.

V. Conclusion

We find statistically significant inferiority of financial characteristics for merging firms based in 14 out of 30 industries, and no significant differences in 11. In the remaining five industries merging firms have superior financial characteristics.

There are two possible explanations for these results. The first one is that nonmerging firms have better performance even before mergers (compared with merging firms in the same industry), and the second one is that mergers have negative effects on financial characteristics of merging firms after mergers. Our analysis does not distinguish these two cases in order to avoid two types of biases mentioned before. Nevertheless, it implies that merging means associating with a group of firms with poor performance, compared with nonmerging group as a whole.

The Fair Trade Commission of Japan (1981) has intensified the regulation of mergers by reducing the market share criterion from 30% to 25% and carrying out severe examination of mergers which exceed this level.

The recent merger movement aimed at survival in an ailing industry reflects the present slow economic growth, and is intended to reorganize and restructure the industry with the support and guidance of Ministry of International Trade and Industry (MITI) in Japan.

Footnotes

1. The new firm, the Nippon Steel Corporation, is the largest steel manufacturing firm in the world, and results from the largest merger in Japan. However, its market share went down 4% to 31%, ten years after the merger.

2. Multivariate analysis were performed based on the assumption of multivariate normality. In most cases, each financial ratio is considered to have the normal distribution. There are some ratios which have rather biased distributions like liquid assets, net sales to fixed assets (biased to the left) and fixed assets to equity (biased to the right). See Okuno (1978). Quadratic multivariate analysis is necessary when the assumption of multivariate normality is not considered to exist.

3. Multicollinearity of 15 variables seems to be a problem. However, Okuno (1978) (pp.102-103) reports that 6 factors resulting from factor analysis of 24 financial ratios have correlation coefficient between 0.69 and -0.60, indicating that multicollinearity can be ignored in this kind analysis with financial ratios in Japan.

Table 5-1. 15 factors whose eigenvalue is larger than unity

(Underlined ratios are representative variables with the highest load in each factor.)

Factor 1 =	0.85014 x	ordinary profit to total assets
+	0.79199 x	net profit to total assets
+	0.80967 x	operating profit to ordinary capital
+	0.79735 x	ordinary profit and financial cost to total assets
+	0.87168 x	ordinary profit to net sales
+	0.72651 x	net profit to net sales
Factor 2 =	0.94977 x	net sales to buildings and equipment
+	0.95630 x	net sales to tangible fixed assets
+	0.73464 x	net sales to fixed assets
Factor 3 =	0.85307 x	inventory turnover period
+	0.92667 x	turnover period of commodity and product
Factor 4 =	0.94763 x	value added per employee
+	0.80645 x	personnel expenses per employee
Factor 5 =	0.68830 x	net sales to total liabilities
Factor 6 =	0.92429 x	ordinary profit to equity
+	0.86981 x	depreciation and retained earnings to equity
Factor 7 =	0.97851 x	total assets growth ratio
Factor 8 =	0.87355 x	personnel expenses to net sales
+	0.82573 x	value added to net sales
Factor 9 =	0.82655 x	turnover period of accounts receivable
+	0.87998 x	turnover period of accounts payable

Factor 10 = 0.82515 x quick ratio

+ 0.87512 x liquid assets ratio

Factor 11 = 0.84867 x net profit to equity

+ 0.87584 x retained earnings to equity

Factor 12 = 0.72215 x net sales to debt

+ 0.81300 x financial costs to debt and bills receivable

Factor 13 = 0.73426 x growth income on sales

+ 0.85535 x operating profit to capital

Factor 14 = 0.64068 x dividend to average capital

+ 0.67030 x ordinary profit to capital

+ 0.77503 x equity per share

Factor 15 = 0.62837 x dividend to net profit after taxes

+ 0.66347 x net profit growth ratio

Table 5-2. Means and standard deviations of merging and nonmerging firms by industry

Industries / Financial ratios / Firms	Beverages		Miscella. food		Silk-reeling		Pulp mills paper mills		Printing		Agricultural chemicals		Industrial inorganic chemicals		Industrial organic chemicals	
	M	N	M	N	M	N	M	N	M	N	M	N	M	N	M	N
Ordinary profit to net sales	4.59	10.76	4.22	5.05	3.37	4.30	4.11	4.35	5.93	5.71	3.48	3.78	4.87	6.15	4.28	4.50
	(3.02)	(6.35)	(2.70)	(4.39)	(3.52)	(2.77)	(3.19)	(3.78)	(2.21)	(3.52)	(2.83)	(4.28)	(3.06)	(4.25)	(2.50)	(3.38)
Net sales to tang. fixed assets	4.01	2.45	4.55	5.33	9.40	5.72	1.86	2.00	3.90	3.77	2.54	0.79	2.77	2.97	2.02	3.07
	(2.04)	(0.60)	(2.67)	(2.26)	(5.60)	(1.25)	(0.52)	(0.61)	(0.56)	(1.31)	(1.13)	(2.58)	(1.06)	(1.44)	(0.87)	(1.81)
Turnover period of commo. & products	1.21	0.50	0.54	0.60	1.03	0.55	0.73	0.57	0.20	0.32	1.06	0.94	0.80	0.86	1.01	0.95
	(0.57)	(0.37)	(0.18)	(0.33)	(0.49)	(0.21)	(0.37)	(0.37)	(0.11)	(0.34)	(0.41)	(0.70)	(0.60)	(0.51)	(0.36)	(0.46)
Value added per employee	37.49	74.66	60.10	59.64	26.59	26.60	53.17	48.66	52.95	45.67	71.47	52.76	48.53	59.77	50.26	51.95
	(22.15)	(46.88)	(27.74)	(39.68)	(14.80)	(15.29)	(33.07)	(32.82)	(30.97)	(26.30)	(45.55)	(26.11)	(25.27)	(32.04)	(30.77)	(36.65)
Net sales to total liabilities	1.38	1.65	2.02	2.15	1.97	1.74	1.05	1.05	2.22	2.18	1.01	1.48	1.48	1.61	0.96	1.37
	(0.29)	(0.48)	(0.81)	(0.94)	(0.62)	(0.50)	(0.26)	(0.27)	(0.18)	(0.71)	(0.30)	(0.60)	(0.64)	(0.65)	(0.20)	(0.51)
Ordinary profit to equity	3.09	5.72	6.01	6.34	7.87	6.63	5.95	10.69	6.57	7.59	9.65	10.53	4.76	7.68	3.99	5.21
	(2.25)	(1.76)	(4.55)	(5.30)	(11.19)	(9.50)	(8.73)	(48.43)	(1.96)	(9.80)	(10.93)	(17.26)	(2.73)	(11.34)	(2.81)	(4.80)
Equity growth rate	112.37	113.32	108.54	113.26	114.86	109.19	113.58	112.31	117.51	115.39	108.59	106.61	112.63	114.25	113.89	113.07
	(11.97)	(11.48)	(13.37)	(13.26)	(18.39)	(12.14)	(13.90)	(15.58)	(9.46)	(15.82)	(16.88)	(16.12)	(11.29)	(15.45)	(11.21)	(12.73)
Personnel expenses to net sales	12.54	12.45	13.72	14.28	8.67	13.13	13.68	13.04	14.93	22.76	12.34	16.62	17.09	5.76	13.15	15.52
	(2.18)	(4.41)	(6.99)	(5.41)	(3.51)	(1.67)	(3.47)	(4.87)	(2.58)	(6.22)	(3.06)	(9.57)	(3.17)	(4.21)	(3.93)	(6.90)
Turnover period of accounts payable	2.29	1.25	2.38	1.78	1.69	0.87	3.50	3.87	2.81	2.66	3.57	2.83	3.54	3.29	3.73	3.24
	(0.70)	(0.45)	(1.00)	(0.76)	(0.57)	(0.25)	(1.27)	(1.19)	(0.29)	(1.06)	(0.81)	(0.86)	(0.74)	(0.89)	(1.27)	(0.89)
Liquid assets ratio	123.94	117.65	102.27	117.86	117.63	119.50	92.28	93.15	103.02	107.47	89.63	99.39	104.70	113.88	92.61	102.83
	(18.02)	(46.22)	(17.50)	(19.44)	(15.42)	(22.27)	(17.28)	(23.57)	(8.34)	(20.10)	(17.55)	(21.07)	(17.99)	(21.38)	(13.81)	(23.39)
Retained earnings to equity	0.67	1.28	2.27	2.35	4.04	3.21	2.27	3.99	2.15	3.24	7.44	9.47	1.71	3.27	0.82	2.85
	(0.82)	(0.59)	(2.27)	(5.36)	(11.43)	(9.20)	(6.53)	(9.22)	(0.97)	(7.56)	(12.24)	(19.93)	(1.56)	(8.39)	(1.13)	(9.64)
Financial costs to debt & bills recei.	6.01	4.58	6.97	5.25	5.01	4.34	6.44	6.68	4.99	6.69	7.99	6.07	6.23	5.80	6.37	5.88
	(0.98)	(5.19)	(2.23)	(2.45)	(1.61)	(0.92)	(1.30)	(1.56)	(0.96)	(1.98)	(2.54)	(1.56)	(0.90)	(2.06)	(1.63)	(1.24)
Sell. & management expen. to net sales	26.68	31.66	18.16	20.37	5.49	5.52	9.87	9.40	7.50	13.05	13.39	14.15	18.24	13.54	12.36	11.73
	(6.49)	(6.87)	(8.37)	(8.62)	(1.66)	(2.05)	(1.86)	(2.33)	(1.15)	(2.64)	(2.70)	(4.67)	(3.97)	(3.93)	(3.20)	(3.41)
Equity per share	3.42	4.77	60.10	59.64	3.43	4.30	4.21	4.09	5.23	4.01	2.23	3.29	3.65	4.19	3.28	3.59
	(0.72)	(1.13)	(27.74)	(39.68)	(0.98)	(1.86)	(1.58)	(2.33)	(2.00)	(2.14)	(0.93)	(1.50)	(1.12)	(2.39)	(0.65)	(1.35)
Net profit growth rate	168.16	110.47	212.16	172.46	416.47	212.20	218.32	184.71	115.96	147.11	592.33	269.84	116.56	143.38	380.43	204.58
	(356.53)	(15.91)	(413.18)	(339.08)	(1772.35)	(335.07)	(425.33)	(453.56)	(14.28)	(192.89)	(1378.89)	(761.45)	(48.20)	(131.37)	(2004.13)	(668.69)

Table 5-2. (Continued)

Industries / Financial ratios / Firms	Ordinary steel & allied pro.		Special steel & allied pro.		Wire cable		Metalwork. machinery equipment		Bearings and valves		Electrial industrial apparatus		Misce. electri. machinery		Motor vehicles equipment		Ship & boat buil. & repair.	
	M	N	M	N	M	N	M	N	M	N	M	N	M	N	M	N	M	N
Ordinary profit to net sales	4.52	5.83	4.38	3.80	3.30	3.19	13.07	9.98	9.91	6.75	4.26	5.70	6.03	7.26	5.46	5.82	5.11	4.08
	(2.90)	(5.13)	(2.75)	(2.98)	(2.15)	(1.99)	(9.48)	(6.80)	(6.89)	(4.68)	(2.30)	(4.75)	(4.73)	(5.25)	(2.70)	(3.60)	(2.27)	(3.09)
Net sales to tang. fixed assets	1.90	2.90	2.68	3.05	5.32	5.29	4.55	4.47	4.28	4.65	6.88	5.52	8.96	6.04	3.75	3.88	4.12	3.84
	(0.72)	(1.96)	(1.39)	(1.55)	(1.44)	(1.61)	(1.69)	(1.46)	(3.10)	(3.41)	(3.64)	(3.75)	(3.61)	(2.94)	(0.92)	(1.41)	(7.75)	(1.12)
Turnover period of commo. & products	0.58	0.56	0.50	0.70	0.70	0.83	1.61	0.79	2.09	0.93	0.96	1.07	0.67	0.63	0.72	0.80	0.07	0.00
	(0.23)	(0.27)	(0.26)	(0.37)	(0.27)	(0.33)	(1.04)	(0.80)	(5.88)	(0.39)	(0.69)	(0.57)	(0.22)	(0.37)	(0.40)	(0.53)	(0.06)	(0.00)
Value added per employee	45.41	53.73	47.23	43.05	44.64	44.17	38.46	38.48	45.93	48.21	39.52	38.85	44.98	42.74	48.82	44.02	36.83	34.08
	(29.32)	(45.00)	(27.35)	(25.09)	(26.01)	(23.38)	(21.76)	(24.01)	(24.05)	(24.04)	(18.93)	(21.34)	(25.01)	(28.71)	(26.80)	(23.25)	(22.99)	(19.87)
Net sales to total liabilities	1.16	1.48	1.26	1.19	1.46	1.68	1.45	1.38	1.42	1.48	1.76	1.45	1.93	2.07	1.78	1.64	0.68	0.66
	(0.37)	(0.84)	(0.47)	(0.38)	(0.29)	(0.44)	(0.58)	(0.62)	(0.70)	(0.45)	(1.03)	(0.66)	(0.58)	(0.87)	(0.40)	(0.48)	(0.12)	(0.26)
Ordinary profit to equity	4.30	7.70	4.99	9.53	4.51	6.48	5.73	6.63	6.88	6.24	3.75	4.68	7.87	7.74	6.24	5.96	5.88	8.24
	(2.50)	(11.02)	(3.31)	(16.06)	(2.76)	(6.27)	(4.41)	(5.49)	(5.28)	(4.54)	(1.94)	(3.57)	(6.44)	(7.64)	(3.13)	(3.36)	(3.03)	(7.48)
Equity growth rate	118.31	115.45	111.85	112.73	112.13	113.38	115.00	115.02	112.70	109.42	108.14	109.42	120.15	116.52	119.63	115.17	117.08	121.83
	(20.34)	(25.37)	(13.62)	(12.21)	(13.50)	(18.17)	(20.97)	(20.85)	(16.05)	(14.51)	(16.05)	(14.51)	(20.24)	(24.11)	(39.79)	(12.08)	(9.94)	(19.15)
Personnel expenses to net sales	11.92	12.21	16.18	13.82	9.95	11.62	25.35	25.38	22.44	19.70	18.85	22.82	17.96	20.96	17.67	22.81	10.75	13.33
	(2.25)	(3.61)	(3.49)	(5.33)	(3.15)	(4.89)	(9.65)	(8.83)	(11.36)	(6.98)	(4.48)	(6.90)	(3.19)	(7.16)	(3.15)	(6.32)	(3.62)	(4.29)
Turnover period of accounts payable	3.41	3.46	3.84	4.74	2.82	3.49	2.41	2.80	4.58	3.69	3.25	3.32	2.66	2.83	3.19	2.83	3.08	3.69
	(1.24)	(1.17)	(1.79)	(1.21)	(1.44)	(1.08)	(1.30)	(0.98)	(12.06)	(0.69)	(1.21)	(1.04)	(0.75)	(1.09)	(1.52)	(0.96)	(0.66)	(1.20)
Liquid assets ratio	101.09	101.97	100.13	95.22	118.56	107.01	195.80	140.30	138.30	128.50	142.10	130.21	119.07	130.77	108.94	117.89	144.69	157.36
	(16.37)	(28.05)	(24.30)	(12.46)	(23.48)	(13.60)	(70.46)	(28.19)	(40.96)	(23.91)	(42.89)	(30.88)	(24.66)	(36.82)	(19.66)	(21.10)	(22.51)	(30.65)
Retained earnings to equity	0.88	3.84	2.57	5.02	1.48	2.49	2.01	2.26	3.17	2.45	1.13	2.28	6.47	3.93	1.90	1.95	1.00	1.15
	(1.48)	(8.92)	(3.40)	(101.3)	(1.76)	(4.27)	(2.79)	(3.01)	(3.38)	(2.66)	(0.74)	(5.36)	(10.62)	(7.33)	(1.23)	(1.62)	(0.94)	(1.40)
Financial costs to debt & bills recei.	6.87	6.52	7.12	7.58	6.43	7.31	2.37	3.89	5.16	5.78	5.54	5.54	4.13	4.08	5.04	5.81	1.59	1.47
	(1.18)	(2.22)	(2.27)	(1.69)	(1.47)	(1.93)	(8.63)	(8.22)	(1.91)	(1.62)	(1.86)	(1.69)	(1.51)	(11.12)	(1.98)	(1.15)	(1.09)	(1.45)
Sell. & management expen. to net sales	7.42	6.58	8.09	7.75	6.82	7.22	13.85	11.87	12.19	12.50	14.06	13.99	14.18	12.35	9.11	9.86	7.07	2.71
	(2.96)	(2.12)	(1.62)	(1.63)	(1.85)	(2.31)	(4.01)	(4.42)	(3.09)	(3.81)	(1.72)	(4.56)	(3.64)	(5.51)	(2.05)	(2.23)	(1.37)	(0.63)
Equity per share	45.41	53.73	47.23	43.05	44.64	44.17	4.19	4.78	4.99	4.47	39.52	38.85	5.97	5.35	48.82	44.02	3.62	3.83
	(29.32)	(45.00)	(27.35)	(25.09)	(26.01)	(23.38)	(1.29)	(3.36)	(2.32)	(1.81)	(18.93)	(21.32)	(3.96)	(3.40)	(26.80)	(23.25)	(0.83)	(0.77)
Net profit growth rate	148.12	445.05	220.55	338.17	130.38	148.12	254.34	283.01	143.95	215.26	178.85	153.69	151.05	179.74	137.10	242.16	959.87	123.70
	(147.39)	(2264.58)	(389.12)	(922.22)	(77.47)	(214.53)	(694.66)	(950.65)	(130.68)	(638.19)	(351.88)	(274.39)	(148.24)	(314.66)	(117.28)	(1632.39)	(7013.72)	(75.76)

Table 5-2. (Continued)

Industries / Financial ratios / Firms	Civil engineer. construc.		Misce. construc.		Trading companies		Metals, minerals wholesale		Department stores		Misce. retail		Real estate		Railroad transport.		Deep sea transport.	
	M	N	M	N	M	N	M	N	M	N	M	N	M	N	M	N	M	N
Ordinary profit to net sales	3.36	3.64	2.44	4.61	0.31	0.43	2.71	1.87	2.02	2.54	3.71	2.87	7.10	7.59	6.39	6.25	4.32	6.17
	(1.69)	(2.13)	(1.13)	(2.65)	(0.16)	(0.10)	(5.86)	(2.42)	(0.93)	(1.37)	(2.36)	(3.20)	(2.92)	(5.41)	(2.72)	(3.91)	(2.83)	(4.27)
Net sales to tang. fixed assets	12.69	13.39	21.63	13.77	106.66	111.63	57.78	59.76	7.93	7.32	6.41	10.38	1.32	9.06	0.85	0.72	1.13	1.14
	(6.85)	(7.15)	(11.05)	(6.82)	(45.91)	(30.58)	(45.06)	(46.04)	(3.96)	(2.93)	(2.62)	(6.59)	(0.45)	(1.05)	(0.33)	(0.47)	(0.54)	(0.83)
Turnover period of commo. & products	0.53	0.42	0.00	0.10	0.36	0.27	0.33	0.56	0.83	0.76	0.97	1.01	21.09	19.53	5.06	9.01	0.00	0.00
	(0.84)	(0.79)	(0.00)	(0.28)	(0.10)	(0.08)	(0.14)	(0.40)	(0.17)	(0.19)	(0.30)	(0.86)	(14.54)	(12.04)	(5.57)	(5.11)	(0.00)	(0.00)
Value added per employee	115.17	102.75	45.16	54.43	43.09	70.54	36.41	43.41	50.32	60.76	44.75	45.65	121.00	87.16	39.99	39.55	127.85	113.99
	(69.22)	(60.20)	(21.10)	(24.76)	(30.91)	(44.15)	(26.36)	(38.99)	(21.10)	(30.38)	(23.41)	(33.54)	(116.00)	(223.28)	(21.93)	(23.15)	(84.85)	(76.23)
Net sales to total liabilities	1.24	1.53	2.03	2.18	2.95	2.72	2.67	2.11	2.46	3.72	1.79	2.05	0.28	0.44	0.57	0.39	0.92	0.99
	(0.38)	(0.66)	(0.31)	(0.71)	(0.40)	(0.32)	(1.05)	(0.79)	(0.42)	(1.78)	(0.71)	(1.07)	(0.07)	(0.13)	(0.28)	(0.16)	(0.31)	(0.55)
Ordinary profit to equity	6.63	7.78	8.22	7.55	5.07	6.09	4.43	12.48	5.54	5.97	6.86	6.42	4.80	3.16	3.72	3.10	6.48	10.03
	(2.72)	(9.02)	(4.18)	(3.90)	(2.34)	(1.66)	(3.62)	(22.73)	(2.24)	(2.35)	(3.14)	(11.57)	(3.46)	(2.36)	(1.46)	(4.65)	(5.03)	(12.64)
Equity growth rate	124.15	121.26	123.14	117.67	117.31	118.88	112.53	118.08	118.64	115.90	115.78	111.12	120.27	119.68	118.00	17.59	109.16	107.67
	(26.85)	(20.02)	(19.96)	(17.42)	(11.96)	(10.81)	(19.10)	(18.65)	(19.59)	(10.81)	(10.66)	(15.94)	(23.65)	(27.50)	(8.76)	(9.32)	(11.22)	(20.21)
Personnel expenses to net sales	15.97	15.89	11.32	17.30	0.72	0.67	9.20	5.38	8.28	8.79	10.99	8.06	3.69	10.85	34.61	36.53	15.25	17.15
	(6.24)	(5.76)	(3.03)	(7.32)	(0.14)	(0.11)	(17.45)	(8.58)	(1.16)	(1.44)	(3.14)	(4.29)	(0.65)	(10.16)	(16.38)	(8.21)	(10.88)	(6.90)
Turnover period of accounts payable	3.31	2.88	3.05	1.77	2.43	2.52	2.41	3.38	1.37	1.17	2.65	2.64	2.70	3.93	0.60	0.35	1.05	1.19
	(0.88)	(1.02)	(0.78)	(1.28)	(0.35)	(0.30)	(1.06)	(1.43)	(0.72)	(0.60)	(1.32)	(1.48)	(2.41)	(1.78)	(1.12)	(0.61)	(0.37)	(0.55)
Liquid assets ratio	113.28	112.03	104.64	117.23	100.91	105.14	95.87	100.52	75.12	89.33	110.31	128.11	197.02	229.34	119.52	153.38	93.49	99.32
	(10.38)	(14.96)	(8.05)	(13.89)	(5.79)	(4.26)	(15.85)	(18.02)	(20.21)	(26.97)	(27.37)	(77.27)	(32.45)	(42.73)	(51.84)	(79.76)	(41.12)	(42.91)
Retained earnings to equity	1.57	2.35	2.00	2.76	1.41	1.46	1.26	4.81	1.60	1.85	2.41	3.30	0.96	0.96	0.62	0.81	1.04	2.98
	(0.93)	(4.02)	(1.67)	(2.80)	(2.53)	(0.44)	(1.72)	(10.13)	(1.07)	(1.04)	(1.36)	(7.98)	(0.48)	(0.92)	(0.49)	(3.76)	(3.22)	(8.37)
Financial costs to debt & bills recei.	3.32	3.25	6.85	4.36	2.80	1.50	3.07	5.25	4.43	1.39	6.95	19.40	5.67	6.19	4.83	5.03	4.50	4.45
	(2.19)	(6.58)	(3.17)	(8.92)	(0.99)	(0.61)	(2.30)	(2.06)	(1.76)	(18.01)	(1.13)	(146.65)	(1.40)	(1.47)	(1.25)	(1.34)	(1.98)	(2.15)
Sell. & management expen. to net sales	5.88	5.41	6.74	7.54	1.98	1.39	4.90	7.17	18.13	18.96	22.03	15.16	3.80	9.71	4.65	5.54	4.91	6.02
	(1.10)	(1.95)	(3.57)	(2.70)	(0.92)	(0.18)	(5.18)	(5.03)	(1.43)	(1.41)	(4.35)	(8.49)	(0.56)	(3.85)	(4.36)	(2.96)	(1.03)	(2.04)
Equity per share	4.32	5.43	4.10	7.05	4.11	5.57	3.29	3.88	4.01	5.36	6.45	5.23	8.17	10.17	3.28	3.05	2.18	2.20
	(1.22)	(2.50)	(0.99)	(3.90)	(1.59)	(2.25)	(0.70)	(1.47)	(0.97)	(2.30)	(2.84)	(4.07)	(1.86)	(3.60)	(0.79)	(0.48)	(0.24)	(0.62)
Net profit growth rate	127.15	149.63	131.92	281.46	135.83	115.53	188.95	203.56	110.38	114.87	120.92	213.96	103.53	96.38	112.97	132.78	815.97	4519.77
	(62.06)	(401.20)	(89.43)	(1788.46)	(158.77)	(25.67)	(522.27)	(556.51)	(32.45)	(31.59)	(62.83)	(691.54)	(48.60)	(49.45)	(17.30)	(188.68)	(157.40)	(326.27)

Table 5-2. (Continued)

Industries / Financial ratios / Firms	Warehouse-ing M	Warehouse-ing N	Local sea transport. M	Local sea transport. N	Hotels M	Hotels N	Motion pictures & amusement M	Motion pictures & amusement N
Ordinary profit to net sales	7.10 **** (2.91)	10.32 **** (6.69)	3.88 *** (1.59)	5.25 **** (2.98)	6.33 (2.16)	6.23 * (5.64)	16.20 **** (18.27)	12.57 **** (8.45)
Net sales to tang. fixed assets	1.47 (0.69)	1.33 (0.64)	3.21 * (1.07)	4.03 **** (2.45)	1.67 (0.24)	1.42 (0.48)	1.37 (1.23)	1.79 (1.20)
Turnover period of commo. & products	0.05 **** (0.12)	0.29 **** (0.57)	0.12 **** (0.26)	0.28 **** (0.65)	0.04 (0.06)	0.09 (0.13)	0.42 * (1.05)	0.18 **** (0.24)
Value added per employee	123.34 (130.27)	114.61 (107.55)	117.65 * (83.55)	88.81 (58.68)	83.18 (23.94)	79.61 (19.07)	118.43 *** (164.42)	62.67 **** (35.94)
Net sales to total liabilities	0.92 **** (0.18)	1.33 **** (0.47)	1.67 ** (0.37)	2.11 **** (0.87)	1.35 (0.68)	1.36 (0.73)	1.54 * (1.25)	1.97 (1.50)
Ordinary profit to equity	4.40 * (1.13)	3.88 * (1.55)	4.89 *** (1.20)	7.64 **** (7.94)	3.44 * (1.75)	5.72 * (3.89)	4.78 **** (4.12)	4.57 **** (2.25)
Equity growth rate	118.45 (17.00)	115.17 (21.61)	115.65 (9.77)	112.93 (13.54)	107.10 (5.24)	102.64 (6.21)	116.26 (25.66)	113.68 (22.99)
Personnel expenses to net sales	40.74 * **** (23.32)	50.58 **** (12.69)	45.65 * (15.12)	45.68 * (22.60)	31.82 (3.61)	29.46 (3.68)	17.41 **** (12.50)	18.14 **** (6.02)
Turnover period of accounts payable	1.92 **** (0.84)	0.88 (1.01)	2.01 **** (0.33)	1.62 **** (0.71)	0.44 * (0.39)	0.38 * (0.14)	1.76 *** (2.28)	0.91 **** (0.93)
Liquid assets ratio	121.32 ** **** (36.39)	146.03 **** (73.30)	115.72 **** (13.35)	113.33 *** (24.02)	85.83 (17.99)	76.55 (28.41)	130.88 **** (82.32)	156.99 **** (229.15)
Retained earnings to equity	1.06 **** (0.36)	1.13 **** (0.82)	1.05 ** **** (0.36)	3.26 **** (7.16)	1.38 ** (0.51)	1.90 ** (1.42)	2.08 *** **** (2.53)	1.20 **** (0.93)
Financial costs to debt & bills recei.	4.80 **** (1.15)	4.75 **** (2.16)	5.85 * **** (0.85)	6.39 **** (1.83)	4.32 **** (1.06)	8.37 **** (1.97)	14.00 **** (76.23)	0.07 **** (11.55)
Sell. & management expen. to net sales	6.45 **** **** (1.56)	12.66 **** (10.50)	7.30 ** (3.16)	9.63 (3.76)	23.51 (32.57)	22.83 (34.25)	11.81 **** **** (5.44)	26.52 **** (14.34)
Equity per share	3.41 **** **** (0.46)	4.37 **** (1.40)	3.30 **** **** (0.36)	4.35 **** (2.37)	5.02 (3.16)	4.63 (1.90)	3.82 **** **** (2.32)	4.40 **** (1.40)
Net profit growth rate	115.12 **** (22.39)	117.02 **** (52.65)	107.19 **** (15.79)	240.39 **** (1011.08)	119.50 (74.28)	132.15 (103.76)	234.70 **** (815.83)	133.29 **** (164.98)

1) M stands for merging firms, N indicates nonmerging firms.

2) * indicates statistical significance at the 5% level, ** 1%, *** 0.5%, **** 0.1%.

3) Upper numbers in each box are means, lower numbers are standard deviations. The asterisks above means and standard deviations indicate the result of t test and F test, respectively.

4) Growth rate is calculated by value of current year / value of previous year x 100, thus, equity growth rate and net profit growth rate are usually over 100. Therefore, the ratio in the table - 100 is the growth rate in the usual sense.

5) Equity per share is considered to be a relevant ratio for explanatory purposes. Because no stock split has been reported in merging firms and nonmerging firms analyzed. See Nihon Keizai Shimbun [1979] and others.

6) Current retained earnings to equity is calculated current retained earning / equity x 100.

Table 5-3. Comparison of performance between merging and nonmerging firms by industry

(A) Nonmerging firms perform better
(1) Beverages, (2) Miscellaneous food, (4) Pulp mills and paper mills,
(7) Industrial inorganic chemicals, (8) Industrial organic chemicals,
(9) Ordinary steel and allied product, (14) Electrical industrial product,
(18) Civil engineering and construction, (19) Miscellaneous construction,
(20) Trading companies, (21) Metals, minerals wholesale trade,
(22) Department stores, (26) Deep sea transportation,
(28) Local water transportation
(B) Merging firms perform better
(5) Printing, (12) Metalworking machinery and equipment,
(13) Bearings and valves, (25) Railroad transportation, (29) Hotels
(C) No significant differences
(3) Silk-reeling, (6) Agricultural chemicals,
(10) Special steel and allied product, (11) Wire and cable,
(15) Miscellaneous electrical machinery, equipment and supplies,
(16) Motor vehicles equipment, (17) Ship and boat building and repairing,
(23) Miscellaneous retail, (24) Real estate, (27) Warehousing
(30) Motion pictures and amusement

Table 5-4. Accuracy of discriminant analysis by industry

	Beverages			Miscellaneous food			Silk-reeling			Paper mills and pulp mills			Printing		
	M	N	T	M	N	T	M	N	T	M	N	T	M	N	T
M	72	0	72	32	1	33	38	1	39	96	24	120	37	2	39
N	0	72	72	0	99	99	1	38	39	32	223	255	2	50	52
T	72	72	144	32	100	132	39	39	78	128	247	375	39	52	91
	acc. = 100 %			acc. = 99.24 %			acc. = 97.44 %			acc. = 85.07 %			acc. = 95.60 %		

	Agricultural products			Industrial inorg. chemicals			Industrial organic chemi.			Ordinary steel & allied prod.			Special steel & allied products		
	M	N	T	M	N	T	M	N	T	M	N	T	M	N	T
M	42	2	44	34	5	39	122	11	133	73	7	80	39	17	56
N	5	39	44	0	143	143	45	183	228	30	130	160	1	111	112
T	47	41	88	34	148	182	167	194	361	103	137	240	40	128	158
	acc. = 92.05 %			acc. = 97.25 %			acc. = 84.49 %			acc. = 84.58 %			acc. = 89.29 %		

	Wire and cable			Metalworking machi. & prod.			Bearings & valves			Electrical indus. appara.			Miscellaneous electrical mach.		
	M	N	T	M	N	T	M	N	T	M	N	T	M	N	T
M	49	7	56	51	6	57	57	8	65	43	9	52	30	9	39
N	5	93	98	4	129	133	9	147	156	19	176	195	19	280	299
T	54	100	154	55	135	190	66	155	221	62	185	247	49	289	338
	acc. = 92.21 %			acc. = 94.74 %			acc. = 92.31 %			acc. = 88.66 %			acc. = 91.72 %		

	Motor vehicles equipment			Ship & boat manu. & repair.			Civil engineer. & repairing			Miscellaneous construction			Trading companies		
	M	N	T	M	N	T	M	N	T	M	N	T	M	N	T
M	75	3	78	68	2	70	29	15	44	36	0	36	105	0	105
N	7	201	208	4	38	42	54	562	616	7	221	228	0	30	30
T	82	204	286	72	40	112	83	577	660	43	221	364	105	30	135
	acc. = 96.50 %			acc. = 96.64 %			acc. = 89.55 %			acc. = 97.35 %			acc. = 100 %		

	Metals, minerals wholesale trade			Department stores			Miscellaneous retail			Railroad transport.			Deep sea transport.		
	M	N	T	M	N	T	M	N	T	M	N	T	M	N	T
M	46	6	52	33	0	33	40	8	48	46	29	75	111	24	135
N	5	86	91	12	131	143	19	113	132	53	157	210	49	56	105
T	51	92	143	45	131	176	59	121	180	99	186	285	160	80	240
	acc. = 92.31 %			acc. = 93.18 %			acc. = 85.00 %			acc. = 71.23 %			acc. = 69.58 %		

	Warehousing			Local sea transport.			Motion pictures & amusement		
	M	N	T	M	N	T	M	N	T
M	30	0	30	24	0	24	63	12	75
N	2	118	120	9	75	84	61	89	150
T	32	118	120	33	75	108	124	101	225
	acc.= 98.67 %			acc. = 91.67 %			acc. = 67.56 %		

M: Merging firms
N: Nonmerging firms
T: Total
acc.: accuracy

Table 5-5. Changes of classification accuracies by industry (from 61 to 15 variables)

Industry	Change of accuracy
industries with lower classification accuracies	
	61 - to - 15
1 Miscellaneous food	99.24 to 88.92
2 Pulp mills and paper mills	85.07 to 64.47
3 Industrial inorganic chemicals	97.25 to 85.71
4 Industrial organic chemicals	84.49 to 76.18
5 Ordinary steel and allied product	84.58 to 68.33
6 Special steel and allied product	89.27 to 79.17
7 Wire and cable	92.21 to 77.06
8 Metalworking machinery and equipment	94.74 to 81.58
9 Bearings and valves	92.31 to 82.81
10 Electrical industrial apparatus	88.66 to 71.26
11 Miscellaneous electrical machinery, equipment and supplies	91.72 to 84.62
12 Motor vehicles equipment	96.50 to 79.02
13 Civil engineering and construction	89.55 to 67.58
14 Miscellaneous construction	97.35 to 90.53
15 Trading companies	100.00 to 89.63
16 Metals, minerals wholesale trade	92.31 to 90.21
17 Department stores	93.18 to 84.09
18 Miscellaneous retail	91.67 to 81.67
19 Warehousing	98.67 to 89.33
20 Local water transportation	85.00 to 81.67
Industries with higher classification accuracies	
1 Silk-reeling	97.44 to 100.00
2 Printing	95.60 to 96.70
3 Agricultural chemicals	92.05 to 97.73
4 Ship and boat building and repairing	94.64 to 100.00
5 Railroad transportation	71.23 to 85.61
6 Deep sea transportation	69.58 to 72.92
7 Motion pictures and amusement	67.56 to 78.22
Industry without any change	
1 Beverage	

Real estate and hotel industries are excluded.

Table 5-6. Discriminant function of the beverage industry

Z = - 0.05100	x	ordinary profit to net assets
+ 0.00751	x	net sales to tangible fixed assets
+ 0.51563	x	turnover period of commodity and product
- 0.00330	x	value added per employee
+ 0.01934	x	net sales to total liabilities
+ 0.08962	x	personnel expenses to net sales
+ 0.43145	x	turnover period of accounts payable
+ 0.00345	x	current ratio
- 0.02517	x	financial costs to debt and bill receivable
- 0.04324	x	selling and management expenses to net sales
- 0.19046	x	equity per share
- 0.00025	x	net profit growth ratio
- 1.33037		

where Z is the discriminant value.

Originally the 15 variables are used for the stepwise discriminant analysis. However, only 12 variables are selected for entry into analysis on the basis of its discriminating power.

CHAPTER 6 GENERAL COMPARISON OF FINANCIAL CHARACTERISTICS BETWEEN MERGING AND NONMERGING FIRMS

I. Introduction

In this chapter, we compare the financial characteristics of merging firms (acquiring firms) and nonmerging firms in general, based on the aggregated data of the 30 industries to supplement chapter 5.

Our hypothesis in this chapter is as follows: there are no statistically significant differences in financial ratios between merging and nonmerging publicly-traded firms when ratios are based on overall industry data for Japan. This hypothesis is tested by both univariate and multivariate analyses.

Data include 130 merging firms and 320 nonmerging firms which belong to the same industries with merging firms. To compare the financial characteristics of merging and nonmerging firms based on overall industry data without considering the data period of mergers, we use the same financial ratios used before.

II. General Comparison by Univariate Analysis

We compare the financial ratios between merging and nonmerging firms as shown in Table 6-1.

Mean of dividend to capital for merging and nonmerging firms is 2.37 vs. 2.67, which are statistically significant at the 0.1% level, i.e., nonmerging firms pay more dividend to capital than merging firms. In contrast, dividend to net profit shows no difference between them. Two of the five capital structure ratios, namely, current ratio (112.16 vs. 118.46) and fixed assets to fixed liabilities, special reserve and equity (91.82 vs. 86.11), have significant differences by the t test at the 0.1%

level, showing higher liquidity for nonmerging firms. The F test supports significant differences in all five ratios between them, indicating higher diversification of those ratios of nonmerging firms.

Five out of the six assets-utilization ratios -- all except net sales to fixed assets -- have statistically significant differences by the t test at the 0.1% or 0.5% level. They are turnover ratio, net sales to building and equipment, net sales to tangible fixed assets, net sales to debt, and net sales to total liabilities, for merging and nonmerging firms, respectively. Comparative differences of the five turnover related ratios between merging and nonmerging firms range from turnover ratio (1.11 vs. 1.17), which is superior for nonmerging firms, to net sales to building and equipment (17.76 vs. 8.31) and net sales to tangible fixed assets (11.82 vs. 7.78), which are superior for merging firm. In between, net sales to fixed assets shows no significant differences on their means. Both net sales to debt (4.16 vs. 8.55) and net sales to total liabilities (1.47 vs. 1.63) are higher for nonmerging firms compared with merging firms.

There are five turnover period ratios, three of which have statistical significance by the t test: turnover period of cash and deposit (1.76 vs. 1.88), turnover period of accounts receivable (2.71 vs. 2.42), and turnover period of inventory (2.19 vs. 2.57) for merging and nonmerging firms, respectively. Nonmerging firms have advantage only on turnover period of accounts receivable. All seven ratios representing profitability show better performance for nonmerging firms, with the statistical significance at the 0.1% level: ordinary profit to total assets (1.14 vs. 1.45), ordinary profit to equity (5.49 vs. 7.00), ordinary profit to capital (10.53 vs. 14.45), net profit to total assets (0.65 vs. 0.83), net profit to equity (3.07 vs.3.99), operating profit to ordinary capital (7.26 vs. 8.02), and ordinary profit and financial costs to total assets (0.83 vs.

1.59) for merging and nonmerging firms.

Three of the seven operating performance ratios exhibit superiority for nonmerging firms with statistically significant differences, namely, ordinary profit to net sales (5.16 vs. 5.53), net profit to net sales (3.01 vs. 3.29), and depreciation costs to net sales (5.58 vs. 4.43) for merging and nonmerging firms, respectively. Merging firms have less burden on two other ratios, selling and management expenses to net sales (10.18 vs. 18.89), and personnel expenses to net sales (15.49 vs. 18.74) with statistical significance at the 0.1% level.

Only one out of the three depreciation and retained earnings ratios has a statistical difference by the t test at the 0.1% level: mean of retained earnings to equity is 1.85 for merging firms and 2.74 for nonmerging firms, indicating more reserved funds for nonmerging firms.

Debt to total assets is 45.27 for merging firms and 40.41 for nonmerging firms, with a statistical difference at the 0.1% level of significance, signifying higher dependence upon debt in merging firms.

As far as equity per share is concerned, nonmerging firms enjoy a higher rate than merging firms. It is 3.88 for merging firms and 4.63 for nonmerging firms.

Among the five growth rates, only the equity growth rate shows a statistical difference between merging and nonmerging firms at the 5% level, with the mean of 112.54 vs. 118.32, exhibiting a higher growth rate for nonmerging firms. This finding contradicts indirectly the widespread belief that mergers contribute to the growth of firms. For management, which intends to merge in order to expand its firm size in the long run, it is advisable to reconsider merging, according to finding that merging firms show less growth on equity than do nonmerging firms for the long run.

There are eight productivity ratios, six of which have statistically

significant differences by the t test on their means. For merging and nonmerging firms, they are 841.95 vs. 418.20 on net sales per employee, 58.43 vs. 61.88 on value added per employee, 44.35 vs. 49.02 on personnel expenses per employee, 613.28 vs. 360.54 on tangible fixed assets per employee, 21.06 vs 24.16 on value added to net sales, and 12.85 vs. 21.12 on value added to fixed assets. Of the five productivity ratios per employee, net sales per employee and tangible fixed assets per employee are lower in nonmerging firms than merging, while value added per employee and personnel expenses per employee are higher in nonmerging firms. On the other hand, value added to net sales and value added to fixed assets are lower in merging firms.

III. General Comparison by Multivariate Analysis

We analyze the same data for merging and nonmerging firms by discriminant analysis as shown in Table 6-2. The classification accuracy in the case of 55 financial ratios is 63.53%, and the F test shows statistically significant difference between merging and nonmerging firms at the 0.1% level. In this case, two degrees of freedom are 32 and 3,738, indicating that the number of missing values is 2,160 (which is the number of total cases - degrees of freedom - 1 = 5,931 - 32 - 3,738 - 1 = 2,160).

When we decrease the number of cases, the number of missing values decreases, and the classification accuracy decreases as well. For example, for the 15 financial ratios selected from the original 55 ratios[1], the discriminant analysis reduces the number of missing values from 2,160 to 84 (i.e., 5,931 - 17 - 5,829 - 1), and the classification accuracy is decreased by 4.16% to 59.37%, in spite of the statistically significant differences at the 0.1% level.

When we compare the accuracy of this aggregate analysis with the

industrial analysis conducted in chapter 5, the latter shows higher accuracy ranging from 67.56% to 100% than the result of the present aggregate analysis.

IV. Conclusion

This chapter has demonstrated general comparative advantages of nonmerging firms over merging firms when aggregated industry data are analyzed in terms of profitability ratios, profitability per share, and growth ratios. This finding itself does not necessarily mean that mergers have negative effects on merging firms. It may indicate that merging firms have inferior financial characteristics compared with nonmerging firms even before mergers. However, our finding gives advice of some sort to those top managements who intend to merge to raise efficiency of their corporations, to get higher market shares, and to reduce risk by diversification. According to our study merging implies belonging to a group of companies with rather poor financial performance compared with nonmerging firms.

In Japan, mergers are closely related with industrial groups. There are six major industrial groups in Japan: Mitsubishi, Mitsui,and Sumitomo, on the one hand, which are originated from the zaibatsu dissolved after World War II, and Fuji (Fuyo), Daiichi Kangin and Sanwa,on the other, which are newcomers as groups. Each of them has its own bank with the same name as its group, which plays a central role in the group via indirect financing which is the mainroute of financing capital in Japan. Each group has a club of presidents of its member firms which serves as a human organization where they cooperate in adjusting and coordinating each other's interests along with interlocking shareholding and exchange workers within each group (Miyazaki (1980) and Okumura (1981)). Most mergers are conducted within the same industrial group. For instance, a firm in the

Mitsubishi Group has never merged other firms outside the group. Mergers are only with inside member firms. Therefore, studies between mergers and industrial groups are also very important in Japan from now on.

Footnotes

1. Those 15 financial variables are selected out of the original 55 variables after applying factor analysis. They are those whose eigenvalue is larger than unity.

Table 6-1. Financial Ratios of Merging and Nonmerging Firms of All Industries

1) Profit distribution			
(1) dividend to capital	2.37 (1.35)	**** ****	2.67 (1.54)
(2) dividend to net profit	102.57 (1566.48)	****	52.32 (111.25)
2) Capital structure ratios			
(3) quick ratio	71.78 (28.78)	****	73.40 (50.40)
(4) current ratio	112.16 (40.02)	**** ****	118.46 (58.02)
(5) total liabilities to equity	641.38 (789.57)	****	849.51 (8278.85)
(6) fixed assets to fixed liabilities, special reserves and equity	91.82 (29.82)	**** ****	86.11 (41.11)
(7) ratio of bill discounted to total bill	46.90 (27.68)	****	45.20 (31.42)
3)Assets-utilization ratios			
(8) turnover ratio	1.11 (0.66)	*** ****	1.17 (0.57)
(9) net sales to buildings and equipment	17.76 (51.84)	**** ****	8.31 (22.22)
(10) net sales to tangible fixed assets	11.82 (29.32)	**** ****	7.78 (14.85)
(11) net sales to fixed assets	4.51 (6.67)	****	4.59 (5.02)
(12) net sales to debt	4.16 (7.19)	**** ****	8.55 (91.28)
(13) net sales to total liabilities	1.47 (0.81)	**** ****	1.63 (0.96)
4) Turnover period ratios			
(14) turnover period of cash and deposits	1.76 (1.88)	* ****	1.88 (1.12)
(15) turnover period of accounts receivable	2.71 (4.26)	*** ****	2.42 (1.66)
(16) turnover period of inventory	2.19 (3.34)	**** ****	2.57 (2.89)
(17) turnover period of commodity and product	0.98 (2.68)		1.09 (2.68)
(18) turnover period of accounts payable	2.69 (2.74)	****	2.60 (1.40)
5) Profitability ratios			
(19) ordinary profit to total assets	1.14 (1.19)	**** ****	1.45 (1.27)
(20) ordinary profit to equity	5.49 (4.82)	**** ****	7.00 (14.43)
(21) ordinary profit to capital	10.53 (9.66)	**** ****	14.45 (14.11)
(22) net profit to total assets	0.65 (0.73)	**** ****	0.83 (0.83)
(23) net profit to equity	3.07 (4.04)	**** ****	3.99 (6.32)
(24) operating profit to ordinary capital	7.26 (4.76)	**** **	8.02 (5.03)
(25) ordinary profit and financial costs to total assets	0.83 (2.68)	**** ****	1.59 (2.91)

1) ** indicates significance at the 1% level, *** 0.5%, **** 0.1%.
2) Upper numbers are means, lower ones in parentheses are standard deviations.
3) Underlined ratios are 14 representative variables selected by factor analysis. The last variable is financial costs / (debt + debentures + accounts receivables)
4) Five financial ratios are omitted from this table, because they have missing values.

Table 6-1. (Continued)

6) Operating performance ratios			10) Growth ratios	
(26) gross income on sales	18.15	18.42	(38) sales growth ratio	116.01 115.56
	(10.29)	(10.05)		(19.46) (19.56)
(27) selling and management expenses to net sales	10.18 ****	18.89	(39) total assets growth ratio	115.10 115.21
	(4.01) ****	(7.66)		(18.20) (17.93)
(28) operating profit to net sales	8.34	8.06	(40) equity growth ratio	112.54 * 118.32 ****
	(6.97) ****	(5.72)		(34.18) (158.73)
(29) ordinary profit to net sales	5.16 *	5.53	(41) fixed assets growth ratio	114.23 114.13
	(6.04) ****	(4.83)		(20.82) **** (23.07)
(30) net profit to net sales	3.01 *	3.29	(42) net profit growth ratio	268.70 193.69 ****
	(4.50) ****	(3.80)		(1955.03) (830.71)
(31) personnel expenses to net sales	15.49 ****	18.74	11) Productivity ratios	
	(11.49)	(11.65)	(43) net sales per employee	841.95 **** 418.20 ****
(32) depreciation expenses to net sales	5.58 ****	4.43		(2222.01) (1063.21)
	(5.54) ****	(4.17)	(44) net profit before taxes per employee	15.28 13.96
7) Depreciation and retained earnings ratios				(41.33) **** (17.70)
(33) depreciation ratio	10.00	10.14	(45) value added per employee	58.43 * 61.88
	(4.68) **	(4.94)		(63.90) **** (52.06)
(34) retained earnings to equity	1.85 ****	2.74	(46) personnel expenses per employee	44.35 **** 49.02
	(4.13) ****	(6.48)		(38.85) **** (44.06)
(35) depreciation and retained earnings to equity	7.97	8.64	(47) tangible fixed assets per employee	613.28 **** 360.54 ****
	(8.82) ****	(23.48)		(1029.33) (445.37)
8) Debt ratio			(48) personnel expenses to value added	84.34 80.91
(36) debt to total assets	45.27 ****	40.41		(69.90) **** (33.43)
	(14.03) ****	(16.51)	(49) value added to net sales	21.06 **** 24.16
9) Profitability per share				(15.16) **** (14.26)
(37) equity per share	3.88 ****	4.63	(50) value added to fixed assets	12.85 **** 21.12
	(1.91) ****	(2.73)		(12.24) **** (18.23)

Table 6-2. Discriminant Analysis of All Industries

55 financial ratios				15 financial ratios			
predicted actual	Merging firms	Non-merging firms	Total	predicted actual	Merging firms	Non-merging firms	Total
Merging firms	1,124	621	1,748	Merging firms	1,180	568	1,748
Non-merging firms	1,542	2,641	4,183	Non-merging firms	1,824	2,341	4,183
Total	2,669	3,262	5,931	Total	3,022	2,909	5,931
Classification accuracy = 63.53 %				Classification accuracy = 59.37 %			
F test $18.79 > F^{32}_{3738}(0.1\ \%)$				F test $28.09 > F^{17}_{5829}(0.1\ \%)$			

IMPLICATIONS

In chapter 1, several characteristics of corporate mergers in Japan were pointed out as follows. 1) Horizontal mergers in Japan occupies 47.36% of three forms of mergers when measured by total assets absorbed for the past 12 years, whereas conglomerate mergers have only 32.35 % by the same measurement. 2) The bigger the size of firms measured by capital, the higher the rate of mergers, i.e. occurrence of mergers. 3) Various questionnaire's research indicate that the influential reasons of mergers are the raising efficiency of management, reduction of administrative cost, diversification and concentralization & specialization of production. In summary, raising efficiency of management and diversification for safety are considered to be main reasons for mergers. 4) Previous analytical studies of mergers indicate neutral effects on safety, growth ratios, and performance in the longer term of perspective.

Our first-step study in chapter 2 indicates that 1) after mergers, equity to total assets and net profit to total assets are worse than before mergers, 2) merging firms have negative effects of mergers on equity to total assets. We extend this research to the largest data available in chapter 3 and found that 9 out of 13 industries have negative effects of mergers. Only two of them showed positive effects and the remaining two presented neutrality.

In chapter 4, we compare the financial characteristics of merging and nonmerging firms in 17 industries which are excluded in the previous chapter, because the data period available is not suited for examining the performance of mergers but good for comparing the financial ratios of these two groups. It was presented that nonmerging firms have superiority on financial characteristics to merging firms in 9 out of 17 industries,

showed inferiority in 4 and neutrality in 4 industries.

When the combined data analyzed in the previous two chapters are used in each industry,nonmerging firms have superiority in 14, inferiority in 5 and neutrality in 11 out of 30 industries.

When the combined data are aggregated over 30 industries and are analyzed between merging and nonmerging firms as general, comparative advantages of nonmerging firms over merging firms are illustrated in profitability ratios and even growth ratios.

As pointed out by Kagono et al. (1983)[1] the management objectives between two countries, Japan and the U.S. are quite different each other. Most important management objective is the market share, the return on investment is the second and the increase in share price is the last one in Japan, whereas, in the U.S. the return on investment is the most important, increase in share price is the second, and improvement of quality of working condition is the last one out of eight objectives.[2] Shimizu (1980) presented the same type of inveestigation on Japanese firms. Of 894 firms examined, no company responds that stock prices is the most important financial indicator and 0.2% of them answered that it is secondly important by 3-item answers.[3]

The sharp contrast of the importance of share price reflects the different business practices between two countries. Takeovers are quite a daily matter in the U.S. v.s. very rare in Japan. Stock option is one of important business practices in the U.S. v.s. no such system exists in Japan.

Therefore, we analyzed corporate mergers in Japan without special intention on stock behavior. For the world wide comparisons, especially, with the U.S. stock price should be included in the analysis for future study.

Footnotes

1. English version is also included partly in Hoshino and Sato (1980). They compared the management system between the U.S. and Japan based on a questionnaire survey of 227 respondents out of Fortune's top 1,000 industrial firms in the U.S. and 255 responses out of 1,031 stock listed companies in the Tokyo Stock Exchange in Japan.

2. Eight objectives are return on investment, increase in share price, increase in market share, improvement of product portfolio, improvement in efficiency of production and physical distribution, equity debt ratio, new product ratio, improvement in public image of the company and improvement in quality of working conditions.

3. Important financial indicators by 3-item answers are rate of sales growth, rate of profit growth, profits, ratio of profits to sales, ratio of profits to equity, debt-equity ratio and current ratio, etc., receipts and outlay of funds, stock prices, and other.

Appendix A. List of industries analyzed

(1) Beverages	*(16) Motor vehicles equipment
(2) Miscellaneous food[1]	(17) Ship and boat building and repairing
*(3) Silk-reeling	(18) Civil engineering and construction
(4) Pulp mills and paper mills	*(19) Miscellaneous construction[7]
*(5) Printing	(20) Trading companies
*(6) Agricultural chemicals[2]	(21) Wholesale trade in metals, minerals[8]
*(7) Industrial inorganic chemicals[3]	(22) Department stores
(8) Industrial organic chemicals[4]	*(23) Miscellaneous retail[9]
*(9) Ordinary steel and allied products[5]	(24) Real estate
*(10) Special steel and allied products	(25) Railroad transportation
(11) Wire and cable	(26) Deep sea transportation
*(12) Metalworking machinery and equipment	*(27) Warehousing
(13) Bearings and cable	*(28) Local sea transportaion
(14) Electrical industrial apparatus	(29) Hotels
*(15) Miscellaneous electrical machinery, equipment and supplies	(30) Motion pictures and amusement

1. Except meat products, dairy products, canned reserved fruits and vegetables, grain mill products, bakery products, sugar and confectionery products, and fats and oils.

2. Except nitrogenous fertilizer.
3. Except industrial sodas and industrial gases.
4. Except plastic materials, synthetic rubber, drugs, soap, detergents, perfumes, cosmetics, and paints.

5. Standard industrial classification index in the U.S. (U.S. Department of Commerce (1972)) has two categories: 331--blast furnaces, steel works and rolling and finishing mills, 332--Irons and steel foundries. These are different from Japanese classification.

6. Except electronic tube, semi-conductor and LSI.
7. Except construction and dredging.
8. Except oil wholesale and trading companies.
9. Includes automobile dealers.

* These industries are analyzed in chapter 3, others in chapter 4.

Appendix B. Financial ratios employed

Underlined ratios are 15 representative variables selected by factor analysis. Definitions of ratios which are clearly understood are omitted.

1) Profit distribution

(1) dividend to capital
(2) dividend to net profit

2) Capital structure & liquidity ratios

(3) quick ratio = (cash + cash equivalents + receivables)/ current liabilities
(4) <u>liquid assets ratio</u> = current assets / current liabilities
(5) total liabilities to equity
(6) fixed assets to equity
(7) fixed assets to fixed liabilities, special reserves and equity
(8) accounts receivable to accounts payable
(9) ratio of bill discounted to total bill

3) Assets-utilization ratios

(10) turnover ratio = net sales / total assets
(11) net sales to operating assets
(12) net sales to buildings and equipment
(13) <u>net sales to tangible fixed assets</u>
(14) net sales to fixed assets
(15) net sales to debt
(16) net sales to total liabilities

4) Turnover period ratios

(17) turnover period of cash and deposit = average cash and deposit / net sales x 12
(18) <u>turnover period of accounts receivable</u> = accounts receivable / net sales x 12
(19) inventory turnover period = average inventory / net sales x 12
(20) <u>turnover period of commodity and product</u> = average commodity and product x net sales x 12
(21) turnover period of accounts payable = accounts / net sales x 12

5) Profitability ratios

(22) ordinary profit* to total assets
(23) <u>ordinary profit to equity</u>
(24) ordinary profit to capital
(25) net profit to total assets
(26) net profit to equity
(27) net profit to capital
(28) <u>operating profit to ordinary capital</u>
(29) ordinary profit and financial costs to total assets

* Ordinary profit = operating profit + non-operating revenue - non-operating expenses. Statistical Bureau of Prime Minister's Office (1981) uses the term recurring profit and Japan Development Bank (1981) uses ordinary income, all of them have the same meaning. This is the most frequently used financial variable as well as sales in Japanese corporations.

6) Operating performance ratios

(30) gross income on sales = gross income / net sales
(31) selling and management expenses to net sales
(32) operating profit to net sales
(33) ordinary profit to net sales
(34) net profit to net sales
(35) ordinary profit and financial costs to net sales
(36) personnel expenses to net sales
(38) financial costs to net sales

7) Depreciation and retained earning ratios

(39) depreciation ratio = depreciation / (buildings and equipment + intangible fixed assets + depreciation)
(40) retained earnings to net profit after taxes
(41) retained earnings to equity
(42) depreciation and retained earnings to equity

8) Debt related ratios

(43) financial costs to debt and bills receivable
(44) debt to total assets

9) Profitability per share

(45) equity per share
(46) ordinary profit per share
(47) net profit per share

10) Growth ratios (Value of current year / value of previous year)

(48) sales growth ratio
(49) total assets growth ratio
(50) equity growth ratio
(51) fixed assets growth ratio
(52) ordinary profit growth ratio
(53) net profit growth ratio

11) Productivity

(54) net sales per employee
(55) net profit before taxes per employee
(56) tangible fixed assets per employee
(57) personnel expenses per employee
(58) personnel expenses to value added
(59) value added to net sales
(60) value added per employee
(61) value added to fixed assets

Appendix C. List of merging firms analyzed

Beverages

Sanraku-Ocean

Takara Shuzō

Gōdō Shusei

Tōyō Jōzō

Mis. food

Nihon Shokuhin Kakō

Marukin

Riken Vitamin Oil

*Silk-reeling

Shinyei

Kobe Kiito

Katakura Industries

Pulp and paper

Takasaki Paper Mfg.

Jūjō Paper

Ōji Paper

Tokutane Paper Mfg.

Nippon Kakoh Seishi

Mitsubishi Paper Mills

Sanyo-Kokusaku Pulp

*Printing

Kyodo Printing

Dainippon Printing

Toppan Printing

*Agricultural chemicals

Rusa Industries

Tōhoku Hiryō

Nippon Kasei Chimicals

San Kagaku

*Industrial inorganic chemicals

Hodogaya Chemical

Maruo Calcium

Osaka Oxygen industries

Industrial organic chemicals

Nissan Chemical industries

Kyōwa Hakkō Kōgyō

Mitsubishi Gas Chemical

Seitetsu Kagaku

Daicel

The Nippon Synthetic Chemical Industry

Mitsui Tōatsu Chemicals

Mitsubishi Chemical Industries

*Ordinary Steel and allied products

Nisshin Steel

Topy Industries

Kobe Steel

Nippon Steel

*Special steel and allied products

Mitsubishi Steel Mfg.

Daido Steel

Hitachi Metals

Yamato Kogyo

Wire and cable

Totoku Electric

Furukawa Electric

Dainichi-Nippon Cables

*Metalworking machinery and equipment

Toshiba Machine

Hitachi Seiki

Tsugami Corp.

Bearings and valves

Okano Valve Mfg

Nippon Miniature Bearing

Nippon Seiko

Nippon Thomson

Miyairi Valve

Electrical industrial apparatus

Nissin Electric

Osaka Transformer

Chuo Seisakusho

Fuji Electric

*Miscellaneous electrical machinery

Tamura Seisakusho

Omron Tateishi Electric

Shin-Kobe Electric Machinery

*Motor vehicle equipment

Koito Mfg.

Ichikko Industries

Sawafuji Electric

Aisin Seiki

Nippondenso

Kinugawa Rubber Industrial

Ship and boat building and repairing

Ishikawajima-Harima Heavy Industries

Hitachi Shipbuilding and Engineering

Sumitomo Heavy Industries

Mitsui Engineering and Shipbuilding

Kawasaki Heavy Industries

Civil engineering and construction

Penta-Ocean Construction

Sumitomo Construction

Taisei Corp.

*Mis. construction

Sanwa Daiei Denki Kogyo

Taiyo-Kudo Electrical Construction

Nankai Construction

Trading companies

Nissho Iwai Corp.

C. Itoh & Co.

Kanematsu-Gosho

Sumitomo Corp.

Toyo Menka

Nichimen

Marubeni Corp.

Wholesale trade in metals and minerals

Matsushima Coal Mining

Okura & Co.

Kanoh Steel

Kinsho-Mataichi Corp.

Department stores

Tokyu Department Store

Maruei Department Store

Meitetsu Hyakkaten

*Miscellaneous retail

Tokyo Toyota Motor

Maruzen

Marui

Midoriya Department Store

Real estate

Mitsui Real Estate Development

Sumitomo Realty & Development

Railroad transportation

Nandai Electric Railway

Kinki Nippon Railway

Seibu Railways

Sagami Railway

Nishi-nippon Railroad

Deep-sea transportation

Nihonkai Steamship

Shin Yei Steamship

Shinwa Kaiun

Japan Line

Showa Line

Nihon Yusen

Mitsui O.S.K. Line

Yamashita-Shinnihon Steamship

Kawasaki Kisen

Daiichi Chuo Kisen

*Warehousing

Keihin Co.

Tatsumi Warehouse

Shibusawa Warehouse

*Local sea transportation

Nissin Transportation & Warehousing

Sankyu Inc.

Asagami Koun Soko

Hotels

Dai-ichi Hotel

Gajoen Kanko

Tokyo Hotel Chain

Motion pictures and amusement

Joban Kosan

Nippon Dream Kanko

Tokyo Recreation

Tokyotokeiba

Chisan-tokan

* These industries are analyzed in chapter 3.

1) English names of Japanese firms are taken from Toyo Keizai Shimposha (1981), Nihon Keizai Shimbun (1979).

2) The number of merging firms (ranging between 2 and 10) and nonmerging firms (2 and 56) are unequal. The latter is not listed.

APPENDIX D. AN ANALYSIS OF CORPORATE BANKRUPTCIES IN JAPAN

I. Introduction

In 1980, the number of corporate bankruptcies in Japan increased by 10% over the preceding year and reached 18,212 cases. The value of liabilities showed an increase of 12% over the previous year, rising to ¥ 2.9 trillion ($ 13 billion). Tokyo Shoko Research[1] gives the following reasons for bankruptcies: 1) stagnant sales, accumulating debt, uncontrollable accounts, all of which lead to the bankruptcies due to depression, 56%, 2) inefficient management 22%, 3) chain reaction: when a parent company fails, some subsidiaries and most subcontractors bankrupt, too, 12%, 4) undercapitalization, 5%, 5) excessive equipment investment, 2%, 6) others, 3%.

There are a lot of studies conducted in the U.S. to predict corporate bankruptcies. Some of them are as follows. Beaver (1966) selected 79 pairs of samples for the comparisons between bankrupt and nonbankrupt firms with the data for five years before bankruptcies. Prediction of corporate bankruptcies with discriminant analysis was first introduced by Altman (1968), who made 33 paired sample of bankrupt and nonbankrupt firms with five financial ratios. The accuracy of his model are 98%, 72%, 48%, 29% and 37% for one to five years before failure respectively.

There are more than ten quantitative analyses of corporate bankruptcies in Japan, almost all of which use the paired sample technique for the prediction of bankruptcies. A few excellent works are as follows. Toda (1973) first introduced discriminant analysis to predict bankruptcies with 15 pairs of bankrupt and nonbankrupt firms in manufacturing industries to compare five financial ratios three years before bankruptcies in Japan. Tanaka and Wakagi (1977) used multiple regression analysis to predict

bankruptcies in five industries with 12 financial ratios totally. Takahashi, Kurokawa and Watase (1979) selected 36 paired of sample to predict the bankruptcies by principal component analysis by using 24 financial variables three years before bankruptcies.

All of these studies use the paired sample technique, however, is influenced by biases, partly because of introducing controlled, nonbankrupted firms which may not be selected properly, and because of differences between industries. To reduce these biases as much as possible, we compare first the financial data of four bankrupt publicly traded firms with that of nonbankrupt publicly traded firms in each industry. Second, comparisons between bankrupt and nonbankrupt firms are examined by the aggregated data of all four industries and four other industries in the section III. Third, comparisons among industries are analyzed in the section IV.

II. Comparisons between bankrupt and nonbankrupt firms by industry

In this section, we analyze and compare the financial ratios of four bankrupt publicly traded firms with those of nonbankrupt publicly traded ones for one to five years before bankruptcies in each of four industries. These four industries and bankrupt firms are 1) steel (Sanyo Special Steel), 2) other chemical machinery (Nippon Card Clothing), 3) movie and amusement (Daiei Motion Picture), 4) pulp and paper (Kokoku Rayon and Pulp). Five financial ratios, namely equity to total assets, current ratio, debt-equity ratio, turnover, and net profit to total assets are used to distinguish between bankrupt and nonbankrupt firms in each industry with multiple discriminant analysis for one to five years before bankruptcies.

Table D-1 shows the result of analysis. In the steel industry, no differences between bankrupt firm, Sanyo Special Steel and other

nonbankrupt firms can be obtained. The reason for non discrimination is due to the windor dressing.[3] The external auditor had known about the manipulation of account for many years, but he confessed that he could do nothing about it by Ballon (1976, p.178). In Japan, the auditor usually has some private connection with the company he serves. The company tries to include the auditor as a insider in its system and emphasizes the interest of management and employee rather than that of shareholders, and investors are considered more important. Further, a company rarely changes auditors and auditors express unfairly the statement to the company. Cooperation between them is carried out informally to protect the interest of management and employee.

In the case of other industrial machinery, for comparison of four half-years periods, i.e. two years totally, discrimination between bankrupt and nonbankrupt firms are found with a statistically significant difference of less than 0.1% level for the whole year of 1969, less than 1% level for second half of 1968, and less than 5% level for the second half of 1967. Therefore, two and half years before bankruptcy, there was a symptom of bankruptcy.

As far as the movie and amusement industry is concerned, a different trend from the previous two industries is shown in Table D-1. We can discriminate bankrupt firms and nonbankrupt firms at the first half year of 1970, 1972 and the second half year of 1969 with a 0.1% statistically significant level: at the second half of 1968 with a 0.5% level: and at the first and second half of 1966 with 5% and 0.5% levels, respectively. There is a rough cyclical trend of comparative performance of bankrupt firms.

In pulp and paper industry, just before bankruptcy of Kokoku Rayon and Paper, no distinction is made between bankrupt and nonbankrupt firms. From one year to two years before bankruptcy, statistically significant

differences between bankrupt and nonbankrupt firms are obtained at less than a 0.1% level for the first half of 1974, less than 0.5% for the second half of 1973, and less than 1% for the first half of 1973. Three and half years before bankruptcy, the first half of 1971, a symptom of discrimination between them is provided.

III. Comparisons between bankrupt and nonbankrupt firms by aggregated data

In the previous section, we analyzed the cases of one bankruptcy in each industry. In this section, we aggregate these cases to discriminate between bankrupt and nonbankrupt firms as a whole without any consideration of differences between industries including four other industries which were not analyzed in the section II, because of lack of enough samples of non bankrupt firms. These new industries and firms are: 1) hemp spinning (Nippon Seni Kogyo), 2) nonferrous mining (Matsuo Mining), 3) sugar manufacturing (The Nagoya Seito), 4) coal mining (Kajima Coal Mining).

Table D-2 indicates the predictability of bankruptcies and discriminant function in each period. By the generalized Mahalanobis' distances, one and two periods before bankruptcies have statistically significant differences at the 0.1% level between bankrupt and nonbankrupt firms, and three, four and five periods have differences at the 5% level. No discrimination is found from six to ten periods among them. This means we can predict bankruptcies six periods, namely three years beforehand.

The discriminant function is as follows.

$$Z = 6.3705 + 0.300367\ X_1 - 0.087889\ X_2 + 0.004763\ X_3 - 0.4045\ X4 + 0.334041\ X_5$$

Z : discriminant value

X_1 : equity to total assets

X_2 : current ratio

X_3 : debt-equity ratio

X_4 : turnover

X_5 : net profit to total assets

For example, a company has the following values for five variables: X_1= 12.8, X_2= 53.7, X_3= 513.6, X_4= 0.78, and X_5= 0.51; Z value is 7.791, which exceeds the value of distinction, 6.0557, meaning that the firm belongs to the bankrupt category.

Table D-3 shows the accuracy of discriminations. In the upper extreme left-hand corner the one half-year accuracy of discrimination between bankrupt and nonbankrupt firms before bankruptcies is shown. The sum of the diagonal elements, 110 + 6 = 116, which represent the total number of discriminations, when divided into the total number of cases 119, yields the accuracy, 97.5%. For all comparisons, the accuracy is between 70.7% and 97.5%. Two and half years before bankruptcies, the accuracy is over 80%, indicating high probability of distinguishing the financial data between bankrupt and nonbankrupt firms. When discriminant analysis is applied to eight pairs of samples by selecting matching samples of a nonbankrupt firm with a bankrupt firm for each eight industries[4], statistically significant differences cannot be found in any half-year period, because of the lack of a sufficient sample[5]. Therefore, a comparison of one bankrupt firm and at least several other firms belonging to the same industry is necessary for such cases.

VI. Comparisons among industries

We analyze the differences of firms in different industries with an assumption that there is no financial difference between industries.

In this section, differences between industries are analyzed as in Table D-4. Comparison between two industries, namely movie and amusement

and other industrial machinery are conducted for the second half of 1969 based on the discriminant analysis of five financial ratios, indicating clear distinction of two industries by statistically significant differences of less than 0.1% level.

Conversely, no statistically significant difference is obtained in the case of nonferrous mining industry and sugar manufacturing industry in the second half of 1970.

Taking two cases of different industries and years, 1) sugar manufacturing industry in the second half of 1970 and 2) hemp spinning in the first half of 1964, the former has a statistically significant difference and the latter has not. This finding indicates the mixture of many types of industries concerning the data in the previous section.

V. Conclusion

In this appendix, we get a high probability of distinguishing the financial characteristics between bankrupt and nonbankrupt firms before bankruptcies by the comparison of bankrupt firms and nonbankrupt firms belonging to the same groups.

The paired sample technique was shown to be less effective than the nonpaired sample technique to distinguish the financial data between bankrupt and nonbankrupt firms before bankruptcies.

In Japan, most large corporations are tightly involved with some kind of industrial or business groupings. Thus, if they are in a shaky financial position or on the verge of bankruptcy, the principal bank of each group as well as the entire group helps them for survival. Finally, the government can be dependent upon to save them. Therefore, quantitative analysis has a strong limitation, especially to predict bankruptcy. Small and medium size firms which do not belong to a group or do not have a principal bank to

depend upon may be apt to bankrupt, which indicate better predictability of bankruptcies. Further research on small and medium size firms is expected in Japan.

Notes

1. Tokyo Shoko Research is one of the two private corporations which are widely quoted source of bankruptcies information by the form of the monthly reports. The other one is Teikoku Deita Bank, both of which report bankruptcies in which total liabilities are more than ¥ 10 million ($ 45,000).

2. See Altman (1968).

3. See Adams and Hoshii (1976) pp.237-239 and Ballon, Tomita and Usami (1976) pp.267-270 for the windor dressing of Sanyo Special Steel Co.. Given the heavy debt on the bank in the postwar Japan, suspension of bank transaction is the most fatal sanction for windor dressing. Of all bankruptcies in Japan, 99% are due to the suspension of bank transaction.

4. Eight pairs are as follows: 1) Sanyo Special Steel vs. DAIDO STEEL, 2) Nippon Seni Kogyo vs. Teikoku Seni, 3) Matsuo Mining vs. Bandai Express electric Railway, 4) Nippon Card Clothing vs. Tanaka Machinery, 5) The Nagoya Seito vs. Toyo Seito, 6) Nippon Card Clothing vs. Tanaka Machinery, 5) The Nagoya Seito vs. Toyo Seito, 6) Daiei Motion Picture vs. NIKKATSU, 7) Kokoku Rayon and Pulp vs. Tokai Pulp, 8) Kajima Coal Mining vs. Joban Kosan.

5. Paired samples include only eight pairs of bankrupt and nonbankrupt firms. Nonpaired samples have eight bankrupt firms and 115 nonbankrupt firms.

Table D-1. Comparison of bankrupt and nonbankrupt firms

steel industry	other industrial machinery	movie and amusement	pulp and paper
Sanyo Special Steel	Nippon Card Clothing	Daiei Motion Pictures	Kokoku Rayon Pulp
1964 F. 3.8446	1969 S. 1056.4****	1971 F. 142.39****	1974 S. 11.975
1963 S. 4.2406	1969 F. 517.75****	1970 S. 10.509	1974 F. 27.746****
1963 F. 7.1474	1968 S. 21.896**	1970 F. 65.63****	1973 S. 25.029***
1962 S. 6.1684	1968 F. 8.8121	1969 S. 2338.3****	1973 F. 21.171**
1962 F. 6.7599	1967 S. 18.678*	1969 F. 6.9170	1972 S. 6.5273
1961 S. 8.8852	1967 F. 13.695	1968 S. 23.666***	1972 F. 8.1835
1961 F. 5.5096	1966 S. 4.0388	1968 F. 11.617	1971 S. 17.528*
1960 S. 9.0635	1966 F. 3.2527	1967 S. 12.720	1971 F. 11.035
1960 F. 8.1239	1965 S. 1.0903	1967 F. 21.477**	1971 S. 13.128
1959 S. 5.2788	1965 F. 9.0694	1966 S. 17.811*	1970 S. 9.6935

1) F. is the first half of year, and S. is second half of year.

2) * indicates the statistically significant difference at the 5% level, ** 1%, *** 0.5%, **** 0.1%.

3) Figures in the table are Mahalanobis' generalized distances.

Table D-2. Discriminant Functions by Period

before bankruptcy	para-meter	equity to total assets	current ratio	debt-equity ratio	turn-over	net profit to total assets	Generalized Mahalanobis' Distance
1 period before	-6.0557	-0.126887	0.053023	-0.002445	5.6532	-0.200960	104.80****
2 periods before	-1.7212	-0.004752	0.020103	-0.000173	6.0239	-0.039745	42.992****
3 periods before	-1.5921	-0.026606	0.222080	0.000491	6.4445	-0.021476	16.800*
4 periods before	-6.0469	0.093443	0.038539	0.000073	6.5415	-0.223050	19.270*
5 periods before	-7.1651	0.168360	0.015452	0.001412	9.0215	-0.371985	17.585*
6 periods before	-5.5167	0.099588	0.019268	0.000791	7.3027	-0.200645	7.7414
7 periods before	-5.3808	0.062586	0.027135	0.000037	8.1755	-0.216800	7.4243
8 periods before	-6.3883	0.121235	0.018834	0.001148	8.3380	-0.266000	10.021
9 periods before	-8.4991	0.075099	0.066024	0.001646	8.3482	-0.273750	12.190
10 periods before	-9.9899	0.072087	0.108000	0.000034	8.1008	-0.224525	5.1490

"1 period before" means h alf a year before bankruptcy, and "2 periods before" means one year before bankruptcy and so on.

Table D-3. Classification accuracy of discriminant analysis before bankruptcy

1 period before				2 periods before				3 periods before			
	N	B			N	B			N	B	
N	110	1	111	N	108	7	115	N	86	19	105
B	2	6	8	B	3	5	8	B	3	5	8
	112	7	119		111	12	123		89	24	113
accuracy = 97.5%				accuracy = 91.9%				accuracy = 80.5%			
4 periods before				5 periods before				6 periods before			
	N	B			N	B			N	B	
N	86	19	105	N	92	13	105	N	80	26	106
B	3	5	8	B	3	5	8	B	4	4	8
	89	24	113		95	18	113		84	30	114
accuracy = 80.5%				accuracy = 85.8%				accuracy = 73.7%			
7 periods before				8 periods before				9 periods before			
	N	B			N	B			N	B	
N	80	28	108	N	89	19	108	N	93	15	108
B	2	6	8	B	4	4	8	B	4	4	8
	82	34	116		93	23	116		97	19	116
accuracy = 70.7%				accruacy = 80.2%				accuracy = 83.6%			

10 periods before			
	N	B	
N	80	28	108
B	4	4	8
	84	32	116
accuracy = 72.4%			

N : Nonbankrupt firms
B : Bankrupt firms

Table D-4. Differences among industries

Year	Industry	Mahalanobis' Generalized Distance
1968 S.	movie and amusement (14)	220.64****
1968 S.	other industrial machinery (23)	
1970 S.	nonferrous mining (6)	13.677
1970 S.	sugar manufacturing (5)	
1970 S.	sugar manufactruing (5)	129.28****
1964 F.	hemp spinning (5)	
1970 S.	coal mining (6)	9.9281
1964 F.	hemp spinning (5)	

1) F. is the first half of year, and S. is second half of year.

2) The number in parenthesis is that of firms in industry analyzed.

References

Adams, T.F.M. and Iwao Hoshii (1976), A Financial History of the New Japan, (Tokyo: Kodansha International).

Altman, E. I. (1968), Financial Ratios Discriminant Analysis and the Prediction of Corporate Bankruptcies, Journal of Finance Vol.23 (September), pp.589-609.

_____ (1971), Corporate Bankruptcy in America, (Lexington, Mass.: D.C. Heath and Company).

_____ (1973), "Predicting Railroad Bankruptcies in America", Bell Journal of Economics and Management Science (Spring), pp.184-211.

Altman, E.I. , R.G. Haldemen and P. Narayanan (1971), "Zeta Analysis", Journal of Banking and Finance 1, pp.29-54.

Altman, Edward I., Robert B. Avery, Robert A. Eisenbeis and Joseph F. Sinkey, Jr. (1981), Application of Classification Techniques in Business, Banking and Finance, (Greenwich, Conn.: JAI Press).

Amihud, Y. and Baruch Lev (1981), "Risk Reduction as a Managerial Motive for Corporate Mergers", Bell Journal of Economics Vol.12 (Autumn), pp.605-617.

Ansoff, H. I., F. E. Brandenberg, R. Portner and R. Radosevich (1971), Acquisition Behavior of U.S. Manufacturing Firms 1946-1965, (Nashvill: Vanderbilt University Press).

Arisawa, Hiromi (1969), Reformation of Industrial Structure and Corporate Mergers, (Tokyo: Diamond), (in Japanese).

Baba, Masao (1974), Economics of Anti-monopoly, (Tokyo: Chikuma Shobo), (in Japanese).

Ballon, R. J., I. Tomita and H. Usami (1976), Financial Reporting in Japan (Tokyo: Kodansha International).

Baumol, W. J. (1959), Business Behavior, Value and Growth, (New York: Macmillan).

Beaver, W.H. (1966), "Financial Ratios as Predictors of Bankruptcies", Journal of Accounting Research Supplement, pp.71-117.

Benston, George J. (1980), Conglomerate Mergers: Causes, Consequences, and Remedies, (Washington D.C.: American Enterprise Institute).

Blum, Marc (1974), "Failing Company Discriminant Analysis", Journal of Accounting Research 12 (spring), pp.1-25.

Bogen, Jules I. (1964), Financial Handbook 4th Edition, (New York: John Wiley & Sons, 1964).

Bradford, W. D. (1977), "Saving and Loan Association Mergers: Analysis of Recent Experience", Review of Business and Economic Research Vol.13 (Fall), pp.1-18.

_____ (1978), "The Performance of Merging and Saving Loan Associations", Journal of Business Vol.51 (January), pp.115-125.

Chiyoda Agency (1977), Financial Data Bank of Japanese Companies (Tokyo: unpublished), (in Japanese).

Copeland, Thomas E. and J. Fred Weston (1983), Financial Theory and Corporate Policy Second Ed. (Reading, Mass: Addison-Weeley).

Cowling, Keith, P. Stoneman, J. Cubbin, J. Cable, G. Hall, S. Domberger and P. Dutton (1980), Mergers and Economic Performance, (Cambridge: Cambridge University Press).

Dodd, P. and R. Ruback (1977), "Tender Offers and Stockholders Return: An Empirical Analysis", Journal of Financial Economics Vol.8 (January), pp.351-374.

Dodd, P. (1980), "Mergers Proposals, Management discretion and Stockholder Wealth", Journal of Financial Economics Vol.8 (January), pp.105-138.

Dambolena, I.G. and S.J. Khoury (1980), "Ratio Stability and Corporate Failure", Journal of Finance 35 (September), pp.1017-1026.

Economic Planning Agency (1968), White Paper on Economy 1968 (Tokyo: Finance Ministry Printing Bureau).

Eisenbeis, Robert A. and Robert B. Avery (1972), Discriminant Analysis and Classification Procedures, Theory and Applications, (Lexington, Mass.: Lexington Books).

Fair Trade Commission of Japan (1971), Business Concentration of Japan: Present Situation of Capital Concentration, Shareholdings, Mergers by Big Corporations, (Tokyo: Finance Ministry Printing Office), (in Japanese).

_____ (1982), Annual Report of the Fair Trade Commission 1966-1982, (Tokyo: Ministry of Finance Printing Bureau), each year (in Japanese).

Federal Trade Commission (1981), Statistical Report on Mergers and Acquisitions, (Washington D.C.: Government Printing Office).

Firth, Michael (1979), "The Profitability of Takeovers and Mergers", Economic Journal Vol.89 (June), pp.311-328.

_____ (1980), "Takeovers, Shareholder Returns, and the Theory of the Firm", Quarterly Journal of Economics Vol.44 (March).

Furukawa, Eiichi (1973), An Empirical Study: Japanese Corporate Growth Policy, (Tokyo: Chuo Keizaisha, 1973).

Futatsugi, Yusaku (1980), "The Impact of Effects of Banking Mergers", Kokumin Keizai Zasshi Vol.133 (April), pp.17-36, (in Japanese).

Harris, Roberts (1980), "The Impact of Corporate Mergers on Acquiring Firms", Journal of Financial Research Vol.3 (Fall), pp.283-295.

Haugen, R. S. and T. C. Langetieg (1975), "An Empirical Test for Synergism in Merger", Journal of Finance Vol.30 (September), pp.1003-1014.

Hirata, Mitsuhiro (1981), "Realties on General Meetings of Shareholders in Japan", Hitotsubashi Journal of Commerce and Management 16 (October), pp.17-26.

Hitachi, Ltd. (1973), OA7 HSAP Statistical Computing Package, (Tokyo: Hitachi, Ltd.), (in Japanese).

Hogarthy, T. Y. (1970), "The Profitability of Corporate Mergers", Journal of Business Vol.43 (July), pp.317-327.

Hoshino, Yasuo (1981), Quantitative Analyses of Corporate Mergers, (Tokyo: Hakuto Shobo), (in Japanese).

_____ (1982 a), "The Performance of Corporate Mergers in Japan", Journal of Business Finance and Accounting Vol.9 (Summer), pp.153-165.

_____ (1982 b), "The Comparison of Financial Characteristics between Merging and Nonmerging firms in Japan", Working Paper No.82-02, Graduate School of Management, Rutgers University, February.

_____ (1982 c), "General Comparison of Financial Characteristics between Merging and Nonmerging Firms", Working Paper No.82-03, Graduate School of Management, Rutgers University, February.

_____ (1982 d), "The Effects of Corporate Mergers in Japan", Working Paper No.82-05, Graduate School of Management, Rutgers University, March.

_____ (1982 e), "The Financial Comparison between Merging and Nonmerging Firms by Year and by Industry in Japan", Working Paper No.82-06, Graduate School of Management, March.

Hoshino, Yasuo and Kazuo Sato (1983), The Anatomy of Japanese Business, (New York, M.E. Sharp).

Hughes, A., D. C. Mueller and A. Singh (1980), Competition Policy in the 1980s: The Implications of the International Merger Wave in D. C. Mueller ed., The Determinants and Effects of Mergers, (Cambridge, Mass.: Oelgeschlager, Gunn & Heim).

Ikeda, Katsuhiko and Noriyuki Doi (1981), An Analysis of Corporate Mergers: International Comparisons, (Tokyo: Chuo Keizai), (in Japanese).

_____ (1983), "The Performance of Merging Firms in Japanese Manufacturing Industry: 1964-75", Journal of Industrial Economics 31 (March), pp.257-266.

Japan Accounting Association Research Group (1980), "An Actual Investigation on Corporate Mergers and its Accounting", Kaikei Vol. 117 (June), pp. 128-137.

Japan Development Bank (1981), Handbook of Financial Data of Industries, (Tokyo: Japan Development Bank), (in Japanese).

Kagono, Tadao, Ikujiro Nonaka, Kiyonori Sakakibara and Akihiro Okumura (1983), Management Comparisons between Japanese and U.S. Firms - Theory of Strategic Adaptation for Environment - (Tokyo: Nihon Keizai Shimbun), (in Japanese).

Kaplan, Engene J. (1972), Japan: The Government-Business Relationship, (Washington D.C.: Government Printing Office).

Lev, Baruch and Gershon Mandelker (1972), "The Microeconomic Consequences of Corporate Mergers", Journal of Business Vol.45 (January), pp.85-104.

Lye, Stephen and Aubrey Silberston (1981), "Merger Activity and Sales of Subsidiaries between Company Groups", Oxford Bulletin of Economics and Statistics Vol.1 (December), pp.303-335.

Mali, Paul (1981), Management Handbook: Operating Guidelines, Techniques and Practices, (New York: John Wiley & Sons).

Mandelker, Gershon (1974), "Risk and Return: The Case of Merging Firms", Journal of Financial Economics Vol.1 (December), pp.303-335.

Matsumoto, Koji (1982), "The Secret of Japanese Management Resulting in High Productivity", Journal of Japanese Trade and Industry Vol.1 and 2, pp.28-34, 40-45.

Meeks, G. (1977), Disappointing Marriage: A Study of the Gains from Merger, (Cambridge: Cambridge University Press).

Melicher, Ronald W. and David F. Rush (1973), "The Performance of Conglomerate Firms: Recent Risk and Return Experience", Journal of Finance Vol.28 (May), pp.141-149.

Ministry of International Trade and Industry, Enterprises Bureau (1970), Corporate Mergers: Actual Situation from the Perspective of Management, (Tokyo: Ministry of Finance Printing Bureau).

Mitsubishi Research Institute (1978), Analysis of Business Firms, The first half year of 1965-1977, (Tokyo: Mitsubishi Research Institute), (in Japanese).

Miwa, Yoshiro (1978), "The Effects of Mergers in Big Corporations: Nippon Steel and Daiichi Kangyo Bank", Keizai Hyoron (May), pp.95-105, (in Japanese).

Miyazaki, Yoshikazu (1980), "The Japanese Type Structure of Big Business" in Kazuo Sato ed. Industry and Business in Japan, (New york: M. E. Sharpe).

Mueller, D. C. (1977), "The Effects of Conglomerate Mergers", Journal of Banking and Finance Vol.1 (December), pp.315-347.

Muramatsu, Shinobu (1973), The Theory of Corporate Mergers (Tokyo:

Dobunkan).

Nakane, Fukio (1980), Low Relating to Prohibition of Private Monopoly and Methods of Preserving Fair Trade of Japan, (Tokyo: Eibun Horeisha, 1980).

Neeley, Walter P. and David P. Rochester (1982), "An Analysis of Mergers between Savings Loan Association in the United States", Applied Economics Vol.14, p.621-636.

Nie, N. H., C.H. Hull, J.G. Jenkins, K. Steinbrenner and D.H. Bent (1975), Statistical Package for the Social Sciences Second ed., (New York: McGraw Hill).

Nihon Keizai Shimbun (1979), NIKKEI; Annual Corporate Reports (Tokyo: Nihon Keizai Shimbun), (in Japanese).

Nikkei business (1982), "An Interview with the President of Minebea", Nikkei Business (January 15).

Nishiyama, Tadanori (1980), The Theory of the Structure of Management Control, (Tokyo: Bunshindo), (in Japanese).

_____ (1981), Japan is No Longer a Pure Pitalist Economy, (Tokyo: Mikasa Shobo), (in Japanese).

Ogura, Yasuhiro (1983), "A Study of Financing Decision in Japanese Company -- in pertaining to the findings of a questionnaire to financial manager--" Joho Kagaku Ronshu No. 13, pp.45-62.

Okumura, Hiroshi (1973), Acquisition, takeover and TOB: Economics of Purchasing Shares, (Tokyo: Toyo Keizai).

_____ (1981), Mitsubishi: An Industrial Group that Moves Japan, (Tokyo: Diamond), (in Japanese).

Okuno, Chuichi and Bundo Yamada (1978), Management Analysis in the Information Age, (Tokyo: Tokyo University Press), (in Japanese).

Operations Research Society of Japan (1976), A Research on Data and Program for Operations Research, (Tokyo: Operations Research Society of Japan), (in Japanese).

Osumi, Kenichiro and Tadao Omori (1983), An Outline of Commercial Code (1) New edition (Tokyo, Yuhikaku) (in Japanese).

Prime Minister's Office, Statistical Bureau (1981), Japan Statistical Yearbook 1981, (Tokyo: Japan Statistical Association).

Rose, P.S. and W.L. Scott (1980), "A Return-Equity Analysis of Eleven Largest U.S. Bank Failures", Review of Business and Economic Research 16 (Winter), pp.1-11.

Sasaki, Naoto (1981), Management and Industrial Structure in Japan, (New York: Pergamon Press).

Shimizu, Ryuei (1980), The Growth of Firms in Japan, (Tokyo: Keio Tsushin).

Shoji Homu Kenkyukai (1982), Handbook of Corporate Mergers, (Tokyo: Shoji Homu Kenkyukai).

Singh, Ajit (1971), Take-overs: Their Relevance to the Stock Market and the Theory of the Firm, (Cambridge: Cambridge University Press).

Smith, D. L. (1969), Characteristics of Merging Banks, Staff Economic Study No.49, (Washington D. C.: U. S. Board of Governors of the Federal Reserve Systems).

_____ (1971), "The Performance of Merging Banks", Journal of Business Vol.44 (April), pp.184-192.

Smith, Keith V. and J. C. Schreiber (1969), "A Portfolio Analysis of Conglomerate Diversification", Journal of Finance Vol.24 (June), pp.413-423.

Smith, Keith V. and J. Fred Weston (1977), "Further Research of Conglomerate Performance", Journal of Business Research Vol.5 (March), pp.5-14.

Sudo, Megumi (1981), "The Performance of Mergers on the Stockholders", Keisokushitsu Technical Paper No.53 (February), pp.1-53.

Suzuki, H. (1971), "Big Business Mergers and Anti-Trust Laws: A Businessman's Point of View" in J. B. Heath ed. International Conference on Monopolies, Mergers and Restrictive Practices, (London: Her Majesty's Stationary Office).

Takahashi, Kichinosuke, Yukiharu Kurokawa and Kazuki Watase (1979), "A Characteristics of Bankrupted Corporations in Financial Statements", Keio Keiei Ronshu (April), pp.40-64 (in Japanese).

Takayanagi, Satoru (1970), "Management's Merits and Demerits of Concentration" in Chuo University Economic Research Institute ed. Firm Concentration and Reorganization of Industries (Tokyo: Toyo Keizai).

Tanaka, Yasumasa and Akio Wakagi(1977), "On Corporate Bankruptcies", 36th Annual Conference of Japan Association of Accounting Research, (June) (in Japanese).

Tax Agency (1983), Actual Situation of Juridical Entity from the Tax Statistics, (Tokyo: Ministry of Finance Printing Bureau, 1983) (in Japanese).

Toda, Toshihiko (1973), "A Note on the Development of Prediction Model of Corporate Bankruptcies in Japan", Keizai Kagaku (October) (in Japanese).

_____, "Note of the Prediction of Corporate Bankruptcies in Japan", in Problems of Management Internationalization edited by Japan Academy of Management, (Tokyo: Chikura Shobo) (in Japanese).

Tokyo Shoko Research (1981), Koshin Tokuho (Tokyo: Tokyo Shoko Research) (in Japanese).

Tokyo University Computing Center (1977), Manual of Program Library, (Tokyo: Tokyo University Computing Center), (in Japanese).

_____ (1978), Manual of the Use of Magnetic Tape, (Tokyo: Tokyo University Computing Center), (in Japanese).

Toyo Keizai Shimposha (1981), Japan Company Handbook 1st half 1981, (Tokyo: Toyo Keizai Shimposha).

U. S. Department of Commerce (1972), Standard Industrial Classification Manual, (Washington D. C.: Government Printing Office).

Watanabe, Toyoki (1981), Practice of New Anti Monopoly Law (Tokyo: Shoji Homu Kenkyukai).

Weston, J. F. and S. K. Mansinghka (1971), "Test of the Efficiency Performance of Conglomerate Firms", Journal of Finance Vol.26 (September), pp.919-936.

Weston, J. F., K. V. Smith and R. E. Schrieves (1972), "Conglomerate Performance Using the Capital Asset Pricing Model", Review of Economics and Statistics (November), pp.357-363.

Weston, J. Fred (1981), "Development in Finance Theory", Financial Management Vol.19 (Summer), pp.5-22.

Wiggins, Steven N. (1980), "A Theoretical Analysis of Conglomerate Mergers" in Roger D. Blare and Robert F. Lanzillotti ed. The Conglomerate Corporation: An Antitrust Law and Economic System, (Cambridge, Mass.: Oelgeschlager, Gunn & Haim).

Wilcox, J.W. (1971), "A Gambler's Ruin Prediction of Business Failure Using Accounting Data", Sloan Management Review 12 (Spring), pp.1-10.

_____ (1976), "The Gambler's Ruin Approach to Business Risk" Sloan Management Review18 (Fall), pp.33-46.

Yamaichi Securities Co. and Yamaich Securities Research Institute (1977), The Fund Raising of Japanese Corporations, (Tokyo: Shoji Homu Kenkyukai), (in Japanese).